Who cares for the carers? The impacts of immigrant elderly care workers on the female labour supply[*]

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Abstract

We analyse how the availability of immigrant workers in the elderly care sector affects the labour force participation of Italian females aged between 45 and 65. Our main data source is represented by the cross-sectional data of AD-SILC. In order to address potential endogeneity issues we exploits an IV strategy based on the role of migration networks in determining the geographical distribution of immigrants over time (Card, 2001). Furthermore, we employ selection bias correction models in order to take into account problem due to sample selection. Our main findings show that the local availability of foreign–born people employed as caregivers has a positive impact on the number of hours worked by Italian women, especially those with high–educational levels and in the Northern regions, and it positively affects the labour force participation of italian women only in the Center and for the low-educated ones.

KEYWORDS: IMMIGRATION, FEMALE LABOUR SUPPLY, ELDERLY CARE SERVICES

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1 Introduction

The labour market consequences of immigration have been deeply analysed by economic literature in the last decades. Inconclusive evidence was provided on the impact on wages and employment rates in the host countries' labour markets, given that such effects are highly heterogeneous and strongly depend on whether and to what extent migrants' skills are complements or substitutes to the skills of existing workers. In general, high–skilled native workers seem to benefit from immigration in terms of both wages and employment rates, while low–skilled natives and previous cohorts of immigrants may suffer because of the increased competition on the market.

Beside such direct impact, the labour market choices of native females can be also affected by the increased supply of family services by female immigrant workers, usually employed as housekeepers and caregivers. Immigration may hence reduce the market price for these services and spur the labour market partipation of native women.

Recent literature mostly investigated this issue with respect to the role that low–skilled immigrants may have in child–rearing. The highly time-intensive nature of this activity often implies a trade–off between labor supply and child-care, which can be smoothened by household services performed by female immigrants. In general, high–skilled native–born young women may take advantage of low–skilled immigration by increasing their labor supply on both the extensive (labour force participation) and the intensive margin (working time).

However, immigration plays also a key role in terms of elderly care by offering domestic help to women (and households) that need to look after elderly parents. This is particularly relevant in Southern European countries characterised by decreasing fertility, rapid population ageing and the absence of adequate public assistance such as assisted living, residential and hospice care. The evidence provided by empirical literature in this respect is still scarce but supports a positive effect of immigration on women labour supply and planned retirement age (Farré *et al.*, 2011; Peri *et al.*, 2015).

In this paper, we analyse how the availability of immigrant workers in the elderly care sector at the district level affects the labour force participation of Italian females.

The closest studies to ours are those by Barone and Mocetti (2011) and Peri *et al.* (2015). Barone and Mocetti (2011) employ LFS data for 2006–2008 and look at the effects of low–skilled immigration on labour force participation and hours spent at work by native Italian working–age women, while Peri *et al.* (2015)

analyse the impact of immigration on the gender gap in retirement and working decisions in the 55-70 age range by using the Survey of Household Income and Wealth (SHIW) data for the 2000-2008 period. However, we depart from their analyses in several respects: first, we employ a more detailed and precise measure of elderly care services provided by immigrant workers at the province level thanks to administrative data collected by the Italian Social Security Institute and focus on native Italian women in the 45-65 age bracket. Second, we rely on a different empirical methodology based on a two–part model that allows for a joint Maximum Likelihood estimation of both the extensive and the intensive margin of female labour supply. Previous studies provide separate estimates of either labour force participation or hours worked that do not properly take into account the truncated nature of the latter variable. Third, our analysis covers the 2009-2012 period, thereby focusing on the recent economic crisis. In this way, we can test whether results obtained in the above mentioned papers for the pre–crisis period still hold or whether the relationship of interest changed during the great recession.

Our main data source is represented by the cross-sectional data of AD-SILC. This is a matching dataset between IT-SILC (Italian Statistics on Income and Living Condition) data gathered by the Italian National Institute of Statistics (ISTAT) and the administrative data on the labour market contracts by the Italian Social Security Institute (INPS). The first one gives us detailed information on the social and economic characteristics of individuals and households and we exploit the second one mainly to get information on the province of residence for each individual. We add to these data the number of immigrant workers employed in the domestic care sector at the province level[1].

In order to address potential endogeneity of the immigration flows, we adopt an instrumental variable approach based on the "shift-share" instruments (Card, 2001) largely employed by immigration literature. This identification strategy exploits the role of migration networks (Munshi, 2003; McKenzie and Rapoport, 2010) in determining the distribution of migrants from the same origin across destination areas. Furthermore, we take into account also potential sample selection issues by using selection bias correction models when we focus on the analysis of the intensive margin.

The main findings of our empirical analysis seem to support previous results and are coherent with our expectations. The share of foreign–born females em-

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[1]These data are are available through the "Osservatorio sui Lavoratori Domestici" managed by INPS.

ployed as caregivers at the provincial level has a positive impact on the time spent in work of Italian women above 45 years in the same province. When splitting the sample according to females' educational attainment and to geographical area, we find heterogeneous behaviours. The evidence of a positive impact gets stronger for high–educated women and for women living in the Northern regions while no impact is detected for the low–educated ones and those living in the Center and in the South. Concerning the extensive margin, the share of foreign–born people employed as caregivers at the provincial level positively affects participation rates of Italian low-educated women and of women who live in the Center regions.

The paper is organised as follows. Section 2 provides a brief review of the existing literature on the topic, with a specific focus on the Italian experience. The Section 3 proposes the empirical specifications and discusses the identification strategies. The Section 4 describes the data sample and the results are discussed in Section 5. Finally, the paper is concluded by Section 6.

2 The effect of immigration on female labour supply: existing evidence

Over the recent years, several empirical analyses focussed on the impact of low–skilled immigration on labour supply decisions of native women. The large availability of cheap market–provided services that are close substitute for household production (Cortes 2008) would primarily affect the time–use decisions of high–skilled women, for whom the opportunity cost of time is the highest. The empirical research tried to investigate whether and to what extent migration flows in local labour markets affect participation (extensive margin) and working time (intensive margin) of native women living in the district, and if such effects are heterogeneous with respect to native women's observable characteristics such as age, education and family burden.

From a methodological point of view, the extensive and the intensive margin are commonly considered as separate, independent outcomes, without accounting for the selection bias that might arise from the truncated nature of the working time variable. Two-part models addressing such an issue are still absent in the existing literature.

When analysing the impact of low–skilled immigration on labour market outcomes, most studies take into account that immigrants may be more likely to reside and/or move in areas where the demand for family and care services is

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higher thus addressing the endogeneity of immigrants' location choice. The identification strategy usually adopted makes use of the enclave–based instrumental variable approach pioneered by Card (2001) that exploits heterogeneity in historical settlement patterns of immigrants from different origin countries.

A large share of literature refers to the US. Cortés and Tessada (2011) show that the low–skilled immigration flows of the 1980s and 1990s increased both the probability of working long hours and the time devoted to market work by women at the top of the wage distribution. These effects go hand in hand with less time spent on household activities and higher expenditure on household services.

College educated women living in US metropolitan areas where immigration was larger experienced also a weaker negative correlation between childbearing and labor force participation (Furtado and Hock, 2010). In a similar vein, Furtado (2016) shows that fertility rates of high–skilled US–born women of childbearing age rose in response to immigrant inflows between 1980 and 2000 and at the same time the increased availability of family care services made women work longer hours. Interestingly, the effect on the intensive margin is larger for women with a college degree compared to those with graduate degrees.

As far as the UK labour market is considered, immigration has a positive effect on the hours worked by high–educated women, on the probability of shifting from a part time to a full time job, and on the probability of working with a recently born child (Romiti, 2018).

The recent surge in immigration to Spain, and in particular female immigration, had a positive and significant impact on the labour supply of high–skilled native women with family responsibilities (Farré *et al.*, 2011). The effect mostly worked through the extensive margin of labour supply by allowing high–skilled women to go back to work after childbirth, and to keep on working when caring for elderly dependents.

Policy interventions concerning the regulation of migration flows can have an influence on the price of market–provided household services. Cortés and Pan (2013) analysed a policy change introduced by the Hong Kong government that enabled systematic inflows of female domestic workers into the local labor market in the late 1970s. This specific program caused an increase in employment of native women with a young child compared to those with older children, especially in the case of mid– and high–skilled females.

East and Velasquez (2018) showed that the roll out of two enforcement policies between late 2000s and 2010s against undocumented migrants, disproportionately employed in the household service sector, reduced both the working probability and the usual hours worked for college-educated US native women. This result

was strongly driven by women with children, that turned out to be the most sensitive to variations in the market price of care services.

Similar empirical evidence is provided for Sweden by Halldèn and Stenberg (2014). They focused on a tax discount that reduced the consumer price of outsourced domestic services by 50% from July 2007. By employing individual register data for 2000-2010, they showed that the tax reform translated into short–term earnings increases for women that mostly reflected additional time devoted to labor market work.

At a cross-country level, by employing harmonized data for early 2000s from surveys related to five different countries (Australia, Germany, Switzerland, UK, and US) Forlani *et al.* (2015) showed that immigration positively affects the extensive margin for native females aged 22–45 and that this result is driven by the significant effect on the average probability of working for unskilled natives, while no significant effect was detected for the high–skilled. On the contrary, the impact on the intensive margin was shown to be significant for high–skilled native women only. The impact on both the intensive and the extensive margin was larger in countries where policies are less supportive to families. Where services such as childcare, optional parental leave and child allowance are not sufficiently developed, immigrants become more relevant in influencing labour market decisions by native women.

Caregiving to elderly parents is indeed another important reason – besides childrearing – that might explain women's limited labour force participation for relatively more mature women in their 40s and 50s. This is particularly true in countries, such as those of Southern Europe, that recently experienced rapid population ageing and at the same time do not provide extensive public formal care services and long–term care benefits. Crespo and Mira (2014) employ the Survey of Health, Ageing and Retirement in Europe (SHARE) data on women between ages 50 and 60 in a treatment effects framework and show that the aggregate loss of employment related to daily informal caregiving in the mid 2000s was negligible in Northern and Central Europe but became significant for Greece, Italy and Spain.

2.1 The Italian case

Despite a relatively large strand of literature that analysed either the impact of immigration on the Italian labour market or the performance of immigrant workers

in Italy[2], few existing studies focused on the specific effects on the labour supply of Italian women.

Barone and Mocetti (2011) examined the link between the presence of immigrants specialised in household production and female labour supply at the local labour market level (LLM) in the period 2006-2008, by means of the Labour Force Survey data. They defined "specialised immigrants" on the basis of their country of origin and found that as their ratio to female total population increased, high–skilled native women worked longer hours, although no effect was detected on the labour force participation. For low–skilled women nor the extensive or the intensive margin is significantly affected. Similarly to Farré *et al.* (2011), the effect was larger for women with more care responsibilities.

Labour supply and retirement plans of Italian native women that take care of elderly parents were instead investigated by Peri *et al.* (2015). In particular, they focused on women over 55 years and analysed how immigrants' supply of domestic labour can shape the gender gap in both working and retirement decisions. By using Survey of Household Income and Wealth (SHIW) data for the four waves between 2000 and 2008, they showed that a larger share of immigrants over total population at the regional level positively affected the women–men gap in the probability of employment over 60 and the women–men differential in planned retirement age.

As already discussed in the Introduction we build on this evidence by offering new insights on the impact of female immigrant employed in the elderly care sector on the labour supply of mature native women.

3   Econometric Model

In this paper, we employ a two part model with selection in order to estimate the middle-aged women's decisions on whether to participate and how much time to spend at the labour market (Cameron and Trivedi (2005)). By selecting for participation in the labour market, we consider three different scenarios: women that are not interested in being active, women willing to participate and actually working, and women who would like to work but are currently unemployed.

The specification with addictive errors terms for the empirical estimates is the following:

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[2]See among the others Gavosto *et al.* (1999), Venturini and Villosio (2006), Accetturo and Infante (2010), Staffolani and Valentini (2010), Brücker *et al.* (2011), Accetturo and Infante (2013).

$$y_{i,p,t}^* = \alpha_1 + ICW_{p,t}\beta_1 + X_{i,t}\gamma_1 + Z_{p/R,t}\delta_1 + \phi_t + \phi_R + \varepsilon_{1,i,p,t}. \tag{1}$$

$$s_{i,p,t}^* = \alpha_2 + ICW_{p,t}\beta_2 + X_{i,t}\gamma_2 + Z_{p/R,t}\delta_2 + \phi_t + \phi_R + \varepsilon_{2,i,p,t} \tag{2}$$

$$y_{i,p,t} = \begin{cases} y_{i,p,t}^* & if\, s_{i,p,t}^* > 0 \\ - & if\, s_{i,p,t}^* \leq 0. \end{cases} \tag{3}$$

where $y*_{i,p,t}$ represents the optimal amount of hours worked in a week (intensive margin), $s*_{i,p,t}$ is the unobservable propensity to participate in the labour market (extensive margin), and $y_{i,p,t}$ accounts for the real hours worked in a week conditional on being active. The indexes i, p, R, and t denote, respectively, individuals, province/region of residence, and year.

Thus, we use a ML estimator under hypothesis of joint normality of the residuals[3] and with clustered standard errors at the provincial level. In the two part model, the participation decision is estimated with a Probit model, whereas the model for the latent variable formulation is a Tobit.

$ICW_{p,t}$ is our variable of interest that measures the percentage share of immigrant elderly care workers over resident population in province p at time t.

$X_{i,t}$ is a set of individual and family level control variables at time t: age, marital status, health status, level of education, tenure in paid works, the presence of at least an elderly relative over 65 years old in good health or in bad health, the number of children under 16 years old, the number of family members in working age, the numbers of other workers, the logarithm of the household disposable income (net of the woman's income) referring to the previous year, the degree of urbanization of the residence place, the ownership of the house and the number of rooms.

$Z_{p/R,t}$ includes control variables at provincial level: female unemployment rate, real GDP growth rate, real GDP per capita, and the supply of formal care services at the regional level, i.e. the percentage share of number of beds in nursing home on population over 66 years old. Finally, Φ_t and Φ_R concern year and regional fixed effects.

Endogeneity concerns are likely to arise with respect to $ICW_{p,t}$. Firstly, there might be omitted variables (e.g. local features of the labour market) that affect both the labour supply by Italian women and immigrants' location choice. Secondly, provinces with higher female employment rates could attract more immi-

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[3] As the empirical literature does not help us to find a variable that affects the labour supply on the extensive margin and not on the intensive one, the second stage equation is identified by the nonlinearity of the functional form.

grant elderly care workers. In order to address these issues, we adopt an instrumental variable strategy based on a revised version of the standard "shift-share" instrument (Card, 2001) that exploits the past composition of the immigrant population by nationality across Italian provinces. The instrument for province p at time t is computed as

$$\widehat{IMMIG}_{p,t} = \left(\sum_j \omega^j_{p,1991} IMMIG^j_t\right)/\widehat{POP}_{p,t}; \qquad \omega^j_{p,1991} = \frac{IMMIG^j_{p,1991}}{IMMIG^j_{1991}} \qquad (4)$$

where $IMMIG^j_t$ represents the overall stock of immigrants from origin j[4] in year t and $\omega^j_{p,1991}$ is the share of immigrants from origin j living in province p. We employ Census data from 1991, that is more than a decade before the beginning of our sample period, in order to avoid potential correlation between the instrument and the error term. $\widehat{POP}_{p,t}$ is the predicted native population in year t computed as the share of province p population over total national population according to the 1991 distribution (Bratti and Conti, 2018). In this way, we avoid the denominator of the instrument being endogenous. At the same time, it is also unaffected by natives' internal migration possibly due to large immigration flows in certain areas, which would be captured, instead, by actual values.

The following first–stage equation for $ICW_{p,t}$ is then added to our specification:

$$ICW_{p,t} = \alpha_3 + \widehat{IMMIG}_{p,t}\beta_3 + X_{i,t}\gamma_3 + Z_{p/R,t}\delta_3 + \Phi_t + \Phi_R + \varepsilon_{3,i,p,t}. \qquad (5)$$

In summary, we estimate the two part model with selection including also equation 5 using a ML estimator, under the hypothesis of joint normality of the residuals. In order to check the robustness of the above specification, we also estimate the two equations separately by using an IV Probit model for the labour force participation and an IV Tobit for the weekly worked hours.

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[4] j refers to the area of origin, rather than to the single country. In particular, $j = 1,...7$ where the world regions considered are: Central and Eastern Europe, Middle East and Northern Africa, Sub–Saharan Africa, North America, Central and Latin America, East Asia and the Pacific, South Asia.

4 Data and Sample

4.1 Sample Selection Criteria

Our main data source is the cross-sectional data of AD-SILC from 2005 to 2012, which is obtained by matching two sources: i) the IT-SILC (Italian Statistics on Income and Living Condition) dataset gathered by the Italian National Institute of Statistics (ISTAT); ii) the administrative data on the labour market contracts by the Italian Social Security Institute (INPS). The first one gives us detailed information on the social and economic characteristics of individuals and households and we exploit the second one mainly to retrieve the province of residence for each individual.

We add to the AD-SILC database the ISTAT "Anziani.Stat"[5] data, that collect the number of available beds in nursing homes at regional level since 2009, and the "Osservatorio sui Lavoratori Domestici" data collected by INPS from 2007 to 2012. Here, detailed information at the province level are provided on both the number of immigrant elderly carers (the so–called "badanti") and the number of immigrant domestic workers. The latter include workers performing a broader set of household care services such as childcaring, homemaking and cooking.

From ISTAT databases we extract also other time-varying control variables at the province level: the population size by age cohorts, female unemployment rate and real GDP.

In order to build the instrument described in equation 4 we use the 1991 Census data referring to the provincial distribution of immigrants by region of origin.[6]

By matching all the above mentioned data sources, we focus on an estimation sample that contains native Italian women interviewed between 2009 and 2012. We select women aged 45 to 65 at the moment of the interview in order to limit endogeneity concerns due to fertility choices. Thus, starting from a universe of women interviewed in the period 2009-2012 of 55,739 units, the sample size reduces to 52,827 when selecting native women and is still further reduced to 20,235 individuals when restricting to the 45-65 age bracket.

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[5]See Anziani.Stat website on http://dati-anziani.istat.it.

[6]The nineteen years lag from the initial year of our analysis ensures against the potential omitted variable bias due to the local labour market demand shocks (see, among others, Card (2001) and Peri *et al.* (2015)).

4.2 Descriptive Statistics

The empirical evidence briefly described in section 2 provides heterogeneous results for the relationship between immigration and female labour supply according to the level of education. Furthermore, Italy is characterized by strong differences between macro–areas for what concerns female behaviour on the labour market.

For these reasons descriptive statistics and empirical estimates will be presented for the entire population and also for sub–samples defined according to the educational level and the macro–area of residence. We distinguish low educated women, with less than secondary education (9,915 cases), from high educated ones (10,320 cases). We also split the sample between Northern regions (7,919 cases), Central regions (6,259), and Southern ones (6,057).[7]

Table 1: Descriptive statistics of the variables of interest - all sample, by levels of educational attainment and geographical areas

	All	Low educ.	High educ.	North	Center	South
	mean	mean	mean	mean	mean	mean
Labour force participation	0.55	0.39	0.70	0.59	0.60	0.45
Weekly worked hours, active pop.	32.88	31.80	33.46	33.07	33.30	31.98
Share of ICW (%)	0.49	0.46	0.51	0.53	0.68	0.24
Observations	20235	9915	10320	7919	6259	6057

Table 1 reports descriptive statistics referring to our outcome variables, labour market participation and weekly worked hours, and the regressor of interest, the share of ICW, disaggregated by level of educational attainment and by geographical area.

Regarding the female labour force participation rate (FLFP rate), it amounts to 55% for all sample and ranges from about 39% for low–educated women to 70% for the high–educated ones and from 45% in the South to 59% and 60% in the North and the Center, respectively. Heterogeneity across educational levels is lower when looking at the intensive margin: on average, women work less than 33 hours a week. The figure rises to more than 33 hours for high–educated women and for those who live in the North and in the Center, whereas it decreases to less than 32 for the low–educated ones and those living in the South.

[7]The Northern regions include Valle d'Aosta, Piemonte, Lombardia, Trentino Alto Adige, Friuli Venezia Giulia, Veneto, and Liguria. In the Center there are Emilia Romagna, Toscana, Marche, Umbria, and Lazio. Finally, the Southern regions are Abruzzo, Campania, Basilicata, Puglia, Molise, Calabria, Sicilia, and Sardegna.

Our regressor of interest is the percentage share of immigrant elderly care workers over total population at the provincial level.[8] On average, it amounts to about 0.5%. The incidence however is more than two times larger in the Central (0.67%) and in the Northern regions (0.53%) compared to the South (0.24%). Figure 1 confirms that the distribution of informal elderly-care service in 2009 was more widespread in the Northern-Central provinces than in the Southern ones, with the highest levels in Toscana, Emilia Romagna, and Liguria. Between 2009 and 2012, these shares increased in almost all Italian provinces, with few exceptions are Sicilia, Calabria, Puglia, and Lombardia.

Table 2 provides descriptive statistics for the set of control variables that account for individual and household characteristics.

We carry out a preliminary analysis of the correlation between our outcome variables and the share of immigrant elderly care workers at the provincial level. For the full sample, Figures 2 and 3 suggest a positive and significant correlation between the share of immigrant elderly care workers and female labour supply in terms of both participation and average weekly worked hours. Regarding the labour force participation, the slope is confirmed positive in all sub-samples by educational level and by geographical area except for Southern regions. Results are very similar also for the weekly worked hours except for the sub–sample of low–educated women with a substantially flat slope.

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[8]In 1991 the number of Italian provinces amounted at 95. Later in time, this number increased up to 110. Given that we need data on 1991, in all the other years provinces were harmonized to 1991 distribution.

Figure 1: % Share of immigrant elderly care workers on Population (2009), Variation of % Share of immigrant elderly care workers on Population during the years 2009-2012 (Var 2009-2012), by province
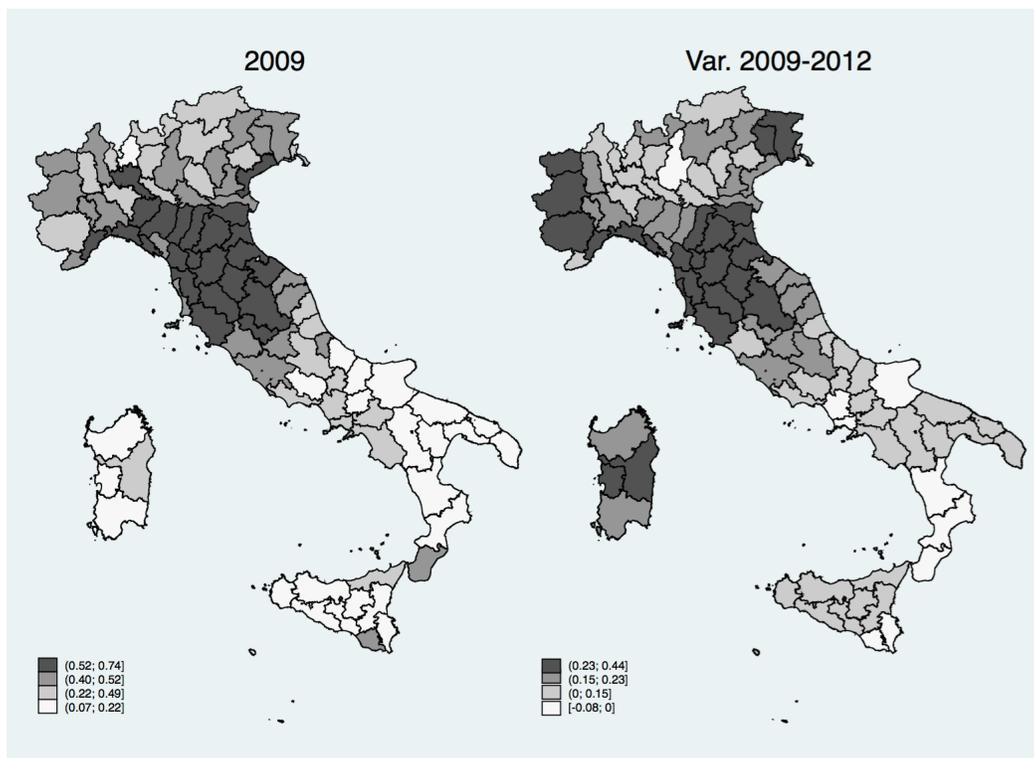
Table 2: Descriptive statistics of the control variables - all sample, by levels of educational attainment and geographical areas

	All mean	Low educ. mean	High educ. mean	North mean	Center mean	South mean
Continuous variables:						
Age	53.17	54.17	52.21	53.10	53.34	53.09
Years in paid work	20.58	18.72	22.38	23.15	22.27	15.48
No.of children aged less than 16	0.24	0.18	0.30	0.25	0.23	0.24
No.of family members in working age	1.72	1.80	1.64	1.59	1.63	1.98
No of other workers in family	0.95	1.01	0.88	0.96	0.94	0.93
log of Net disposible income	9.83	9.96	9.70	9.89	9.89	9.69
No. of rooms	3.74	3.62	3.86	3.68	3.81	3.76
Categorical variables:						
Education levels:						
- none, elementary	0.18	0.36	0.00	0.15	0.16	0.23
- compulsory	0.31	0.64	0.00	0.32	0.29	0.33
- secondary	0.39	0.00	0.76	0.42	0.41	0.32
- tertiary	0.12	0.00	0.24	0.11	0.15	0.12
Marital status:						
- single	0.08	0.06	0.10	0.08	0.08	0.08
- with a partner	0.76	0.79	0.74	0.76	0.74	0.79
- separated, divorced	0.10	0.07	0.12	0.11	0.12	0.06
- widow	0.06	0.07	0.04	0.05	0.06	0.06
Heath status:						
- very good	0.08	0.05	0.10	0.07	0.06	0.09
- good	0.59	0.52	0.65	0.62	0.62	0.51
- fair	0.26	0.32	0.21	0.25	0.24	0.31
- bad	0.06	0.09	0.04	0.05	0.07	0.07
- very bad	0.01	0.02	0.00	0.01	0.01	0.01
Elderly member(s) $\times$ health status:						
- no elderly family members	0.86	0.83	0.88	0.86	0.84	0.86
- elderly member(s) in good health	0.10	0.12	0.08	0.11	0.11	0.09
- elderly member(s) in bad health	0.04	0.05	0.03	0.03	0.04	0.04
House of ownership	0.82	0.78	0.85	0.83	0.84	0.80
Degree of urbanization area:						
- densely populated area	0.38	0.32	0.44	0.45	0.30	0.36
- intermediate area	0.40	0.42	0.37	0.37	0.50	0.33
- thinly-populated area	0.22	0.26	0.18	0.18	0.20	0.31
Aggregate variables:						
Share of nursery home bed (%)	2.61	2.56	2.66	3.94	2.21	1.29
Female unempl. rate	10.37	10.75	10.01	7.05	8.75	16.40
Real GDP per capita	0.02	0.02	0.02	0.03	0.03	0.02
Real GDP growth rate	-0.01	-0.01	-0.01	-0.00	-0.01	-0.01
Observations	20235	9915	10320	7919	6259	6057

Figure 2: Labour force participation (FLFP rate) and % share of immigrant elderly care workers on population (ICW share(%)) - all sample (a), by education levels (b), and by geographical areas (c)
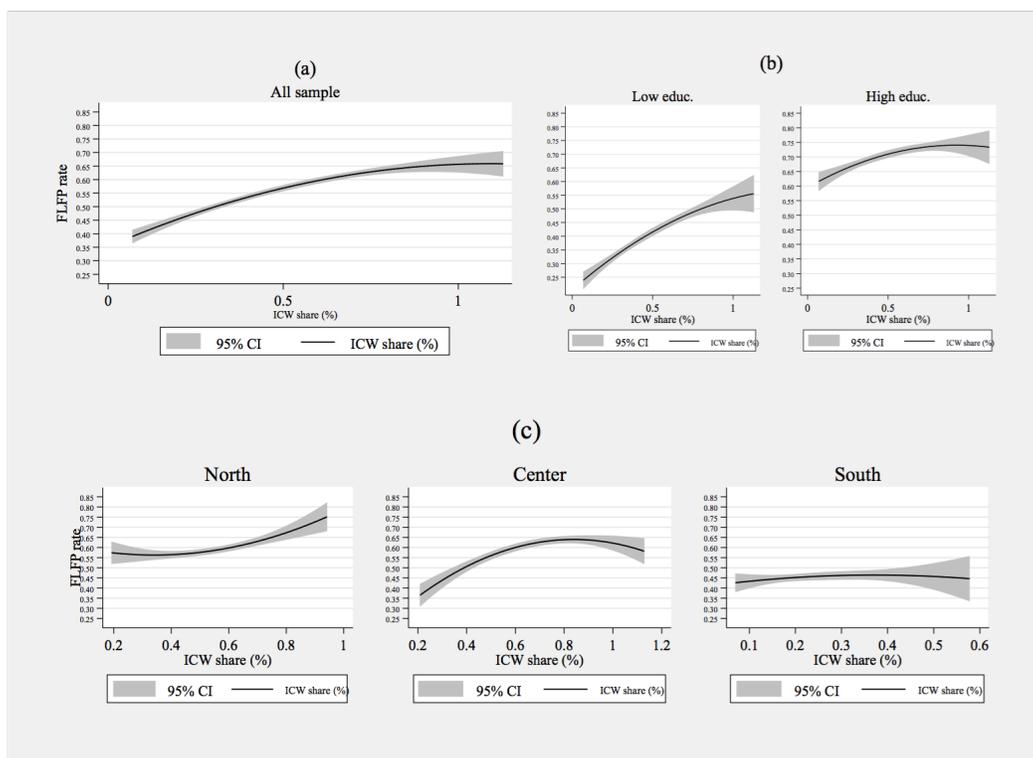
Figure 3: Weekly worked hours (WWH) and % share of immigrant elderly care workers on population (ICW share (%)) - all sample (d), by education levels (e), and by geographical areas (f)
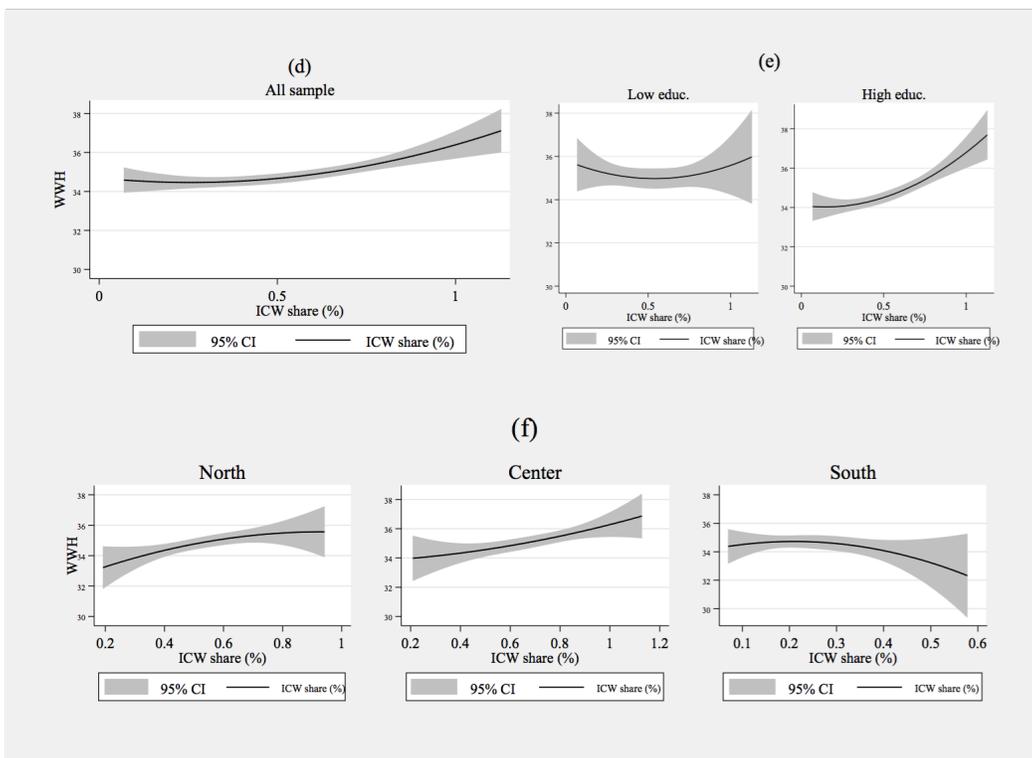
5 Empirical results

Our preferred estimation strategy is based on the IV two part model with selection, described in equations 1-5. This model avoids any potential bias due to sample selection problems and allows for a joint estimation of the two dependent variables, participation and working time, by taking into account the potential endogeneity of our variable of interest $ICW_{p,t}$. Estimation results are provided in Table 3 both for the overall sample and for the sub–samples disaggregated by educational level and geographical area.

When instrumenting the share of caregivers with the traditional "shift-and-share" strategy, the first-stage regression shows that the instrument has mostly a positive and significant effect on the local presence of caregivers and the F-statistic is well above the critical threshold of 10 (Stock and Yogo, 2005). The only exception is represented by Southern provinces, whose F-statistic is much lower (1.744) than the critical value and the instrument does not significantly affect the share of international care workers on the resident population. Such a weak identification might be due to the low incidence of immigrants on resident population in the South and to the even lower share of international care workers[9]. For these reasons, despite providing results for the South throughout the paper we would not specifically comment on them and focus on the remaining set of estimates.

The upper part of the table shows the marginal effect of an increase in the share of immigrant elderly care workers on the weekly hours worked by the female population aged between 45 and 65. The relationship is positive and significant at 10% for the entire sample. When moving on to the different sub–groups, it is clear that the overall significance is driven by high–educated women and by the Northern regions. Such evidence recalls results provided in Barone and Mocetti (2011), who find a significant impact of immigration on the intensive margin for the full sample of Italian women and show that this effect is limited to the high–educated group. The same kind of effect is found also in Cortés and Tessada (2011) and Forlani *et al.* (2015).

In terms of elasticity, a 1% rise in the share of immigrant caregivers on total resident population increases the number of worked hours by 12% on the full sample (column 1). When focusing on either high–educated women (column 3) or

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[9]By comparing the distribution of elderly care workers by nationality in the different macroareas, striking differences emerge: the share of Italian women performing elderly care services is almost three times larger in Southern provinces compared to the rest of the country. In addition, Southern provinces also experienced the lowest increase in the share of immigrant elderly care workers over the period 2009-2012, as depicted in Figure 1.

the Northern subsample (column 4), the effect becomes stronger: worked hours increase respectively by 22% and 16%. In other words, if we refer to the average figures for the variables of interest reported in Table 1 for the full sample, an increase in the share of migrant care workers on total population by 0.1 percentage points, that is from 0.55% to 0.65%, would increase the average weekly worked hours from 32.88 to 33.60. For the high–educated subsample, an analogous increase in the share of ICW by 0.1 percentage points would raise the average weekly worked hours from 33.46 to 34.49, while for women living in the North the increase would be from 33.07 to 33.96 working hours per week.

Concerning the extensive margin, the share of foreign–born people employed as caregivers at the provincial level does not affect participation rates of Italian women in the whole sample. When we focus on the subsamples, we find positive and statistical significant effects for low-educated women and for those who live in the Center regions. An increase of 0.1 percentage points in the share of ICW increases the probability of participation at the labour market by 0.021 and 0.028 percentage points, respectively. Such effects seem to be driven by the choices of the postponed retirement for the women over 60 years old.[10] The results are in line with the evidence provided in Forlani *et al.* (2015) and Peri *et al.* (2015) of a significant and positive effect on the probability of employment while they depart from (Barone and Mocetti, 2011), who find no significant effect on participation of Italian women for the 2006-2008 period (Barone and Mocetti, 2011).

The effects of the control variables included in the estimated specification for both the intensive and the extensive margin are mostly significant and in line with our expectations. Detailed results are provided in Table B.1 in the Appendix.

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[10]We repeat the estimation for the sample of women aged 45-60 and the effects lose the statistical significance.The estimates are available from the authors upon request.

Table 3: Working hours, IV two part model with selection

	(1) ALL	(2) Low ed.	(3) High Ed.	(4) North	(5) Center	(6) South
Intensive margin - Weekly Worked Hours						
Share of ICW	7.239*	5.790	10.338**	8.900***	7.698	99.603
	(1.91)	(0.74)	(2.14)	(3.08)	(0.84)	(0.84)
Extensive margin - Labour Force Participation						
Share of ICW	0.124	0.210*	0.062	0.048	0.284*	-0.998
	(1.61)	(1.95)	(0.56)	(0.55)	(1.86)	(-1.31)
Share of ICW						
Instrument	0.133***	0.140***	0.127***	0.143***	0.100***	0.221
	(5.33)	(5.59)	(5.10)	(4.52)	(3.06)	(1.18)
First stage F-statistics	23.513	21.991	24.290	16.928	7.501	1.744
Full set of controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20235	9915	10320	7919	6259	6057

Notes: *** Significant at 1%; ** significant at 5%; * significant at 10%. Marginal effects and *t* statistics in parentheses. Coefficients for the full set of control variables are reported in Appendix B, Table B.1.

[a] We control for: age, education (5 classes), marital status (4 classes), health (5 classes), years in paid work, No. of children less than 16, No. of family members in working age, elderly member in the family X health status (3 classes), No. of other workers in the family, log of other members family income, ownership of the house, No. of rooms in the house, degree of urbanisation (3classes), female unemployment rate (province), real GDP per capita (province), real GDP growth rate (province), share of nursery home beds on population 66+ (region), years, regions, and constant.

[b] The instrument is built as seen in equation 5. Standard errors are clustered at the provincial level.

5.1 Robustness checks

In order to test the validity of our baseline estimates, Table 4 provides separate estimates for the two outcomes of interest by employing an IV Tobit (panel a) and an IV Probit (panel b), respectively[11]. Such results corroborate the previous evidence both in terms of statistical significance and in terms of magnitude of the marginal effects. In panel c) we estimate an IV two part model where the principal equation is modelled as an ordered probit by defining 7 classes for our dependent variable[12]. Results are in line with the baseline specification, although the statistical relevance disappears for the full sample.

In panel d) of Table 5, we estimate the baseline IV two part model by adding the interaction between year and regional dummies as further control variables. The main results are confirmed and their magnitudes are very similar.

In panel e) we replace our regressor of interest, the share of immigrant elderly care workers, with the share of immigrant care workers which include both immigrant elderly carers and domestic workers. The "Osservatorio sui Lavoratori Domestici" data collected by INPS indeed include information on both types of contracts and this allows us to assess the broader effect of immigrant workers in the family care sector on female labour market outcomes. The effect on the intensive margin is still significant, but with a lower magnitude, which may be related to a different distribution of domestic workers compared to elderly care workers across Italian provinces and/or to a higher specialization of immigrant workers into elderly care services compared to domestic ones.

Finally, in panel f) we focus on women who live in the most urbanised areas. The results are totally confirmed and the size of the marginal effects are higher than the main ones: it might be consistent with the greater availability of the immigrant care service's supply than that is in the rural areas.

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[11]Results for the complete set of control variables is available in Tables B.2 and B.3 in the Appendix.

[12]The seven classes are defined as follows: 1 if the woman does not work and is looking for a job, 2 if she has a reduced part-time job with less than 20 hours per week, 3 for part-time job with less than 28 hours, 4 for the augmented part-time job with less than 35 hours, 5 for a reduced full-time job with less than 40 hours, 6 for a full-time job with 40 hours, and, finally, 7 for women that work more than 40 hours per week.

Table 4: Robustness checks

	(1) ALL	(2) Low ed.	(3) High Ed.	(4) North	(5) Center	(6) South
a) IV Tobit						
Intensive margin - Weekly Worked Hours						
Share of ICW	7.609*	6.424	10.549**	9.257***	8.055	82.778
	(1.90)	(0.80)	(2.13)	(2.94)	(0.82)	(0.86)
Full set of controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11153	3906	7247	4673	3735	2745
First Stage						
Instrument	0.129 ***	0.138***	0.125***	0.135***	0.096***	0.253
	(4.86)	(4.72)	(4.94)	(4.13)	(2.75)	(1.33)
First stage F-statistics	23.309	21.621	24.247	16.918	7.173	1.866
b) IV Probit						
Extensive margin - Labour Force Participation						
Share of ICW	0.537	0.860**	0.282	0.124	1.196*	-4.619
	(1.63)	(1.98)	(0.56)	(0.55)	(1.86)	(-1.34)
Full set of controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	20235	9915	10320	7919	6259	6057
First Stage						
Instrument	0.133***	0.140***	0.127***	0.143***	0.100***	0.221
	(5.33)	(5.59)	(5.10)	(4.52)	(3.06)	(1.18)
First stage F-statistics	28.389	31.062	25.883	20.307	9.304	1.387
c) Ordered Probit						
Intensive margin - Weekly Worked Hours in classes						
Share of ICW	0.379	0.109	0.745	0.757***	-0.025	6.138
	(1.12)	(0.19)	(1.63)	(2.77)	(-0.03)	(0.83)
Extensive margin - Labour Force Participation						
Share of ICW	0.124	0.209*	0.061	0.050	0.283*	-0.985
	(1.61)	(1.95)	(0.56)	(0.57)	(1.85)	(-1.31)
Observations	20235	9915	10320	7919	6259	6057

Notes: *** Significant at 1%; ** significant at 5%; * significant at 10%. Marginal effects and *t* statistics in parentheses. The estimated parameters of the coefficient all the other regressors are reported in Appendix B, Tables B.3-B.2.

[a] See footnote [a] of Table 3.

[b] The instrument variable of our regressor of interest (share of ICW) is built as seen in equation 5. The standard errors are clustered at the provincial level.

Table 5: Robustness checks

	(1) ALL	(2) Low ed.	(3) High Ed.	(4) North	(5) Center	(6) South
d) Adding *year × regions*						
Intensive margin - Weekly Worked Hours						
Share of ICW	7.047*	5.615	9.751**	8.288***	8.180	101.230
	(1.92)	(0.74)	(2.14)	(3.25)	(0.344)	(0.83)
Extensive margin - Labour Force Participation						
Share of ICW	0.119*	0.199*	0.056	0.045	0.276**	-0.947
	(1.65)	(1.96)	(0.53)	(0.53)	(2.18)	(-1.28)
Observations	20235	9915	10320	7919	6259	6057
e) Share of immigrant domestics						
Intensive margin - Weekly Worked Hours						
Share of domestics	0.892**	0.694	1.250**	1.293***	0.710	10.103
	(1.99)	(0.69)	(2.51)	(2.83)	(0.95)	(1.30)
Extensive margin - Labour Force Participation						
Share of domestics	0.015	0.026**	0.007	0.007	0.025	-0.103*
	(1.64)	(2.10)	(0.55)	(0.56)	(1.53)	(-1.79)
Observations	20235	9915	10320	7919	6259	6057
f) Most urbanised areas						
Intensive margin - Weekly Worked Hours						
Share of ICW	7.445**	2.505	11.081**	8.573***	7.788	136.753
	(2.46)	(0.37)	(2.49)	(3.37)	(1.11)	(1.22)
Extensive margin - Labour Force Participation						
Share of ICW	0.125	0.281**	-0.017	0.021	0.302**	-1.035
	(1.63)	(2.34)	(-0.17)	(0.29)	(2.34)	(-1.10)
Observations	15718	7297	8421	6483	5031	4204

Notes: *** Significant at 1%; ** significant at 5%; * significant at 10%. Marginal effects and *t* statistics in parentheses.

[a] See footnote [a] of Table 3.

[b] The instrument variable of our regressor of interest (share of ICW) is built as seen in equation 5. The standard errors are clustered at the provincial level.

6   Conclusions

In this paper, we analysed the role of immigrant elderly care workers in affecting the labour supply of Italian native women aged 45 and over. To this end, AD-SILC data were matched with INPS data on foreign–born workers employed in the elderly care sector at the province level for the period 2009-2012.

Our estimates show that, once potential endogeneity is accounted for by means of IV strategies and by models that correct for selection bias, there is a significant effect of immigration on female labour supply in terms of intensive margin. The share of immigrant care workers over total population positively affects the weekly worked hours in the entire sample. The average effect of an increase in the share of immigrant care workers over total population by 0.1 percentage points is a rise from 32.88 to 33.60 working hours per week. This result is driven mainly by the group of high–educated women and by those living in the Northern regions. By contrast, no effects are detected on the extensive margin for the full sample. The availability of immigrant care workers affects the labour force participation only in the Center and for the low-educated ones.

This second–order effect of immigration on native female labour supply can be important in order to promote female participation into the labour market in countries, such as Italy, which traditionally have a large gender gap in labour force participation.

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Appendix

A   A theoretical model for care services

The aim of this section is to theoretically investigate the labour supply effects of an exogenous increase in the availability of care attendants.

We assume that in any given period two generations coexist inside families, namely the youngest and the elderly. In the family i, young individuals spend their time by working on the market (h_i) and as care givers for the older (x_{1i}^S); they do no demand care services and all their income comes from labour. Old individuals do not work and demand care services to three different actors: the family (x_{1i}^D), through the care offered by the sons , the markets, through professional carers (x_{2i}^D), and the state, through retirement homes (x_{3i}^D). Their income (m_i) is exogenously given. Even if the following analysis refers to the older (individuals in their retirement age), and young (their sons) inside the same family i, we drop the index i to simplify the notation,

The well being of individuals depends positively on consumption (c) and care services (X), if needed, and negatively on labour activities (y); thus, we assume:

1. separability between the argument of the utility function and risk neutral individuals[13]

2. perfect substituibility between care services offered in old-age residential home and care services offered through the market and through the family.

According to the point 2., the care service (X) is defined as follows

$$X = x_3 + f(x_1, x_2) \tag{A.1}$$

and one of the two conditions must hold, $x_3 = 0$ or $f(x_1, x_2) = 0$, depending on the relative prices. We consider now the case with $x_3 = 0$, so that the case where care services are not demanded to residential houses.

The utility of the older (subscript O) is therefore given by:

$$u_0 = c_O + f(x_1^D, x_2) \tag{A.2}$$

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[13]Separability and linearity imply that changes in total income affect only consumption, because demand for care service increases until their marginal utility is higher than their price and the supply of labour raises until the marginal disutility due to work is lower than the wage. This assumption does not allow us to adequately consider the effects of a change in income on our variables of interest, but strongly simplifies the results.

Where we assume $f_1(x_1,x_2), f_2(x_1,x_2) > 0$ and $f_{11}(x_1,x2), f_{22}(x_1,x_2) \leq 0$. Older's income is m, used to buy care services from their sons at the price p_1 (which represents the (implicit) payment for care services inside families), care services in the market and the price p_2 for an consumption goods at the price $p_C = 1$. Therefore:

$$c_0 = m - (p_1 x_1 + p_2 x_2)$$

By maximizing utility and given the budget constraint, we get the FOCs:

$$\begin{cases} -p_1 + f_1(x_1,x_2) = 0 \\ -p_2 + f_2(x_1,x_2) = 0 \end{cases} \tag{A.3}$$

By differentiating the FOCs with respect to p_1 and with respect to p_2, we obtain:

$$\begin{cases} \frac{\partial x_1}{\partial p_1} = \frac{f_{22}}{|H|} < 0 & \frac{\partial x_2}{\partial p_1} = \frac{-f_{12}}{H|} \\ \frac{\partial x_1}{\partial p_2} = \frac{-f_{12}}{|H|} & \frac{\partial x_2}{\partial p_2} = \frac{f_{11}}{|H|} < 0 \end{cases} \tag{A.4}$$

where $|H|$ is the determinant of the Hessian matrix, that must be positive in order to get a maximum in the utility function.

Given the concavity of the f function, $\frac{\partial x_1}{p_1}$ and $\frac{\partial x_2}{p_2}$ show a clear-cut negative sign. The signs of $\frac{\partial x_1}{\partial p_2}$ and $\frac{\partial x_2}{\partial p_1}$ depends on the sign of f_{12}. Using the definition of q-complements: "if x_1 and x_2 are q-complements, an increase in the quantity of x_2 leads to an increase in the marginal value of x_1." [14], we conclude that if family care and market care are q-substitutes, then $\frac{\partial x_1}{\partial p_2} > 0$.

Therefore we obtain that, in the case of non-utilisation of residential homes, the demand functions for care services are negatively sloped. If the demand of family care, x_1, and market care, x_2, are q-substitutes (if $f_{12} < 0$), then a decrease in the market price of care services decreases the demand for family care.

The young (subscript Y) do not need care services and get their income from labour. Their utility is given by:

$$u_Y = c_Y - y(h, x_1) \tag{A.5}$$

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[14](Hicks, 1956 Revision of Demand Theory. `https://www.researchgate.net/publication/227356027_Elasticities_of_substitution_and_complementarity`. See also: David Ian Stern. January 2009, Journal of Productivity Analysis 36(1):79-89. "Hicks and Allen (1934a) went on to discuss the dichotomy of "competitive" and complementary commodities or inputs, which Hicks (1970) renamed q-substitutes and q-complements.1 Since Pareto and Edgeworth these concepts had been used to discriminate between commodities and inputs based on the sign of the second derivative of the utility or production function (Hicks and Allen 1934a" Elasticities of substitution and complementarity) .

where we assume $y_1(h,x_1), y_2(h,x_1) > 0$ and $y_{11}(h,x_1), y_{22}(h,x_1) \geq 0$. By defining w the wage rate, the budget constraint of the young generation is given by:

$$c_Y = wh + p_1 x_1 \tag{A.6}$$

Consider now the young generation, as described by the equations A.5 and A.6. The FOCs are:

$$\begin{cases} w - y_h(h,x_1) = 0 \\ p_1 - y_1(h,x_1) = 0 \end{cases} \tag{A.7}$$

That, differentiated with respect to w and p_1, solves to:

$$\begin{cases} \frac{\partial x_1}{\partial p_1} = \frac{y_{11}}{|H|} > 0 & \quad \frac{\partial h}{\partial p_1} = \frac{-y_{h1}}{|H|} \\ \frac{\partial x_1}{\partial w} = \frac{-y_{h1}}{|H|} & \quad \frac{\partial h}{\partial w} = \frac{y_{11}}{|H|} > 0 \end{cases} \tag{A.8}$$

where $|H|$ is the determinant of the Hessian function. The above results imply that, in the case of non-utilisation of residential homes, the labour supply functions are positively sloped. If working time on the market, h, and working time as caregivers in the family, x_1, are q-complement, a decrease in the price of family care (p_1) increases labour supply on the market.

Putting together the above results, we can state that:

Theorem 1 *In the case of non-utilisation of residential homes, if family care (x_1) and market care (x_2) are q-substitutes, a reduction in the price of market care, p_2, decreases the demand for family care. Given that the supply for family care is not affected by p_2, the equilibrium price for family care, p_1, decreases. If h (work on the market) and x_1 (work for family care) are q-complement, the reduction in p_1 causes an increase in the supply of labour in the market.*[15]

The assumptions of q-complementarity in the supply of different types of labour, $y_{h1} > 0$, and the assumption of q-substitutability in the demand for care services between different type of care, $f_{12} < 0$ are both necessary conditions[16] between the two argument to obtain the following result: an increase in the availability of caregivers in the market, due to low skilled, mainly female migrations, reduces the price for market care and increases the labour supply of sons.

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[15]Labour in the market increases following a reduction in p_2 also in the unrealistic case where x_1 (family care) and x_2 (market care) are q-complements and h (market work) and x_1 (work for family care) are q-substitutes.

[16]Actually, they hold in the case the functions f ad y depends on the sum of the argument as it may seem realistic. For instance if $f = (x_1 + x_2)^{\alpha}$, with $\alpha < 1$ and $y = (h + x_1)^{\beta}$, with $\beta > 1$.

Finally, let us come back to the availability of old-age residential homes for care services. The likelihood of choosing this solution depends on the relative price of residential homes with respect to the weighed price of care through the marker and through the family. If the former reduces because of immigration, the choice of residential home becomes less appealing. This means that a reduction in p_2 (an increase in the availability of caregivers on the market) is likely to reduce the share of old who choose residential home and, through this channel, the overall demand for family care must increase because, by assumption, no family care is needed in the case care services are offered from residential homes.

Theorem 2 *The higher availability of care services on the market and the reduction of their price:*

- *In the case of non-utilisation of residential homes and assuming $y_{h1} > 0$ and $f_{12} < 0$ increases the labour supply of sons;*

- *assuming perfect substitutability between care demanded inside residential homes and the other types of care services, by reducing the share of families that use residential homes, reduces the labour supply of sons.*

The two go in opposite directions, Intuitively, migrant caregivers substitute the work of sons who therefore can supply more labour in the market but they also substitute the demand for residential homes and, by this way, they raise the time sons devote to the care of their relatives.

B   Full set of estimation results

Table B.1: Weekly Worked Hours, IV two part model with selection

	(1) ALL	(2) Low ed.	(3) High Ed.	(4) North	(5) Center	(6) South
Intensive margin - Weekly Worked Hours						
Share of ICW	7.239*	5.790	10.338**	8.900***	7.698	99.603
	(1.91)	(0.74)	(2.14)	(3.08)	(0.84)	(0.84)
Age	-0.169***	-0.017	-0.200***	-0.146**	-0.235***	-0.169**
	(-4.59)	(-0.19)	(-4.49)	(-2.45)	(-4.23)	(-2.18)
Education level - Reference: none, elementary						
- compulsory	0.812	1.401*		0.876	0.184	1.452
	(1.11)	(1.89)		(0.85)	(0.12)	(1.00)
- secondary	1.855***		-1.186***	1.799	1.826	1.741
	(2.63)		(-3.63)	(1.43)	(1.43)	(1.43)
- tertiary	3.165***			3.423**	2.886**	2.808**
	(4.24)			(2.39)	(2.19)	(2.14)
Marital status - Reference: single						
- with a partner	-0.453	0.686	-1.497**	-1.574	-0.477	1.463
	(-0.74)	(0.57)	(-2.31)	(-1.61)	(-0.47)	(1.19)
- separated, divorced	0.091	-0.053	0.069	0.105	-0.602	1.131
	(0.17)	(-0.04)	(0.11)	(0.12)	(-0.63)	(1.07)
- widow	-0.976	-0.466	-1.251	-0.152	-1.009	-1.749
	(-1.21)	(-0.34)	(-1.20)	(-0.12)	(-0.56)	(-1.38)
Health - Reference: very good						
- good	-1.048**	-1.628	-0.781*	-2.667***	0.840	-1.026
	(-2.06)	(-1.29)	(-1.71)	(-5.20)	(1.01)	(-0.76)
- fair	-2.171***	-3.405**	-1.471***	-3.424***	-0.868	-1.562
	(-4.38)	(-2.54)	(-3.01)	(-4.99)	(-0.99)	(-1.42)
- bad	-2.831***	-3.541**	-2.419**	-4.328***	-1.805	-1.855
	(-3.75)	(-2.51)	(-2.52)	(-4.72)	(-1.15)	(-1.30)
- very bad	-1.796	-0.890	-3.369**	-2.818	-2.088	3.663
	(-1.00)	(-0.37)	(-2.00)	(-1.02)	(-0.75)	(1.07)
Years in paid work	0.374***	0.456***	0.296***	0.309***	0.368***	0.481***
	(16.69)	(11.81)	(10.37)	(8.57)	(9.09)	(13.18)
No.of children aged less than 16	-1.181***	-1.140	-1.226***	-1.912***	-0.511	-0.866
	(-3.95)	(-1.63)	(-3.51)	(-5.11)	(-1.02)	(-1.25)
Elderly members × health - Reference: no elderly						
- elderly in good health	0.748	1.208	0.649	0.938	0.450	0.185
	(1.42)	(1.19)	(1.18)	(0.99)	(0.47)	(0.17)
- elderly in bad health	1.625**	2.582*	1.024	2.969**	1.151	0.815
	(2.05)	(1.87)	(1.13)	(2.51)	(0.79)	(0.59)
No. of family members in working age	-0.310*	0.208	-0.338	-0.353	-0.221	-0.546**
	(-1.73)	(0.54)	(-1.60)	(-1.36)	(-0.63)	(-2.02)
No. of other workers	0.578***	-0.059	1.075***	0.966***	0.795**	-0.403
	(2.70)	(-0.15)	(3.55)	(2.96)	(2.25)	(-0.81)
log Net disposible income	-0.447***	-0.761***	-0.304***	-0.457***	-0.603***	-0.178
	(-6.39)	(-5.65)	(-4.11)	(-4.64)	(-4.71)	(-1.35)
House of ownership	1.752***	1.833**	1.605***	1.644***	2.193**	1.917**
	(4.08)	(2.36)	(3.25)	(3.49)	(2.33)	(1.98)

No. rooms	0.288**	0.503*	0.195	0.144	0.421	0.301
	(1.98)	(1.77)	(1.24)	(0.62)	(1.42)	(1.15)
Degree of urbanization - Reference: densely populated area						
- Intermediate area	0.012	1.174	-0.475	-0.549	0.532	-0.080
	(0.03)	(1.57)	(-1.26)	(-0.97)	(0.68)	(-0.06)
- Thinly-populated area	0.831*	2.333**	0.006	1.078	0.781	0.190
	(1.71)	(2.48)	(0.01)	(1.56)	(1.00)	(0.12)
Share of nursery home beds on pop.66+	-0.395	-0.692	-0.387	-0.503	-1.834	4.866
	(-0.79)	(-1.26)	(-0.61)	(-0.83)	(-0.87)	(0.54)
Female unempl. rate	-0.174*	-0.368**	-0.046	-0.249*	0.047	-0.000
	(-1.71)	(-1.97)	(-0.46)	(-1.70)	(0.21)	(-0.00)
Real GDP per capita	3.255	54.466	-47.163	-24.962	85.734**	-335.013
	(0.11)	(0.80)	(-1.28)	(-1.44)	(2.33)	(-0.91)
Real GDP growth rate	1.114	4.852	-0.865	2.344	-1.240	-40.255
	(0.25)	(0.61)	(-0.19)	(0.63)	(-0.11)	(-0.69)
Constant	34.599***	28.582***	38.859***	39.333***	35.533***	-13.003
	(10.42)	(5.30)	(8.11)	(10.55)	(3.39)	(-0.22)
Extensive margin - Labour Force Participation						
Share of ICW	0.537	0.853*	0.292	0.213	1.198*	-4.505
	(1.61)	(1.95)	(0.56)	(0.55)	(1.86)	(-1.34)
Age	-0.152***	-0.131***	-0.179***	-0.167***	-0.155***	-0.127***
	(-36.08)	(-24.90)	(-30.80)	(-31.57)	(-20.09)	(-13.25)
Education level - Reference: none, elementary						
- compulsory	0.085*	0.143***		0.092	-0.038	0.175**
	(1.72)	(2.96)		(1.09)	(-0.43)	(2.32)
- secondary	0.490***		-0.546***	0.491***	0.313***	0.596***
	(8.08)		(-10.71)	(4.81)	(3.47)	(5.54)
- tertiary	1.011***			0.866***	0.857***	1.261***
	(13.90)			(7.32)	(8.00)	(9.85)
Marital status - Reference: single						
- with a partner	-0.383***	-0.396***	-0.399***	-0.296***	-0.433***	-0.434***
	(-6.12)	(-4.97)	(-3.79)	(-3.04)	(-4.00)	(-3.74)
- separated, divorced	-0.014	-0.011	-0.067	-0.012	-0.041	0.043
	(-0.22)	(-0.10)	(-0.66)	(-0.12)	(-0.45)	(0.27)
- widow	-0.247***	-0.295***	-0.271**	-0.120	-0.441***	-0.232
	(-3.05)	(-2.68)	(-2.04)	(-0.93)	(-3.80)	(-1.30)
Health - Reference: very good						
- good	-0.034	-0.015	-0.029	-0.081	0.080	-0.055
	(-0.86)	(-0.22)	(-0.47)	(-1.31)	(1.21)	(-0.73)
- fair	-0.153***	-0.066	-0.233***	-0.205***	-0.082	-0.164**
	(-3.51)	(-0.90)	(-3.10)	(-3.06)	(-1.06)	(-2.26)
- bad	-0.183***	-0.130	-0.214**	-0.212***	-0.111	-0.211**
	(-3.74)	(-1.57)	(-2.04)	(-2.98)	(-1.13)	(-2.40)
- very bad	-0.568***	-0.361*	-1.109***	-0.551**	-0.332	-1.056***
	(-3.16)	(-1.77)	(-4.57)	(-1.99)	(-0.94)	(-4.58)
Years in paid work	0.069***	0.062***	0.080***	0.067***	0.065***	0.073***
	(39.88)	(32.30)	(30.78)	(21.91)	(25.92)	(17.50)
No. of children aged less than 16	-0.121***	-0.167***	-0.110***	-0.163***	-0.134***	-0.065
	(-5.17)	(-4.43)	(-3.11)	(-3.94)	(-3.26)	(-1.51)
Elderly members × health - Reference: no elderly						
- elderly in good health	-0.005	-0.074	0.059	0.048	-0.010	-0.036
	(-0.13)	(-1.05)	(0.70)	(0.64)	(-0.16)	(-0.34)

- elderly in bad health	0.018	-0.058	0.116	0.020	-0.036	0.051
	(0.25)	(-0.75)	(0.87)	(0.16)	(-0.32)	(0.40)
No. of family members in working age	0.007	-0.016	0.035	0.008	0.027	0.009
	(0.45)	(-0.69)	(1.42)	(0.23)	(0.89)	(0.39)
No. of other workers	-0.057***	-0.016	-0.103***	-0.078***	-0.025	-0.086**
	(-2.88)	(-0.58)	(-3.81)	(-2.62)	(-0.77)	(-2.12)
log Net disposible income	-0.158***	-0.156***	-0.162***	-0.164***	-0.152***	-0.155***
	(-10.05)	(-7.69)	(-7.51)	(-5.02)	(-6.10)	(-6.11)
House of ownership	-0.056	-0.145***	0.057	0.014	-0.091	-0.120**
	(-1.55)	(-3.07)	(0.98)	(0.19)	(-1.42)	(-2.57)
No. rooms	0.036***	0.014	0.063***	0.031	0.049***	0.018
	(3.16)	(0.83)	(3.47)	(1.54)	(3.04)	(0.74)
Degree of urbanization - Reference: densely populated area						
- intermediate area	-0.011	-0.019	-0.011	-0.039	0.005	0.039
	(-0.32)	(-0.37)	(-0.19)	(-0.65)	(0.07)	(0.61)
- thinly-populated area	-0.081*	-0.094	-0.041	-0.154**	-0.075	-0.023
	(-1.93)	(-1.30)	(-0.55)	(-2.24)	(-1.20)	(-0.25)
Share of nursery home beds on pop.66+	-0.018	0.039	-0.063	-0.037	0.356	-0.314
	(-0.54)	(0.63)	(-1.55)	(-1.05)	(1.29)	(-1.11)
Female unempl. rate	-0.001	-0.001	-0.001	-0.020	0.024	-0.010
	(-0.06)	(-0.12)	(-0.14)	(-1.61)	(1.37)	(-0.81)
Real GDP per capita	1.300	0.090	3.178	1.081	5.278	9.763
	(0.55)	(0.02)	(0.75)	(0.42)	(0.93)	(0.74)
Real GDP growth rate	-1.037***	-1.452***	-0.526	-0.845	-3.009***	1.693
	(-2.74)	(-2.85)	(-0.88)	(-1.59)	(-2.59)	(0.96)
Constant	8.072***	6.736***	10.495***	9.381***	6.140***	9.190***
	(20.95)	(12.04)	(23.02)	(22.55)	(4.68)	(6.53)
Share of ICW						
Instrument	0.133***	0.140***	0.127***	0.143***	0.100***	0.221
	(5.33)	(5.59)	(5.10)	(4.52)	(3.06)	(1.18)
Age	0.000	0.000**	-0.000	0.000	0.000	0.000
	(1.13)	(2.33)	(-1.02)	(1.30)	(0.77)	(0.68)
Education level - Reference: none, elementary						
- compulsory	0.001	0.002		0.000	0.001	0.003
	(0.60)	(1.21)		(0.04)	(0.36)	(1.25)
- secondary	-0.001		-0.000	-0.003	0.001	0.001
	(-0.50)		(-0.12)	(-0.81)	(0.19)	(0.30)
- tertiary	-0.000			-0.001	0.001	0.000
	(-0.15)			(-0.21)	(0.27)	(0.12)
Marital status - Reference: single						
- with a partner	0.004	0.004	0.005	0.009*	0.011**	-0.002
	(1.49)	(0.85)	(1.30)	(1.87)	(1.97)	(-0.54)
- separated, divorced	0.003	0.003	0.003	0.008**	0.009*	-0.003
	(1.10)	(0.62)	(0.93)	(2.19)	(1.71)	(-0.63)
- widow	0.002	0.002	0.002	0.005	0.007	-0.005
	(0.38)	(0.37)	(0.33)	(1.04)	(0.73)	(-0.94)
Health - Reference: very good						
- good	0.002	0.003	0.002	-0.002	0.002	0.007
	(0.48)	(0.65)	(0.30)	(-0.44)	(0.39)	(1.44)
- fair	0.001	0.000	0.002	-0.004	0.001	0.004
	(0.27)	(0.05)	(0.48)	(-0.76)	(0.17)	(0.69)
- bad	0.004	0.003	0.006	-0.005	0.012*	0.004

	(0.81)	(0.60)	(0.92)	(-0.90)	(1.70)	(0.83)
- very bad	0.001	0.005	-0.013	-0.012	0.018	-0.004
	(0.08)	(0.60)	(-1.20)	(-1.23)	(1.51)	(-0.51)
Years in paid work	-0.000	-0.000	0.000	-0.000**	0.000	-0.000
	(-0.20)	(-0.20)	(0.36)	(-1.96)	(0.45)	(-0.52)
No. children aged less than 16	0.001	0.004**	-0.002	0.003*	-0.002	0.000
	(0.65)	(2.32)	(-1.05)	(1.76)	(-0.84)	(0.00)
Elderly members × health - Reference: no elderly						
- elderly in good health	-0.001	0.000	-0.004	-0.002	-0.011*	0.005
	(-0.47)	(0.13)	(-1.06)	(-0.65)	(-1.87)	(1.42)
- elderly in bad health	-0.001	0.001	-0.005	0.004	-0.006	-0.002
	(-0.30)	(0.21)	(-1.09)	(0.88)	(-1.19)	(-0.43)
No. of family members in working age	-0.001	-0.001	-0.002*	-0.003**	-0.006**	0.001
	(-1.49)	(-0.90)	(-1.85)	(-2.15)	(-2.24)	(0.75)
- No. of other workers	0.002*	0.003**	0.000	0.004**	0.004	-0.001
	(1.65)	(2.23)	(0.03)	(2.02)	(1.40)	(-0.63)
log Net disposable income	-0.001**	-0.001	-0.001	-0.002***	-0.000	-0.000
	(-2.31)	(-1.42)	(-1.37)	(-2.89)	(-0.08)	(-0.32)
House of ownership	-0.001	-0.002	0.001	0.003	-0.001	-0.001
	(-0.30)	(-0.76)	(0.20)	(0.79)	(-0.49)	(-0.54)
No. of rooms	0.001	0.000	0.001	0.002	-0.001	-0.000
	(0.45)	(0.22)	(0.56)	(1.03)	(-1.01)	(-0.04)
Degree of urbanization - Reference: densely populated area						
- intermediate area	0.006	0.006	0.004	0.019	-0.014	0.003
	(0.54)	(0.62)	(0.42)	(1.20)	(-1.63)	(0.24)
- thinly-populated area	0.012	0.012	0.012	0.031	0.008	0.004
	(0.98)	(1.04)	(0.95)	(1.50)	(0.46)	(0.33)
Share of nursery home beds on pop.66+	0.013	0.010	0.016	0.047*	-0.006	-0.070**
	(0.55)	(0.43)	(0.65)	(1.80)	(-0.08)	(-2.47)
Female unempl. rate	-0.005**	-0.006**	-0.005*	0.015**	-0.020***	-0.004**
	(-2.06)	(-2.44)	(-1.66)	(2.47)	(-3.10)	(-2.15)
Real GDP per capita	3.016*	2.762*	3.272*	3.497	1.043	2.335
	(1.86)	(1.78)	(1.94)	(1.48)	(0.44)	(1.14)
Real GDP growth rate	0.171	0.197	0.144	-0.057	0.216	0.460***
	(1.11)	(1.29)	(0.90)	(-0.28)	(0.91)	(3.07)
Constant	0.364***	0.370***	0.357***	0.012	0.762***	0.498***
	(2.85)	(2.93)	(2.78)	(0.09)	(2.72)	(5.27)
lnsig_1						
Constant	2.482***	2.673***	2.350***	2.468***	2.462***	2.603***
	(143.01)	(102.10)	(122.79)	(83.39)	(91.77)	(13.81)
lnsig_3						
Constant	-2.569***	-2.570***	-2.578***	-2.654***	-2.653***	-2.896***
	(-44.15)	(-47.81)	(-40.35)	(-27.29)	(-25.35)	(-28.82)
atanhrho_12						
Constant	-0.054**	-0.089	-0.060	-0.004	-0.019	-0.232**
	(-2.02)	(-1.54)	(-1.34)	(-0.10)	(-0.48)	(-2.00)
atanhrho_13						
Constant	-0.048*	-0.043	-0.072*	-0.039	-0.031	-0.478
	(-1.76)	(-0.94)	(-1.76)	(-1.42)	(-0.50)	(-0.99)
atanhrho_23						
Constant	-0.040	-0.056	-0.038	-0.020	-0.017	0.210

	(-1.56)	(-1.61)	(-0.89)	(-0.60)	(-0.33)	(1.09)
Observations	20235	9915	10320	7919	6259	6057

Notes: We control for: years and regions. The standard errors are clustered at the provincial level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.2: Labour Force Participation, IV probit

	(1) ALL	(2) Low ed.	(3) High Ed.	(4) North	(5) Center	(6) South
Share of ICW	0.537	0.860**	0.282	0.214	1.196*	-4.619
	(1.63)	(1.98)	(0.56)	(0.55)	(1.86)	(-1.34)
Age	-0.152***	-0.131***	-0.179***	-0.167***	-0.155***	-0.127***
	(-36.19)	(-24.98)	(-30.96)	(-31.52)	(-20.08)	(-12.89)
Education level - Reference: none, elementary						
- compulsory	0.084*	0.142***		0.092	-0.038	0.171**
	(1.71)	(2.96)		(1.09)	(-0.44)	(2.28)
- secondary	0.489***		-0.545***	0.491***	0.313***	0.591***
	(8.07)		(-10.74)	(4.81)	(3.47)	(5.46)
- tertiary	1.010***			0.866***	0.857***	1.258***
	(13.91)			(7.32)	(8.00)	(9.78)
Marital status - Reference: single						
- with a partner	-0.383***	-0.399***	-0.396***	-0.296***	-0.434***	-0.431***
	(-6.13)	(-5.01)	(-3.77)	(-3.04)	(-4.03)	(-3.69)
- separeted, divorced	-0.014	-0.014	-0.062	-0.012	-0.041	0.049
	(-0.21)	(-0.13)	(-0.62)	(-0.12)	(-0.45)	(0.30)
- widow	-0.246***	-0.295***	-0.266**	-0.120	-0.442***	-0.220
	(-3.04)	(-2.69)	(-2.00)	(-0.93)	(-3.81)	(-1.23)
Health - Reference: very good						
- good	-0.034	-0.011	-0.031	-0.081	0.081	-0.052
	(-0.85)	(-0.17)	(-0.50)	(-1.31)	(1.23)	(-0.69)
- fair	-0.153***	-0.062	-0.235***	-0.205***	-0.081	-0.160**
	(-3.50)	(-0.85)	(-3.12)	(-3.06)	(-1.06)	(-2.19)
- bad	-0.183***	-0.127	-0.216**	-0.212***	-0.111	-0.209**
	(-3.73)	(-1.54)	(-2.06)	(-2.96)	(-1.13)	(-2.35)
- very bad	-0.571***	-0.363*	-1.115***	-0.551**	-0.335	-1.062***
	(-3.17)	(-1.77)	(-4.63)	(-1.98)	(-0.94)	(-4.65)
Years in paid work years in paid work	0.069***	0.062***	0.080***	0.067***	0.065***	0.072***
	(40.27)	(32.48)	(31.08)	(22.01)	(26.16)	(16.91)
No. of children aged less than 16	-0.121***	-0.167***	-0.111***	-0.163***	-0.134***	-0.066
	(-5.18)	(-4.42)	(-3.13)	(-3.94)	(-3.26)	(-1.51)
Elderly members × health - Reference: no elderly						
- elderly in good health	-0.005	-0.073	0.058	0.048	-0.010	-0.036
	(-0.12)	(-1.04)	(0.69)	(0.64)	(-0.16)	(-0.33)
- elderly in bad health	0.018	-0.059	0.119	0.020	-0.036	0.050
	(0.25)	(-0.78)	(0.89)	(0.16)	(-0.32)	(0.39)
No. family members in working age	0.007	-0.015	0.035	0.008	0.027	0.008
	(0.46)	(-0.65)	(1.42)	(0.24)	(0.89)	(0.34)
No. of other workers	-0.057***	-0.017	-0.103***	-0.079***	-0.025	-0.087**
	(-2.88)	(-0.61)	(-3.81)	(-2.62)	(-0.77)	(-2.16)
log Net disposible income	-0.157***	-0.155***	-0.162***	-0.164***	-0.152***	-0.153***
	(-9.98)	(-7.67)	(-7.52)	(-5.02)	(-6.11)	(-5.96)
House of ownership	-0.057	-0.145***	0.054	0.014	-0.092	-0.120**
	(-1.57)	(-3.05)	(0.93)	(0.19)	(-1.44)	(-2.54)
No. rooms	0.036***	0.014	0.063***	0.031	0.049***	0.018
	(3.15)	(0.82)	(3.47)	(1.54)	(3.05)	(0.75)
Degree of urbanization - Reference: densely populated area						

- intemediate area	-0.011	-0.019	-0.009	-0.039	0.005	0.039
	(-0.31)	(-0.37)	(-0.16)	(-0.65)	(0.08)	(0.61)
- thinly-populated area	-0.081*	-0.094	-0.041	-0.154**	-0.075	-0.028
	(-1.93)	(-1.30)	(-0.55)	(-2.24)	(-1.20)	(-0.30)
Share of nursery home beds on pop. 66+	-0.019	0.037	-0.062	-0.037	0.357	-0.320
	(-0.55)	(0.60)	(-1.50)	(-1.05)	(1.29)	(-1.10)
Female unempl. rate	-0.001	-0.001	-0.001	-0.020	0.024	-0.011
	(-0.07)	(-0.13)	(-0.16)	(-1.61)	(1.37)	(-0.85)
Real GDP per capita	1.331	0.103	3.326	1.082	5.282	9.951
	(0.57)	(0.03)	(0.79)	(0.42)	(0.93)	(0.73)
Real GDP growth rate	-1.045***	-1.447***	-0.554	-0.846	-3.021***	1.766
	(-2.77)	(-2.85)	(-0.93)	(-1.59)	(-2.60)	(0.99)
Constant	8.078***	6.747***	10.495***	9.382***	6.141***	9.245***
	(21.08)	(12.09)	(23.07)	(22.56)	(4.68)	(6.47)

First Stage Estimation
Share of ICW

Age	0.000	0.000**	-0.000	0.000	0.000	0.000
	(1.13)	(2.33)	(-1.02)	(1.30)	(0.77)	(0.68)
Education level - Reference: none, elementary:						
- compulsory	0.001	0.002		0.000	0.001	0.003
	(0.60)	(1.21)		(0.04)	(0.36)	(1.25)
- secondary	-0.001		-0.000	-0.003	0.001	0.001
	(-0.50)		(-0.12)	(-0.81)	(0.19)	(0.30)
- tertiary	-0.000			-0.001	0.001	0.000
	(-0.15)			(-0.21)	(0.27)	(0.12)
Marital status - Reference: single:						
- with partner	0.004	0.004	0.005	0.009*	0.011**	-0.002
	(1.49)	(0.85)	(1.30)	(1.87)	(1.97)	(-0.54)
- separated, divorced	0.003	0.003	0.003	0.008**	0.009*	-0.003
	(1.10)	(0.62)	(0.93)	(2.19)	(1.71)	(-0.63)
- widow	0.002	0.002	0.002	0.005	0.007	-0.005
	(0.38)	(0.37)	(0.33)	(1.04)	(0.73)	(-0.94)
Education level - Reference: very good						
- good	0.002	0.003	0.002	-0.002	0.002	0.007
	(0.48)	(0.65)	(0.30)	(-0.44)	(0.39)	(1.44)
- fair	0.001	0.000	0.002	-0.004	0.001	0.004
	(0.27)	(0.05)	(0.48)	(-0.76)	(0.17)	(0.69)
- bad	0.004	0.003	0.006	-0.005	0.012*	0.004
	(0.81)	(0.60)	(0.92)	(-0.90)	(1.70)	(0.83)
- very bad	0.001	0.005	-0.013	-0.012	0.018	-0.004
	(0.08)	(0.60)	(-1.20)	(-1.23)	(1.51)	(-0.51)
Years in paid work	-0.000	-0.000	0.000	-0.000**	0.000	-0.000
	(-0.20)	(-0.20)	(0.36)	(-1.96)	(0.45)	(-0.52)
No. children aged less than 16	0.001	0.004**	-0.002	0.003*	-0.002	0.000
	(0.65)	(2.32)	(-1.05)	(1.76)	(-0.84)	(0.00)
Elderly members × health - Reference: no elderly						
- elderly in good health	-0.001	0.000	-0.004	-0.002	-0.011*	0.005
	(-0.47)	(0.13)	(-1.06)	(-0.65)	(-1.87)	(1.42)
- elderly in bad health	-0.001	0.001	-0.005	0.004	-0.006	-0.002
	(-0.30)	(0.21)	(-1.09)	(0.88)	(-1.19)	(-0.43)

No. family members in working age	-0.001	-0.001	-0.002*	-0.003**	-0.006**	0.001
	(-1.49)	(-0.90)	(-1.85)	(-2.15)	(-2.24)	(0.75)
No. of other workers	0.002*	0.003**	0.000	0.004**	0.004	-0.001
	(1.65)	(2.23)	(0.03)	(2.02)	(1.40)	(-0.63)
log Net disposible income	-0.001**	-0.001	-0.001	-0.002***	-0.000	-0.000
	(-2.31)	(-1.42)	(-1.37)	(-2.89)	(-0.08)	(-0.32)
House of ownership	-0.001	-0.002	0.001	0.003	-0.001	-0.001
	(-0.30)	(-0.76)	(0.20)	(0.79)	(-0.49)	(-0.54)
No. rooms	0.001	0.000	0.001	0.002	-0.001	-0.000
	(0.45)	(0.22)	(0.56)	(1.03)	(-1.01)	(-0.04)
Degree of urbanization - Reference: densely populated area						
- intermediate area	0.006	0.006	0.004	0.019	-0.014	0.003
	(0.54)	(0.62)	(0.42)	(1.20)	(-1.63)	(0.24)
- thinly-populated area	0.012	0.012	0.012	0.031	0.008	0.004
	(0.98)	(1.04)	(0.95)	(1.50)	(0.46)	(0.33)
Share of nursery home beds on pop. 66+	0.013	0.010	0.016	0.047*	-0.006	-0.070**
	(0.55)	(0.43)	(0.65)	(1.80)	(-0.08)	(-2.47)
Female unempl. rate	-0.005**	-0.006**	-0.005*	0.015**	-0.020***	-0.004**
	(-2.06)	(-2.44)	(-1.66)	(2.47)	(-3.10)	(-2.15)
Real GDP per capita	3.016*	2.762*	3.272*	3.497	1.043	2.335
	(1.86)	(1.78)	(1.94)	(1.48)	(0.44)	(1.14)
Real GDP growth rate	0.171	0.197	0.144	-0.057	0.216	0.460***
	(1.11)	(1.29)	(0.90)	(-0.28)	(0.91)	(3.07)
Instrument	0.133***	0.140***	0.127***	0.143***	0.100***	0.221
	(5.33)	(5.59)	(5.10)	(4.52)	(3.06)	(1.18)
Constant	0.364***	0.370***	0.357***	0.012	0.762***	0.498***
	(2.85)	(2.93)	(2.78)	(0.09)	(2.72)	(5.27)
athrho2_1						
Constant	-0.040	-0.057	-0.037	-0.020	-0.016	0.217
	(-1.56)	(-1.62)	(-0.87)	(-0.61)	(-0.32)	(1.10)
lnsigma2						
Constant	-2.569***	-2.570***	-2.578***	-2.654***	-2.653***	-2.896***
	(-44.15)	(-47.81)	(-40.35)	(-27.29)	(-25.35)	(-28.82)
Observations	20235	9915	10320	7919	6259	6057

Notes: We control for: years and regions. The standard errors are clustered at the provincial level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table B.3: Weekly Worked Hours, IV tobit

	(1) ALL	(2) Low ed.	(3) High Ed.	(4) North	(5) Center	(6) South
Share of ICW	7.609*	6.424	10.549**	9.257***	8.055	82.778
	(1.90)	(0.80)	(2.13)	(2.94)	(0.82)	(0.86)
Age	-0.215***	-0.112	-0.243***	-0.151**	-0.251***	-0.249***
	(-5.69)	(-1.57)	(-5.22)	(-2.23)	(-5.00)	(-2.94)
Education level - Reference: none, elementary						
- compulsory	0.882	1.543**		0.894	0.232	1.305
	(1.21)	(2.05)		(0.86)	(0.15)	(0.84)
- secondary	2.041***		-1.318***	1.814	1.913	2.139*
	(2.90)		(-4.00)	(1.44)	(1.53)	(1.70)
- tertiary	3.497***			3.452**	3.022**	3.639***
	(4.69)			(2.40)	(2.35)	(2.66)
Marital status - Reference: single						
- with partner	-0.570	0.426	-1.594**	-1.613*	-0.511	0.742
	(-0.94)	(0.36)	(-2.48)	(-1.66)	(-0.50)	(0.61)
- separated, divorced	0.099	-0.037	0.074	0.111	-0.607	1.166
	(0.18)	(-0.03)	(0.12)	(0.13)	(-0.64)	(1.28)
- widow	-1.021	-0.577	-1.310	-0.144	-1.067	-1.313
	(-1.27)	(-0.41)	(-1.25)	(-0.12)	(-0.59)	(-0.80)
Health- Reference: very good						
- good	-1.036**	-1.549	-0.782*	-2.648***	0.838	-0.995
	(-2.03)	(-1.24)	(-1.71)	(-5.21)	(1.00)	(-0.83)
- fair	-2.201***	-3.359**	-1.525***	-3.421***	-0.894	-1.517
	(-4.45)	(-2.53)	(-3.16)	(-5.05)	(-1.01)	(-1.57)
- bad	-2.875***	-3.511**	-2.535***	-4.322***	-1.845	-1.878*
	(-3.81)	(-2.48)	(-2.63)	(-4.72)	(-1.17)	(-1.67)
- very bad	-1.997	-1.057	-3.848**	-2.899	-2.111	2.131
	(-1.13)	(-0.46)	(-2.33)	(-1.06)	(-0.78)	(0.57)
Years in paid work	0.398***	0.505***	0.317***	0.313***	0.375***	0.553***
	(16.74)	(13.91)	(10.76)	(8.64)	(9.28)	(12.60)
No. of children aged less than 16	-1.215***	-1.271*	-1.259***	-1.920***	-0.527	-0.746
	(-4.04)	(-1.81)	(-3.61)	(-5.11)	(-1.05)	(-1.04)
Elderly members × health - Reference: no elderly						
- elderly in good health	0.701	1.065	0.616	0.911	0.443	-0.960
	(1.33)	(1.04)	(1.12)	(0.96)	(0.47)	(-0.51)
- elderly in bad health	1.630**	2.481*	1.072	2.977**	1.186	0.608
	(2.06)	(1.79)	(1.17)	(2.53)	(0.82)	(0.42)
No. family members in working age -0.307*	0.193	-0.334	-0.348	-0.223	-0.517*	
	(-1.70)	(0.50)	(-1.56)	(-1.34)	(-0.63)	(-1.80)
No. other workers	0.558***	-0.075	1.036***	0.966***	0.795**	-0.478
	(2.58)	(-0.19)	(3.37)	(2.96)	(2.25)	(-0.86)
log Net disposible income	-0.462***	-0.810***	-0.315***	-0.455***	-0.610***	-0.168
	(-6.64)	(-6.05)	(-4.28)	(-4.61)	(-4.81)	(-1.09)
House of ownership	1.702***	1.674**	1.604***	1.619***	2.180**	1.319
	(3.92)	(2.19)	(3.23)	(3.50)	(2.31)	(1.33)
No. rooms	0.300**	0.517*	0.214	0.141	0.431	0.381
	(2.06)	(1.82)	(1.35)	(0.61)	(1.45)	(1.51)
Degree of urbanization - Reference: densely populated area						

- intermediate area	0.015	1.130	-0.453	-0.554	0.543	-0.106
	(0.04)	(1.49)	(-1.19)	(-0.97)	(0.68)	(-0.09)
- thinly-populated area	0.857*	2.368***	0.009	1.103*	1.062	-0.182
	(1.80)	(2.58)	(0.02)	(1.66)	(1.40)	(-0.12)
Share of nursery home beds on pop.66+	-0.438	-0.735	-0.427	-0.487	-1.707	3.584
	(-0.87)	(-1.23)	(-0.66)	(-0.81)	(-0.79)	(0.49)
Female unempl. rate	-0.183*	-0.383**	-0.050	-0.261*	0.047	-0.093
	(-1.82)	(-2.06)	(-0.51)	(-1.76)	(0.21)	(-0.33)
Real GDP per capita	2.779	50.934	-42.982	-27.810	85.595**	-279.283
	(0.09)	(0.71)	(-1.25)	(-1.45)	(2.28)	(-0.94)
Real GDP growth rate	1.074	4.847	-1.177	2.447	-1.575	-31.817
	(0.24)	(0.63)	(-0.25)	(0.66)	(-0.14)	(-0.66)
Constant	36.293***	32.271***	40.557***	39.417***	35.363***	-2.067
	(11.15)	(6.45)	(8.63)	(10.18)	(3.13)	(-0.04)

First Stage estimation

Share of ICW

Age	0.000	0.001	-0.000	0.000	0.000	-0.000
	(0.20)	(1.51)	(-1.02)	(0.99)	(0.11)	(-0.94)
Education level - Reference: none, elementary						
- compulsory	0.000	-0.001		-0.002	-0.006	0.007*
	(0.05)	(-0.29)		(-0.24)	(-0.78)	(1.65)
- secondary	-0.001		0.000	-0.003	-0.007	0.003
	(-0.36)		(0.16)	(-0.49)	(-1.16)	(0.91)
- tertiary	-0.002			-0.002	-0.006	0.003
	(-0.48)			(-0.31)	(-0.83)	(0.83)
Marital status - Reference: single:						
- with a partner	0.007*	0.005	0.007	0.014**	0.010	0.002
	(1.83)	(0.73)	(1.55)	(2.36)	(1.54)	(0.37)
- separated, divorced	0.002	-0.001	0.002	0.006*	0.009	-0.004
	(0.51)	(-0.18)	(0.56)	(1.77)	(1.51)	(-0.77)
- widow	0.001	-0.003	0.003	0.003	0.010	-0.012**
	(0.17)	(-0.33)	(0.55)	(0.57)	(1.34)	(-2.00)
Health- Reference: very good						
- good	-0.000	-0.005	0.001	-0.005	0.004	0.007
	(-0.05)	(-0.87)	(0.26)	(-0.93)	(0.63)	(1.33)
- fair	-0.000	-0.008	0.003	-0.005	0.004	0.002
	(-0.03)	(-1.41)	(0.55)	(-0.89)	(0.72)	(0.34)
- bad	0.004	-0.008	0.013*	-0.006	0.018**	0.003
	(0.69)	(-0.96)	(1.81)	(-0.83)	(2.24)	(0.55)
- very bad	0.006	-0.001	0.005	-0.001	0.015	0.002
	(0.42)	(-0.08)	(0.43)	(-0.04)	(0.75)	(0.17)
Years in paid work	-0.000	-0.000	-0.000	-0.000**	0.000	-0.000
	(-1.61)	(-1.63)	(-0.35)	(-2.01)	(0.12)	(-0.66)
No. children aged less than 16	0.001	0.007**	-0.001	0.003*	-0.002	-0.002
	(0.59)	(1.98)	(-0.49)	(1.72)	(-0.57)	(-0.90)
Elderly members × health - Reference: no elderly						
- elderly in good health	0.002	0.004	-0.001	0.002	-0.011	0.017***
	(0.43)	(0.72)	(-0.11)	(0.45)	(-1.52)	(2.94)
- elderly in bad health	-0.003	0.003	-0.009	0.003	-0.014**	-0.000
	(-0.70)	(0.36)	(-1.48)	(0.46)	(-2.09)	(-0.07)
No. family members in working age	-0.002	-0.001	-0.001	-0.003**	-0.004**	0.000

	(-1.37)	(-0.60)	(-1.37)	(-2.07)	(-2.14)	(0.47)
No. of other workers	0.002	0.003	0.001	0.003*	0.003	-0.001
	(1.07)	(1.33)	(0.51)	(1.77)	(0.88)	(-0.57)
log Net disposible income	-0.001***	-0.002***	-0.001**	-0.002***	0.000	-0.001*
	(-3.06)	(-2.64)	(-2.30)	(-2.69)	(0.00)	(-1.70)
House of ownership	0.003	0.005	0.001	0.006	-0.001	0.004
	(1.16)	(1.53)	(0.37)	(1.36)	(-0.20)	(1.63)
No. rooms	0.000	-0.000	0.000	0.003	-0.002	-0.001
	(0.22)	(-0.08)	(0.07)	(1.08)	(-1.62)	(-0.55)
Degree of urbanization - Reference: densely populated area						
- intermediate area	0.005	0.009	0.002	0.019	-0.015*	0.005
	(0.45)	(0.82)	(0.23)	(1.13)	(-1.71)	(0.36)
- thinly-populated area	0.012	0.015	0.011	0.032	0.007	0.007
	(0.93)	(1.11)	(0.84)	(1.45)	(0.37)	(0.53)
Share of nursery home beds on pop.66+	0.018	0.019	0.018	0.042*	-0.021	-0.069**
	(0.81)	(0.95)	(0.73)	(1.69)	(-0.34)	(-2.51)
Female unempl.rate	-0.004	-0.004	-0.004	0.016**	-0.019***	-0.003**
	(-1.43)	(-1.50)	(-1.44)	(2.53)	(-2.88)	(-1.98)
Real GDP per capita	3.095*	3.284*	2.907*	3.740	1.132	2.179
	(1.85)	(1.84)	(1.83)	(1.49)	(0.49)	(1.04)
Real GDP growth rate	0.134	0.083	0.158	-0.072	0.215	0.449***
	(0.91)	(0.61)	(0.99)	(-0.35)	(0.88)	(3.13)
Instrument	0.129***	0.138***	0.125***	0.135***	0.096***	0.253
	(4.86)	(4.72)	(4.94)	(4.13)	(2.75)	(1.33)
Constant	0.338***	0.303***	0.365***	0.022	0.822***	0.512***
	(2.85)	(2.81)	(2.81)	(0.19)	(3.15)	(5.57)
alpha						
Constant	-7.883*	-8.597	-10.115*	-6.849	-5.436	-92.144
	(-1.79)	(-0.99)	(-1.81)	(-1.43)	(-0.50)	(-0.95)
lns						
Constant	2.479***	2.660***	2.345***	2.470***	2.466***	2.486***
	(141.60)	(108.85)	(123.06)	(79.90)	(96.35)	(75.12)
lnv						
Constant	-2.573***	-2.566***	-2.585***	-2.650***	-2.695***	-2.913***
	(-41.34)	(-43.93)	(-39.87)	(-26.94)	(-24.59)	(-29.14)
Observations	11153	3906	7247	4673	3735	2745

Notes: We control for: years and regions. The standard errors are clustered at the provincial level.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$