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Social Participation of the Elders in Europe: The Influence of Individual and Contextual Variables

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The Influence of Individual and Contextual Variables

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Conflct of interest

Mª Angeles Molina (author A) declares that she has no conflict of interest; Jose Luis Cañadas-Reche (author B) declares that he has no conflict of interest, and Rafael Serrano-del-Rosal (author C) declares that he has no conflict of interest

Social Participation of the Elders in Europe: The Influence of Individual and Contextual Variables

Introduction

A common stereotype about the group of older adults is that they are a "passive class" and that they are a burden on society (e.g., Becker and Schroots 2008; Butrica and Schaner 2005). In contrast to this stereotyped image, there is a more positive approach to understand and tackle old age as a state and as a process: *active aging*. The World Health Organization defines it as *"the process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age"* (WHO 2002).

Active aging is a process that covers the whole life cycle, with the individual achieving high physical and cognitive functioning, a low probability of disease or disease-related disability and a high engagement to life (Rowe and Khan 1997).

The "engagement to life" factor in the field of social research has been studied and measured through social participation; as far as the group of older adults is concerned, this is specially valid, as it involves being present and active in social life, acknowledging the collective value of the elders in society (Fernández-Ballesteros et al. 2011; Mendes de León 2005).

Most definitions of social participation and other related concepts (social engagement, social capital, social support, social integration…) share the general idea that the interaction with others through the involvement in activities is essential (Levasseur et al. 2010). As regards the activities that are usually considered in the operationalization of social participation, a wide range is included: associationism, voluntary work, political activity, lifelong learning, leisure and free time, among others.

Many studies have revealed the relation between social participation and other functioning measures; thus, it has been related to preserving the cognitive function in old age (Lövdén, Ghisletta, and Lindenberg 2005; Crowe et al. 2003; Scarmeas et al. 2001), to maintaining good health (Sirven and Debrand, 2008), to longevity (Moen, Dempster-McClain and Williams 1989), and to high levels of psychological well-being (Beck Page 1988).

The empirical research aimed to search for determining factors in social participation in old age has identified individual variables such as the level of education, occupation, age and health (Bukov, Maas and Lampert 2002). Although most of the times these variables have been studied from a strictly individual and transversal perspective empirically analyzing their interpersonal variability at a given moment in time, due to their characteristics it may certainly be interesting to analyze them from a cultural, social and longitudinal perspective, like the one cohorts may provide.

A cohort is defined as the aggregate of individuals who experience the same event within the same time interval; the defining event is commonly the year of birth (Ryder 1965). Each cohort has its peculiarities and is different from the rest. Therefore, the changes in the population pyramid that have been occurring entail changes in the successive generations that are aging. The characteristics and behaviors of the people who are approaching and will reach old age are different and will probably keep on changing as new generations reach this stage in life (Ramiro et al. 2012).

The individuals as socializing agents and agents of their own aging process, as well as the socio-political managers as those responsible for public policies, and the socio-cultural and economic context as the scene where all of them interact in a given moment and place, may intervene in the social participation of the elders. Thus, social participation may be influenced by individual characteristics, but also by contextual factors that go beyond them.

The aim of this work is to analyze social participation in old age on the basis of a model with the capacity to integrate individual variables (age, level of education, cognitive functioning) and contextual variables (cohort, country) at the same time. The analysis of the relative weight of these factors will allow us to discover where the changes taking place in social participation are leading to, making it possible to consider explanations both at the individual level (e.g., age) and the aggregate level (period and cohorts), which have as much to do with the life cycle as with socialization and the socio-political context.

Design and methods

The data used have been obtained from the Survey of Health, Ageing and Retirement in Europe (SHARE). SHARE is a longitudinal and multidisciplinary database of micro data of people over 50 in European countries (see www.share-project.org). Data from the baseline (W1) has been used in this

study, as well as from waves two (W2) and four (W4). The first data collection took place in 2004-2005, the second wave was collected in 2006-2007, and the fourth one in 2010. Wave three is a retrospective survey focusing on respondents' life stories; the questions in this survey are not comparable with the other waves, that is why it was not included in this study. Details about the research and methodology of the analyzed waves may be found in Börsch-Supan and Jürges, 2005; Borsch-Supan et al, 2013, and Malter, Börsch-Supan, 2013.

The information about social participation was obtained from the questions: "*Please look at card 35. Have you done any of these activities in the last month?*" in waves W1 and W2, and "*Please look at card 34: which of the activities listed on this card - if any - have you done in the past twelve months?*" in wave W4. The following response categories where included: voluntary or charity work, attended an educational or training course, gone to a sport or social club, taken part in religious or political organizations. With the aim of being able to compare the questions from waves W1 and W2 with those of W4, the response frequency was taken into account. The participation variable was defined as a dichotomous variable ("has participated / has not participated"), coding answers as "has participated" whenever the respondents said that they had done at least one of the included activities. In W4, when respondents said that they had done at least one of the activities every day, week or month or most of the months of the year, their answer was coded as "has participated". In this last wave, if the respondent said that during the year he or she had done one of these activities but less frequently, it was coded as "has not participated", so that the variable classifies participation situations with a similar minimum frequency. The original name of the variables may be found in Table 2.

The other variables considered were: birth cohort, country, age, wave of the study, level of education, cognitive functioning and self-perceived health.

As regards the age variable, it should be noted that two variables have been derived from it: age and squared age through transformation with orthogonal polynomials. With a change of base, the latter makes it possible to consider the linear and quadratic effects of age with no collinearity between both variables (see Kleinbaum 2013; Shacham and Brauner 1997).

As regards the cognitive functioning variable, a cognitive score index was calculated. This index involves the following items (Dewey and Prince 2005): naming correctly the day of the week, day of the month, month and year (one point for each correct answer, maximum: four); an immediate and a delayed 10-word recall test (one point for each correct answer, maximum: 20); a mathematical performance test

(one point for each correct answer, maximum: five). For missing cognitive indexes we computed scores of zero. The range of cognitive functioning is 0-29.

In order to explain the relation between participation (dichotomous variable) and the rest of variables of interest, a logistic regression model has been considered. As SHARE is a longitudinal survey, the respondents' answers in the different waves are not independent (the same person may answer in more than one wave and it is clear that their answer to the same question in one wave is somehow related to their answer in the other wave(s)). Considering a classic model where this correlation structure was not included might lead to spurious relations. Therefore, a multilevel logistic regression must be considered, where at least one of the levels is the variable identifying the respondent.

In order to reach the objective of this research, apart from modeling the variation among the respondents, it has been deemed appropriate to also model the variation among cohorts and countries. Including the cohort variable in a level higher than the individual level enables to separate its effect from the effect of age, as well as solving the problem of high collinearity among age, cohort and year of survey.

The reason why the country level is considered is the data's structure, as the surveys were conducted in different countries and not at the same time.

Thus, the variation structure used in the model has four levels. The first level corresponds to the answers given in each wave, the second level corresponds to the individuals themselves, the third level would be the country of origin, and the fourth level would be the birth cohort. Note that the first three levels are hierarchized (answers, subjects, country of origin of the subject), while the fourth level is crossed with the country level (within each cohort there are individuals from different countries).

There are two clearly different parts in the formulation of the model: on the one hand, the part of the so-called *fixed effects*, which would be equivalent to a classic logistic regression model; on the other hand, the part of the *random effects*, which takes into account other sources of variability.

In the final adjusted model, the *fixed effects* part may be expressed as

$$\begin{aligned} \mathrm{P}[Participation_i] \;=\; & \mathrm{logit}^{-1}\,(\,\alpha_0 + \alpha^{subject}_{j[i]} + \alpha^{cohort}_{k[i]} + \alpha^{country}_{l[i]} + \beta_1 \cdot age + \beta_2 \cdot \mathrm{age}^2 \\ & + \beta_3 \cdot Wave_2 + \beta_4 \cdot \mathrm{Wave}_4 + \beta_5 \cdot eduyears + \beta_6 \cdot cognitive \\ & + \beta_7 \cdot sphus(verygood) + \beta_8 \cdot sphus(good) \\ & + \beta_9 \cdot sphus(fair) + \beta_{10} \cdot sphus(poor)) \end{aligned}$$

where $logit^{-1}(x) = \frac{1}{1+exp(-x)}$

In the part of *random effects*, the intercepts associated to subject, cohort and country are modeled, so that

$$\begin{aligned} \alpha_j^{subject} &\backsim \mathcal{N}(0, \sigma^2_{subject}) \text{ for j} = 1, \dots, 40193 \\ \alpha_k^{cohort} &\backsim \mathcal{N}(0, \sigma^2_{cohort}) \text{ for k} = 1, \dots, 9 \\ \alpha_l^{country} &\backsim \mathcal{N}(0, \sigma^2_{country}) \text{ for l} = 1, \dots, 10 \end{aligned}$$

The main difference if compared with classic logistic regression models is the inclusion of certain categorical variables as *random effects*. For the variables considered in the part of *random effects*, instead of estimating the coefficients associated to codification through dummy variables, the variance of the probability distribution is estimated, thereby the model is more parsimonious. In our case, using a classic analysis would have made it impossible to include the *subject* variable in the model, as it would entail more than 40,000 parameters, and that is computationally unfeasible.

The process to adjust and select variables has been carried out using the lme4 package (Bates et al. 2014) for language R (R CoreTeam 2014). As a first stage a multilevel logistic regression was adjusted, where the variables of respondent, cohort and country were included in the part of random effects. Later, other variables were added in the part of fixed effects and the obtained models were checked on the basis of the Akaike Information Criterion (AIC), until a model was reached in which the inclusion of other variables did not improve the previous model.

Results

In Table three, the column corresponding to the final model shows the estimated coefficients, their standard errors and the associated p-values. In that table it is not possible to appreciate the size of the effects of the fixed effects variables on participation. In order to visualize both the effect and the statistical signification, the charts of the mean effects have also been made (Figure 1), representing the estimated participation in relation to the different variables of the model, adding the confidence intervals at 95 per cent. A minor effect of the waves is observed, estimating a higher participation in the most recent waves. As regards age, there is more participation in the 60-70 age range, where participation is over 60 per cent. The cognitive functioning and years of education are strongly associated to the increase in participation, with a direct relation in both cases: the higher the cognitive functioning and the more years of education, the higher the participation. As expected, self-perceived health is also associated to

the level of participation, with more participation from people who have a better perception of their own health.

The analysis of the variables introduced in the part of random effects is carried out from two approaches. In the first case, the percentage of variability explained by each variable (subject, country and cohort) is calculated. To that end, the intraclass correlation coefficient is obtained, which, for a factor *u*, is defined as:

$$\rho_u = \frac{\sigma_u^2}{\sigma_u^2 + \sigma^2_{\text{other random effects}} + \sigma_e^2}$$

where σ_u^2 is the variance estimated by the model for the factor *u* and σ_e^2 is the residual variance. In the case of the logistic regression $\sigma_e^2 = \pi^2/3$, the intraclass correlation coefficient ranges from zero if grouping conveys no information to 1 if all members of a group are identical (Gelman and Hill 2007). Thus, for the final model:

$$\rho_{Subject} = \frac{1.90}{1.90 + 0.27 + 0.01 + \pi^2/3} = 0.35$$

$$\rho_{country} = \frac{0.27}{1.90 + 0.27 + 0.01 + \pi^2/3} = 0.05$$

$$\rho_{cohort} = \frac{0.01}{1.90 + 0.27 + 0.01 + \pi^2/3} = 0.02$$

The variability explained by the variation among subjects is 35 per cent, five per cent by country, and two per cent by cohort. Table three shows how the estimated variance corresponding to cohorts and countries decreases as explanatory variables are introduced in the model, while the one corresponding to subjects remains stable. This performance seems to indicate that part of the variability explained by countries and cohorts in the models with fewer variables is in fact due to other variables. This is a very interesting result because, naturally, belonging to a certain country or cohort is not important per se but because there is a group of elements of the culture, the socioeconomic environment and other spheres which, altogether, may be collected even if aggregately only if we take into account this type of levels that go beyond the individuals but are necessarily influencing them somehow.

Secondly, the model does not estimate the effect of each variable category on the participation (of each subject, cohort or country), but it is possible to "predict" those effects through the Best Linear Unbiased Prediction, BLUP (Robinson 1991). In fact, it has been proven that the estimates made through BLUP are usually more efficient than the traditional estimates using BLUE (Best Linear Unbiased Estimation) (Lax and Phillips 2009; Rao 2003).

As in the case of fixed effects, the charts representing the estimated participation have been made (Figure 2). As far as the cohorts are concerned, there are big differences between the "older" ones (people born before 1930), with a participation of less than 30 per cent, and the subsequent cohorts, where the estimated participation is around 45-50 per cent (Figure 2). The higher confidence interval for the 1960-1965 cohort reflects a greater instability in their participative behavior; this is the cohort with the smallest number of respondents. Figure 3 shows the participation pattern by cohort and wave of the study; those belonging to the cohorts of people born after 1935 have experienced an increase in their average participation, showing an increase of ten points from the first wave. As stated above, the variability explained by grouping respondents in the different cohorts is very low, although there are significant differences among cohorts, as shown by the confidence intervals (Figure 2).

The low intraclass correlation coefficient for the cohort shows that, in principle, it would not be necessary to include this variable in the part of random effects but in the part of fixed effects. However, it has been left in the part of random effects to separate its effect from that of age, as there is a high correlation between both variables.

The estimated effects for country (Figure 4) also show an important result: a clear North-South pattern. More precisely, in the most northern countries (Denmark, Sweden), together with the Netherlands and Switzerland, the participation is 50 per cent or higher. This is in clear contrast to participation in countries such as Spain and Italy, both because of a lower participation of older adults in all age ranges in the latter and because of the stage of life when participation begins to drop sharply.

Indeed, analyzing how the participation pattern shifts according to age and wave within each country (Figure 5), the differences among the different countries may be more clearly observed. While in most of the countries in each wave the age range where there is a greater participation is between 50 and 70, with a marked decrease from 70 on, in Spain and Italy there is a completely different pattern, not only because there is less participation in all age ranges, but also because participation begins to drop from 60 years of age on.

Discussion

The methodologically constructed measurement of social participation includes, as stated above, different activities considered in aggregate, which would call for a more detailed analysis of the phenomenon if the objective is to learn about the type or form of social participation. However, that was not the objective of this work, as the involvement of anyone in the activities considered accounts for the social participation of the group of the elders and acknowledges it, empirically supporting the theoretical perspectives that do not consider it as a social group exclusively consuming resources, but rather a source of social resources which is undervalued today. This is why rather than analyzing each type of activity, the focus has been on participation, which made an aggregate measure more interesting, making it possible to approach the contribution of this group to the community. The activities considered under the concept of social participation have been conceptualized by other authors as *"formal social participation"* (Ferraro 1984; Utz et al. 2002).

In contrast to the widespread stereotype of older adults being a "passive class" and a burden on society (e.g., Becker et al. 2008; Butrica et al. 2005), the analysis of the empirical reality made in this work reveals a different image, as the participation rate is over 60 per cent between 60 and 70 years of age, and more than half of the respondents is still engaged in activities in society, even at advanced ages. It is no coincidence that the transit to retirement and the first years of retirement coincide temporally with the highest rates of social participation. Different studies have pointed to the involvement in activities after retirement as one of the factors with a positive effect on the process of adaptation to retirement (Wang, Henkens and van Solinge 2011; Dorfman and Douglas 2005; Kim and Feldman 2000). However, it is important to point out that the analyzed data empirically support two opposing theories; in the case of the younger elders, certain activities (labor) are replaced with others (activities in and for society), in accordance with the activity theory (Havinghurst 1961), while in the case of the older elders, the individual gradually disengages from community life, as proposed by the disengagement theory (Cumming and Henry 1961). Hence, rather than opposing theories, the obtained data point to a greater applicability of either one depending on the moment of old age considered. Nevertheless, at this point the huge heterogeneity of older adults must be noted, and while a generalist statement has been made, this does not reject the recognition of an interindividual variability (Neugarten 1975).

As regards the results obtained from the model, the following conclusions may be drawn:

First of all, after controlling the contextual variables, the effects of the individual variables maintain their level of significance. This points to the validity of generating models explaining social participation on the basis of individual characteristics. In the obtained model, self-perceived health, cognitive functioning and level of education are explicative factors. These variables are interrelated in many studies: social participation and cognitive functioning (e.g.: Bassuk, Glass and Berkman 1999; Zunzunegui et al. 2003; Lóvden et al. 2005), social participation and health (e.g.: Young 1998; Fried 2004), social participation and level of education (Wu, Tang and Yan 2005; Kim et al. 2007), level of education and health (e.g.: Eikemo 2008; Laaksonen 2008), or level of education and cognitive functioning (e.g.: Bennett 2003; Evans 1993).

Secondly, although the effect of the contextual variables seems to share much of its variance with the individual variables (which is obvious and also supports the idea of the influence of the environment and the social context on individuals), it is still significant. This elaborates on the idea of a greater completeness of a model like the one we propose. This type of variables transcending individual factors provides information on questions that have not been collected in the individual field. For instance, the level of education is considered as a personal variable but, at the same time, it is a fact that there are generational gains regarding educational attainment and differences among countries in this variable (Barro and Lee 1993; Barro and Lee 2001). This illustrates how individual differences are at the same time the ones marking the differences among cohorts and countries, but also, aggregately, turn into elements transcending them somehow. In this regard, it is very important to take into account the brief period of time covered by SHARE, which makes it difficult for the comparison among cohorts to have had a greater influence in the model. However, even with this limitation in the data, there is a significant effect that may be confirmed in the model and could be greater if the time range were longer.

We consider that the different rate of social participation found among the different countries analyzed is also an interesting result, and the more so when it occurs beyond individual differences, as proven by the proposed model. This result encourages a line of research inquiring into the causes of this inequalities taking into account sociocultural longitudinal factors which are reflected in individual behaviors. In this regard, together with comparisons based on macro data, the search for explanations should tend toward a compared analysis of policies promoting social participation and in favor of older

adults. Thus it is striking to have observed a restrictive change regarding participation on the basis of age in all countries, but at an especially early age in the case of Spain and Italy.

Inquiring into the patterns of the variation rate of social participation in different environments and stages in old age and their causes must be one of the focuses of future research. If this is not done, it is easy to end up making unfounded generalizations about a group of citizens with an ever-increasing presence in European societies. What is more, social policy managers should take into account this type of findings when planning their policies. New generations of older adults, more educated and in better health conditions, will reach old age; this must be taken into account in order to promote the social participation of the elders and to provide contexts facilitating and giving visibility to the contribution of this group to society.

Compliance whith Ethical Standards

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Conflict of Interest

The authors declare that they have no conflict of interest.

Informed Consent

Informed consent was obtained from all individual participants included in the study.

Ethical Treatment of Experimental Subjects (Animal and Human)

This article does not contain any experimental studies with human or animal subjects performed by any of the authors.

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Figure 1. Estimated wave, age, cognitive functioning, years of education and self-perceived health effects. 95% confidence intervals have been added.

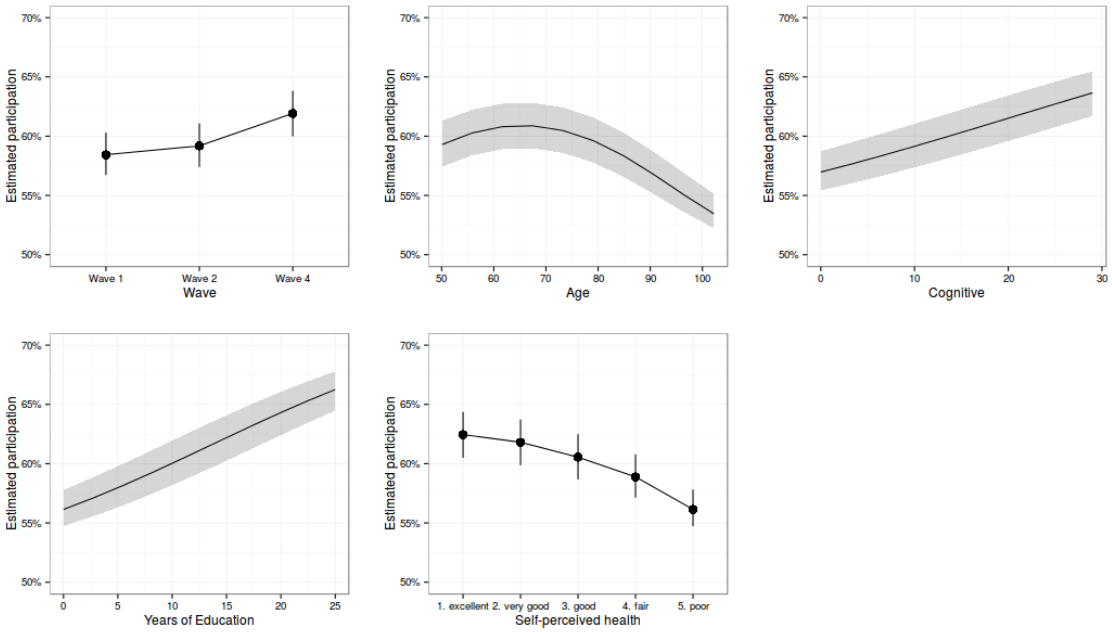

Figure 2. Estimated cohort effect. 95 per cent confidence intervals have been added.

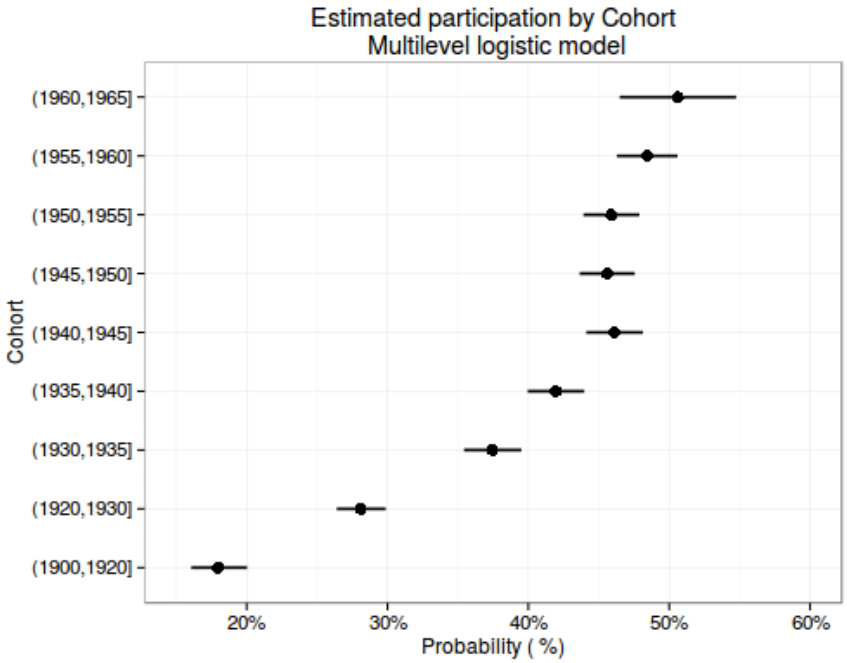

Figure 3. Estimated cohort means by wave.

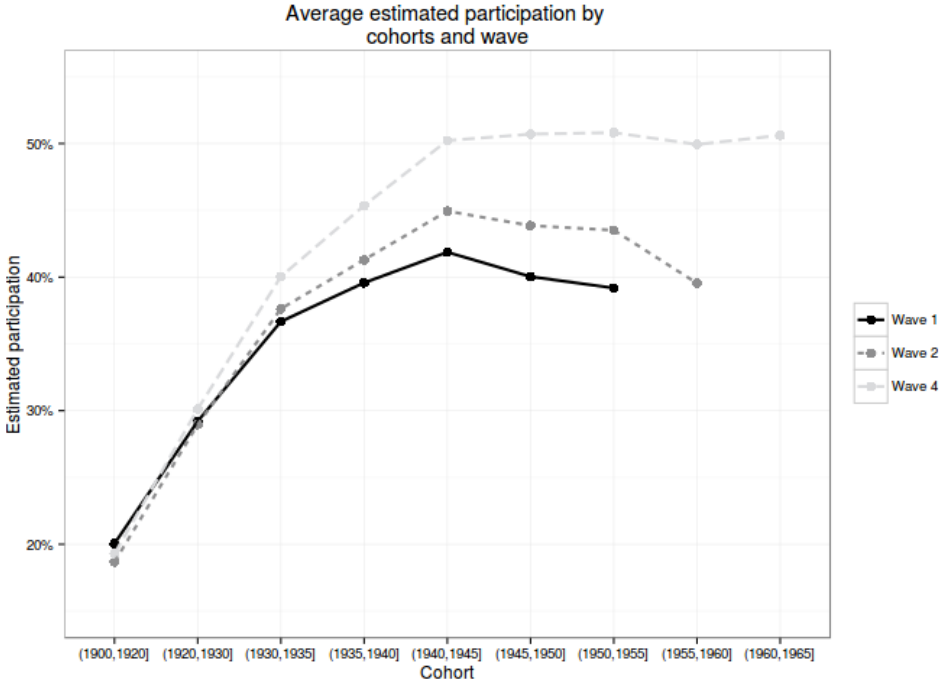

Figure 4. Estimated country effects. 95 per cent confidence intervals have been added.

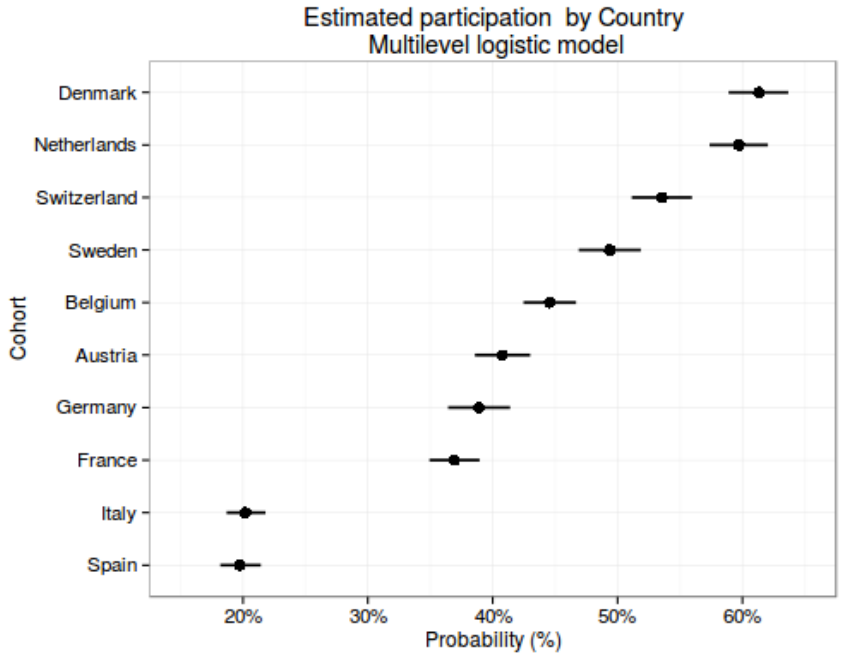

Figure 5. Change in the patterns of participation by age, country and wave. Each point represents the participation estimated by the model for each combination of age, country and wave. Smooth curves using local weighted regression have been adjusted to show trends.

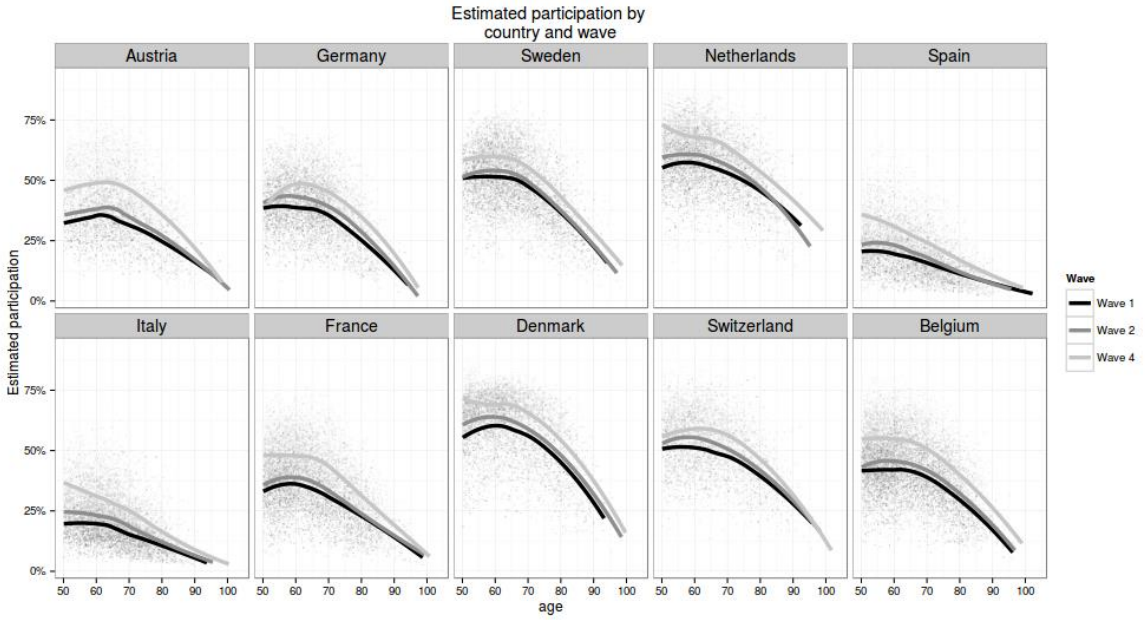

Table 1. Sample by country and wave

	Wave 1	Wave 2	Wave 4	Total
Austria	1526	1156	4907	7589
Germany	2870	2470	1526	6866
Sweden	2927	2651	1904	7482
Netherlands	2694	2553	2676	7923
Spain	2238	2036	3295	7569
Italy	2390	2800	3404	8594
France	2833	2703	5477	11013
Denmark	1562	2473	2184	6219
Switzerland	932	1401	3617	5950
Belgium	3576	2988	5051	11615
Total (10 countries)	23548	23231	34041	80820

Table 2. Variables used to build participation indicator

Description	Name in waves 1 and 2	Names in wave 4
Done voluntary or charity work	ac002d1	ac035d1
Attended an educational or training course	ac002d4	ac035d4
Gone to a sport, social or other kind of club	ac002d5	ac035d5
Taken part in activities of a religious organization	ac002d6	ac035d6
Taken part in a political or community-related organization	ac002d7	ac035d7

Table 3. Statistical models

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Final
(Intercept)	-0.44	-0.46	-0.38	-0.65**	-1.50***	-2.22***	-1.66***
	(0.30)	(0.43)	(0.40)	(0.22)	(0.20)	(0.19)	(0.18)
Age		97.77***	89.78***	-73.85***	-48.94***	-25.33***	-17.28*
		(8.38)	(8.44)	(5.12)	(5.37)	(7.49)	(7.85)
Age^2			-42.07***	-38.88***	-45.53***	-38.72***	-36.68***
			(4.87)	(3.87)	(4.22)	(4.72)	(4.78)
Wave 2				0.20***	0.12***	0.09***	0.13***
				(0.02)	(0.03)	(0.03)	(0.03)
Wave 4				0.51***	0.42***	0.59***	0.60***
				(0.02)	(0.03)	(0.03)	(0.03)
Years of Education					0.09***	0.08***	0.07***
					(0.00)	(0.00)	(0.00)
Cognitive						0.05***	0.04***
						(0.00)	(0.00)
Self-perceived							-0.11**
							(0.04)
Self-perceived							-0.32***
							(0.04)
Self-perceived							-0.61***
							(0.04)
Self-perceived							-1.15***
							(0.06)
AIC	99816.05	99657.32	99562.06	99331.01	84494.10	83992.15	83144.78
BIC	99853.20	99703.76	99617.79	99405.31	84576.37	84083.56	83272.75
Log Likelihood	-	-	-	-	-	-	-
Deviance	99808.05	99647.32	99550.06	99315.01	84476.10	83972.15	83116.78
Num. obs.	79826	79826	79826	79826	68961	68961	68940
Num. groups: Subject	49240	49240	49240	49240	40201	40201	40193
Num. groups:	10	10	10	10	10	10	10
Num. groups: Cohort	9	9	9	9	9	9	9
Variance:	1.93	1.96	1.96	1.94	2.05	1.99	1.90
Variance:	0.49	0.51	0.51	0.48	0.36	0.32	0.27
Variance:	0.36	1.19	0.99	0.00	0.00	0.01	0.01

*** p < 0.001, ** p < 0.01, * p < 0.05

Statistical models

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