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Gender Norms and Cognitive Health in Later Life: An Analysis of Second-Generation Immigrants

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Abstract

This paper investigates whether inherited gender norms contribute to gender disparities in cognitive health at older ages. We adopt an epidemiological approach that exploits variation in the cultural background of second-generation immigrants living in the same European countries, thereby disentangling cultural and institutional factors. Combining data from the Survey of Health, Ageing and Retirement in Europe (SHARE) with measures of gender norms in parents' countries of birth from the Integrated Values Surveys, we find that women score lower on cognitive tests, relative to men, when gender norms that prevail in their parents' country of birth are more conservative. Importantly, more traditional gender norms are associated with a higher probability of women, relative to men, to reach the threshold indicating mild cognitive impairment. Exploring potential pathways, we find that more traditional gender norms are associated with a lower probability of women, compared to men, to work in high-skilled occupations and participating in training courses later in life, pointing to gender disparities in opportunities for cognitive stimulation throughout the life course.

JEL classification

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Keywords

gender norms, cognitive health, second generation immigrants, epidemiological approach

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1. Introduction

Men and women experience disparities in cognitive health at older ages, posing a significant challenge for ageing societies. Worldwide, women experience higher age-specific rates of dementia than men (Prince et al., 2013; Wimo et al., 2013), leaving them disproportionately exposed to the burdens associated with cognitive impairment, including functional limitations (McGuire et al., 2006), diminished quality of life (Hussenoeder et al., 2020) and healthcare expenditures (Vecchio et al., 2016). Higher female life expectancy further compounds these burdens, as women tend to survive longer than men with dementia (Mazure & Swendsen, 2016; Winblad et al., 2016).

Gender norms have been targeted as a potential factor of health disparities between men and women (Bassoli, 2025; Caroli & Weber-Baghdiguian, 2016; Heise et al., 2019). However, whether they shape cognitive health gaps in later life remains insufficiently understood. These gaps vary considerably across cohorts and countries (Lei et al., 2012; Weber et al., 2014), suggesting that they reflect, at least partly, gender differences shaped by contextual factors. Older women have relatively better cognitive performances in contexts characterized by more gender-equal attitudes (Bonsang et al., 2017), suggesting that gender norms might play a role. However, identifying the specific contribution of gender norms to these gaps is fundamentally challenging because social norms are closely intertwined with institutional environments (Alesina & Giuliano, 2015), which may both shape gender gaps in later-life cognitive health. Disentangling these influences is nevertheless crucial for understanding how these gender disparities emerge over the life course.

This paper addresses this challenge by using the epidemiological approach that isolates the role of gender norms in shaping cognitive health gaps between men and women, while holding the institutional environment constant. This approach, developed by Fernández and Fogli (2009), focuses on second-generation immigrants who live in the same country, but have inherited different cultural backgrounds through their parents' countries of origin. In the literature, this method has been used to examine the contribution of gender norms to gender gaps in school performance (Bergvall, 2024; Holmlund et al., 2023; Rodríguez-Planas & Nollenberger, 2018), higher educational attainment (Huber & Paule-Paludkiewicz, 2024), choice of educational field (Aldén & Neuman, 2022), teenage smoking behaviours (Rodríguez-Planas & Sanz-de-Galdeano, 2019) and willingness to compete (Hauge et al., 2023). While these studies have

focused on populations of children and young adults, whether gender norms play a role through older ages remains an open question. A potential pathway through which gender norms may shape later-life cognitive health, decades after their transmission, is *cognitive reserve*. This concept is grounded in neuroplasticity, which refers to the brain's capacity to compensate for age-related neural damage by optimizing the use of existing neural networks and engaging alternative pathways (Stern, 2002, 2012). This capacity is developed through exposure to cognitively stimulating activities over the life course (Wu et al., 2016). Gender norms may shape women's and men's opportunities to acquire and maintain cognitive stimulation over the life course, thereby generating differences in cognitive reserve and ultimately contributing to gender disparities in later-life cognitive health.

Against this background, this paper investigates whether gender norms transmitted by the first generation shape gender gaps in later-life cognitive health among second-generation immigrants. We use data from the Survey of Health, Ageing and Retirement in Europe (SHARE), which provides detailed measures of cognitive health for individuals aged 50 and older, as well as information on their parents' countries of birth. Cognitive functioning is assessed using the Cognitive Score Index (CSI) which combines test scores in three core cognitive domains: memory, verbal fluency, and numeracy. Following existing literature, we proxy inherited gender norms using prevailing gender-role attitudes in the parental country of birth (hereafter, country of ancestry) in the Integrated Values Surveys (IVS). Our findings using this Measure of Gender Norms (MGN) are robust to employing alternative measures of gender norms from the World Economic Forum and the World Bank, to several sample modifications and to accounting for individual, parental and country-level characteristics that could confound the relationship between gender norms and the gender gap in later-life cognitive health. Our paper yields a set of findings that relate to several strands of the literature.

First, we show that the more conservative the gender norms in the country of ancestry, the lower the cognitive test scores of women relative to men among second-generation immigrants. Specifically, a one-standard-deviation increase in the MGN in the country of ancestry is associated with a decline of 0.22 standard deviations in the CSI for women, relative to men, among second-generation immigrants. This estimate is equivalent to approximately 6 years of cognitive ageing at age 65, and amounts to 35% of the cognitive score gap between individuals with and without tertiary education. This result has important health implications: more

conservative gender norms are also associated with a higher risk of reaching the threshold of pre-dementia diagnosis among women than men. In this respect, our results contribute to the literature establishing a link between gender norms and gender gaps in health. So far, the literature has focused on adolescent smoking behaviours (Rodríguez-Planas & Sanz-de-Galdeano, 2019), self-reported health among working-age adults (Caroli & Weber-Baghdiguian, 2016), and depression and unhealthy behaviours in later life (Bassoli, 2025). Yet the methodologies used in the latter two studies do not permit a clear distinction between cultural and institutional determinants. We add to this strand of research by showing that gender norms, independent from the institutional environment, also have a role to play in gender disparities in later-life cognitive health, a key dimension of healthy ageing.

Second, the relationship between gender norms and the gender gap in later-life cognitive health is concentrated among second-generation immigrants with parents born in the same country, rather than among those with one foreign-born and one native-born parent. This finding is consistent with stronger transmission of cultural traits when parents share the same background, as emphasized in the theory of cultural transmission (Bisin & Verdier, 2011). In the empirical literature, a similar pattern has been documented for earlier life outcomes, including gender gaps in school performance (Rodríguez-Planas and Nollenberger, 2018), higher educational attainment (Huber & Paule-Paludkiewicz, 2024) and willingness to compete (Hauge et al., 2023), as well as female fertility decisions and labour-market participation (Blau et al., 2013). We contribute to this literature by showing that the influence of transmitted gender norms persists into later life when parents share the same cultural background, shaping gender differences in cognitive health decades after transmission.

Third, this paper investigates potential pathways through which gender norms shape cognitive health gender gaps later in life. Consistent with the concept of cognitive reserve, later-life cognitive health has been linked with a range of potential drivers operating at different stages of life (Bertogg et al., 2026). In this paper, we examine whether inherited gender norms shape these potential channels of cognitive stimulation differently for women and men, thereby contributing to gender disparities in cognitive health at older ages.

At an early stage, education has often been targeted as a determinant of later-life cognitive functioning. Previous literature in medical and social science has shown that more educated individuals exhibit better cognitive health at older ages (Chen and O'Donnell, 2025; Cristofalo

et al., 2025; Lövdén et al., 2020). Evidence of a positive causal effect of education on cognitive performance has also been provided by quasi-experimental studies exploiting educational reforms, in various contexts (Banks and Mazzonna, 2012; Cha et al., 2025; Crespo et al., 2014; Glymour et al., 2008; Gorman, 2023; Monnet et al., 2026; Schneeweis et al., 2014). In line with these findings, gender differences in educational attainment have been advanced as a potential explanation for gender gaps in later-life cognitive health. Descriptive evidence supports this pathway in Latin America and the Caribbean (Maurer, 2011). While this link holds across other countries and cohorts, further explorations however provide limited support for a causal relationship (Angrisani et al., 2020). For education to constitute a mediating channel through which inherited gender norms shape gender gaps in later-life cognitive health, such norms would need to affect the educational attainment of women and men differently. In the United States, second-generation immigrant women attain less higher education relative to their male counterparts when gender norms in the country of ancestry are more conservative (Huber & Paule-Paludkiewicz, 2024). In our setting, inherited gender norms do not significantly affect gender gaps in educational attainment, with differences in the cohorts and countries considered potentially explaining this divergence. Instead, education appears to moderate the relationship: inherited gender norms affect the gender gap in later-life cognitive health significantly among men and women without tertiary education, but not among those with a tertiary degree. In line with the concept of cognitive reserve, higher educational attainment may provide women with greater capacity to buffer against the consequences of lower cognitive stimulation over the life course, thereby attenuating the influence of traditional gender norms on gender disparities in later-life cognition.

During midlife, occupational experiences may constitute an important pathway underlying gender differences in cognitive health later in life. Occupational complexity, or the degree of cognitive stimulation at work, likely contributes to the development of cognitive reserve. Bonsang et al. (2012) find a negative effect of retirement on cognitive functioning, suggesting a protective role of midlife employment on later-life cognitive health. However, the effect of retirement varies with occupational skill level, with negative effects among higher-skilled occupations and positive effects among lower-skilled occupations (Coe et al., 2012). Similarly, managerial occupations are protective of later-life cognitive functioning, whereas manual and agricultural occupations are associated with poorer cognitive outcomes (Sebastianutto et al., 2026). Taken together, this evidence points to the importance of cognitive stimulation through

skill use at work for later-life cognitive health. Consequently, we assess whether inherited gender norms shape gender differences in the level of skills used in the current or last occupation. Drawing on the description of skill use levels across occupations of Kawaguchi & Toriyabe (2022), we categorise occupations according to their skill level. We find that a one-standard-deviation increase in the MGN is associated with an 8.2-percentage-point decrease in the probability that women, relative to men, work or have worked in a higher-skilled occupation. This estimate corresponds to a reduction of approximately 20% relative to the average proportion of individuals working or having worked in high-skilled occupations. Furthermore, parenthood may be an important moderator in the relationship between inherited gender norms and gender differences in occupational skill levels. Women exposed to more traditional gender norms experience larger child penalties on the labour market, which persist across generations (Kleven et al., 2019). These penalties may translate into lower cognitive health in later life through changes in work-related skill use and occupational sorting. In particular, childbirth has been shown to reduce work-related skills, with larger and more persistent penalties among mothers (Jessen et al., 2026), and to contribute to occupational sorting into lower-skilled jobs among mothers (Iakovlev & Tealdi, 2026; Pepin & VanderBerg, 2021). Consistent with this evidence, we find that the relationships between inherited gender norms and gender gaps in both later-life cognitive health and occupational skill level are concentrated among individuals with children.

In later life, individuals with active and socially integrated lifestyles tend to exhibit better cognitive functioning (Fratiglioni et al., 2004). In particular, participation in physical and social activities is associated with a better cognitive health (Adam et al., 2007; Cai, 2022; Huang et al., 2025) while social integration may also play a protective role (Mair and Ornstein, 2026). Cross-country differences in social participation have even been advanced as a potential channel towards gender discrepancies in cognitive performance in later life (Schmitz et al., 2026). In our analysis, we find no significant evidence that inherited gender norms are associated with gender differences in active lifestyles and social participation, including regularly engaging in voluntary work, going to a sports or social club, participating in a political or community-related organisation, reading or playing games. However, more traditional inherited gender norms are associated with a lower likelihood of women participating in training courses later in life, relative to men, suggesting gender discrepancies in opportunities for cognitive stimulation through continued learning. Inherited gender norms are not significantly associated either with

gender differences in social integration, as measured by Social Integration Index developed by Gruber et al. (2024). These findings suggest that the cognitive gender gap associated with inherited gender norms is unlikely to operate through differences in behaviours at older ages. Instead, our results point toward disparities emerging earlier in the life course, particularly through occupational complexity during adulthood.

The remainder of the paper is organised as follows. Section 2 introduces the data sources, the variables of interest and the analytical sample. Section 3 outlines the empirical strategy and discusses its underlying assumptions. Section 4 provides a graphical description of the relationship between inherited gender norms and gender differences in cognitive health. Section 5 presents the main results, assesses their robustness and explores potential pathways underlying this relationship. Section 6 concludes.

2. Data

2.1. Analytical sample

Following the epidemiological approach, that we describe in Section 3 and in Appendix A, we construct a sample of second-generation immigrants who are born in their country of residence and have at least one parent born in another country. This sample is drawn from the Survey of Health, Ageing and Retirement in Europe (SHARE), a comprehensive longitudinal survey providing demographic, socio-economic and health information on individuals aged 50 and older in Europe. SHARE is particularly well suited to our analysis as it provides both individuals' and their parents' countries of birth, together with test scores covering core cognitive domains in later life and potential drivers of cognitive stimulation.

We make several restrictions to this sample of second-generation immigrants. First, we exclude individuals with parents who were born in different countries (4% of the sample of second-generation immigrants), as assigning a single country of ancestry to these individuals is not possible. As a robustness check, we include them back in the sample and alternatively assign them the country of ancestry of the mother and the father, as previously done in the literature (Aldén & Neuman, 2022). Estimates are robust to their inclusion (see Table D7 in Appendix D). Second, we restrict the analysis to Waves 4 through 9 of SHARE, covering the period from 2011 to 2022. This restriction stems from the availability of the cognitive measures used to

construct our Cognitive Score Index: one of the cognitive tests included in the index (the serial subtraction test) is only available from Wave 4 onwards. As a robustness check, we reconstruct the index excluding this cognitive dimension, allowing us to extend the sample to Waves 1 through 9. The resulting estimate is similar to our baseline estimate (see Table D7), consistent with the absence of a significant association between inherited gender norms and gender differences in the serial subtraction score (see Table C1 in Appendix C). In addition, Waves 8 and 9 were collected between 2019 and 2022 and therefore partly overlap with the COVID-19 pandemic[1]. In Appendix D, we show that excluding these waves leaves our results virtually unchanged (see Table D7). Third, we exclude countries of ancestry represented by fewer than 10 observations, or for which the sample includes only men or only women. Such restrictions are common practice in studies using the epidemiological approach (Aldén & Neuman, 2022; Fernández & Fogli, 2009; González & Rodríguez-Planas, 2020; Rodríguez-Planas & Nollenberger, 2018; Rodríguez-Planas & Sanz-de-Galdeano, 2019).

Taking these restrictions into account, the final sample contains 14,567 observations of second-generation immigrants[2]. Of these, 3,623 correspond to individuals with parents born in the same country. The remaining 10,944 observations correspond to individuals with one foreign-born parent: 5,741 have a foreign-born mother and 5,203 a foreign-born father. Sample sizes by country of ancestry are presented in Table B1 (see Appendix B).

The longitudinal structure of SHARE allows us to observe cognitive scores for the same individual at several points in time (3.5 times on average, in our sample). In the baseline specification, individuals contribute one observation for each wave in which they participated between Waves 4 and 9, with their cognitive test score in that wave serving as the outcome. We do so to exploit the maximum sample size available, and therefore improve efficiency. As a consequence, some individuals contribute more observations to the estimation than others. We check whether this feature of the data affects our results using three alternative specifications. First, we collapse the data at the individual level by averaging cognitive scores across all available waves. Second, we reweight observations by the inverse of the number of times an

[1] The 8th wave of SHARE was conducted during 2019 and early 2020. However, the survey was halted in March 2020 due to the onset of the COVID-19 pandemic in Europe.

[2] In our sample, second-generation immigrants are born and live in the following countries: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, France, Finland, Germany, Greece, Hungary, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain and Switzerland.

individual appears in the sample. Third, we retain only each individual's first observed cognitive test score, so that every individual contributes a single observation. Table D8 in Appendix D shows that the baseline results remain similar across these alternative approaches.

[Table 1 about here]

2.2. Measures of cognitive health

In SHARE, cognitive functioning is evaluated through a series of tests administered during a face-to-face interview. These tests, widely recognised in the field of cognitive ageing, have been validated for diagnosing different stages of cognitive impairment, including dementia, in the medical literature (O'Donovan et al., 2023). Table 1 reports the means and standard deviations of the test scores for the full sample of second-generation immigrants (Column 1), for individuals with a foreign-born mother only (Column 2), individuals with a foreign-born father only (Column 3) and individuals with both parents born abroad and in the same country (Column 4). Mean scores are virtually similar across groups of second-generation immigrants. We describe each cognitive test below and then combine them into a Cognitive Score Index (CSI), that we describe below and which serves as our main outcome.

Episodic Memory. Individuals are asked to memorise 10 common words read aloud by the interviewer. Episodic memory is tested by asking individuals to recall as many of these words as possible, both immediately and after a delay. The immediate word recall (IWR) test takes place immediately after the interviewer gives the list. The delayed word recall (DWR) test is administered after completing the fluency and numeracy tests described below. Both scores range from 0 (i.e., the individual does not remember any of the listed words) to 10 (i.e., they remember all of them). To limit re-test effects across waves, a list is randomly drawn among four different lists. In the whole sample, individuals remember 5.6 words immediately and 4.3 after a delay, on average.

Verbal Fluency. For this test, individuals have to name as many different animals as possible in 1 minute. The verbal fluency task is a tool used to measure executive functions that are necessary for the cognitive control of behaviour, i.e., selecting and successfully monitoring

behaviours that facilitate the attainment of goals (Shao et al., 2014). The verbal fluency test score ranges from 0 to 93 in the whole sample, with an average of 22 names within one minute.

Serial Subtraction. This test assesses individuals' ability to perform a sequence of simple mental calculations. Respondents are asked to subtract 7 from 100 and then continue subtracting 7 from each successive result, for a total of five subtractions. One point is awarded for each correct answer, yielding a score ranging from 0 to 5 and averaging to 3.9.

Numeracy. Numeracy is assessed through a series of questions involving simple calculations based on real-life situations. The difficulty of subsequent questions depends on respondents' previous answers: individuals who answer the first question correctly proceed to a more difficult question, while those who answer incorrectly receive an easier one. The complete sequence of questions is described in Appendix B. The resulting score ranges from 1 to 5, with higher values indicating greater numeracy skills. Specifically, respondents receive a score of 1 if they answer both Questions 1 and 2 incorrectly and a score of 2 if they answer Question 2 correctly. Among respondents who answer Question 1 correctly, those who fail to answer Question 3 correctly receive a score of 3. Those who answer Question 3 correctly receive a score of 4 if they fail Question 4 and a score of 5 if they answer Question 4 correctly. The average numeracy score in our sample is 3.6. Because the numeracy test is administered only during respondents' first interview, we assign their first-interview score to their observations in subsequent waves, allowing us to retain all available observations as described in Section 2.1. Using first interview observations only does not change the results (see Table D8 in Appendix D).

Cognitive Score Index. Our main outcome is the Cognitive Score Index (CSI), which combines scores across all cognitive tests described above. Because the individual tests are measured on different scales, we first standardise each test score and then construct the CSI, which is the average of these standardised scores. Higher values of the index therefore indicate better overall cognitive functioning. We use the CSI as our main outcome in both the graphical and regression analyses. Results for each cognitive test separately are reported in Appendix C. As an alternative outcome, we use the SHARE-Cog instrument developed by O'Donovan et al. (2023). More details on this measure are given in Appendix D.

Threshold for dementia diagnosis. While cognitive impairment is part of the normal ageing process, some individuals can experience larger cognitive loss as they grow older. In the medical

literature, there is a distinction between *normal cognition* (which refers to healthy cognitive functioning), *mild cognitive impairment* (usually defined as a pre-dementia stage) and *dementia,* the most advanced stage of unhealthy cognitive impairment (O'Donovan et al., 2023; Petersen et al., 2014). Criteria to classify individuals suffering from dementia symptoms have been developed in the literature, though with no clear consensus on the threshold to use for diagnosis. With a recent literature review, Bradfield (2023) shows that, in the absence of a strict cut off, studies converge towards classifying individuals with a cognitive score falling under 1.5 standard deviations below the mean as individuals with mild cognitive impairment or pre-dementia. Difficulties conducting instrumental activities of daily living (IADL) are also a common criterion used in the literature, although their role in defining cognitive impairment remains debated. Some studies suggest that mild cognitive impairment does not generally interfere with the ability to perform these activities independently, although "*greater effort, compensatory strategies, or accommodation may be required*" (Bradfield, 2023). Drawing on this literature, we consider two indicators for pre-dementia. The first is a binary variable taking the value of one if the Cognitive Score Index (CSI) falls at least 1.5 standard deviations below the mean, and zero otherwise. The second additionally requires individuals to report at least one IADL limitation. In SHARE, individuals are asked whether they have difficulty conducting the following activities without any help: using a map in an unknown place, preparing a hot meal, shopping for groceries, making telephone calls, taking medication, doing work around the house and managing money.

2.3. Individual characteristics

Table 1 also reports socio-economic and demographic characteristics of the sample. Some of these variables are included as covariates in the main estimations, while others are used in the mechanisms analysis that investigates potential channels operating at different stages of the life course. Specifically, education is examined as an early-life mechanism. For midlife, we consider occupation type as a mediator and parenthood as a moderator. Finally, social participation and integration are examined as mediators operating later in life. We discuss these analyses in more detail in Section 5.2.

Among all second-generation immigrants, individuals are aged 66 at the time of interview and 57% of them are women. 10% have a primary school level attainment (ISCED 0-1), 63% have

completed a secondary or post-secondary degree (ISCED 2-4) and 27% hold a tertiary level diploma (ISCED 5-6).[3]

34% of the sample has (or used to have, if retired) a higher skill-use occupation, as opposed to a lower skill-use occupation. This classification is built on the study of Kawaguchi and Toriyabe (2022) that compares the distribution of skill use at work between occupations. Based on the International Standard Classification of Occupations, the authors show that literacy use is the highest among professionals (e.g., engineers, health professionals, teachers...), followed – in this order – by managers (e.g., chief executives, senior officials, administrative and commercial managers...), occupations of the armed force, technical professionals, clerks (e.g., healthcare assistants, social workers, secretaries...), sales and service workers, agricultural workers, craft workers, plant and machine operators, and is the lowest for elementary occupations.[4] We split those occupations in two equal size groups: occupations with "higher skill use" (professionals, managers, occupations of the armed force, technical professionals and clerks) and occupations with "lower skill use" (sales and service workers, agricultural workers, craft workers, plant and machine operators and elementary occupations). About 90% of individuals had at least one child over their life course.

We measure later-life active lifestyle and social participation using binary variables indicating whether individuals have engaged in a given activity at least once a month in the past twelve months. We construct an indicator for each of the following activities: doing voluntary or charity work; attending training courses; going to a sports or social club; engaging in political or community-related organisation; reading books, magazines or newspapers; and playing games (including word games, number games, card games and chess). Among all second-generation immigrants, 14% engage in voluntary or charity work at least once a month, 7% attend training courses, 26% participate in sports or social clubs and 5% are involved in political or community-

[3] Education levels are based on the International Standard Classification of Education (ISCED-97). They are classified as follows: ISCED 0: "Pre-primary education", ISCED 1: "Primary education", ISCED 2: "Lower secondary education"; ISCED 3: "Upper secondary education", ISCED 4: "Post-secondary non-tertiary education", ISCED 5: "First stage of tertiary education" and ISCED 6: "Second stage of tertiary education". For more details, see: https://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-1997-en_0.pdf

[4] For more details on the classification of occupations, see: https://ilostat.ilo.org/methods/concepts-and-definitions/classification-occupation/.

related organisations. Reading and playing games are more common, with 81% and 58% of individuals, respectively, reporting these activities at least once a month.

To capture social integration, we use the Social Integration Index provided by SHARE (Gruber et al., 2024) that combines information on social ties, including the presence of a partner and regular contact with relatives or friends, with participation in social activities. It ranges from 1 to 4, with higher values indicating greater social integration. Among all second- generation immigrants, the average Social Integration Index is 2.92.

Overall, individuals with two foreign-born parents tend to have slightly lower cognitive test scores, lower educational attainment and a lower probability of having worked in a higher-skill occupation. They are also somewhat more likely to be parents. In later life, they report lower social participation and integration. Taken together, these patterns suggest that individuals with two foreign-born parents differ from those with only one foreign-born parent along several dimensions that may be relevant to cognitive health. We discuss this point further in Section 5.1.

2.4. Measure of Gender Norms (MGN)

Following previous studies investigating the relationship between gender norms and gender differences in various characteristics (Bonsang et al., 2017; Fortin, 2005; Guiso et al., 2008; Hauge et al., 2023), we proxy gender norms with prevailing gender-role attitudes in the country of ancestry using the Integrated Values Surveys (IVS)[5].

Specifically, we construct a Measure of Gender Norms (MGN) based on the proportion of individuals who agree with a statement reflecting conservative gender roles: "*When jobs are scarce, men should have more right to a job than women*." IVS respondents can agree, disagree, or express no clear opinion on this statement. For our baseline measure, we assign a value of one to respondents who agree and zero to those who disagree, excluding respondents with no clear opinion. As a robustness check, we alternatively classify respondents without a clear opinion as either agreeing or disagreeing with the statement. The resulting estimates are slightly

[5] The IVS merges the European Values Study (EVS) and the World Values Survey (WVS) files together. More details can be found at: https://europeanvaluesstudy.eu/methodology-data-documentation/integrated-values-surveys.

smaller, but of virtually similar amplitude (see Table D3 in Appendix D). The MGN then reflects the share of respondents who agree with the statement. It ranges from 0 to 1, with higher values indicating more conservative gender norms prevailing in the country.

We use this statement for the MGN since it explicitly asks respondents to assess the relative roles of men and women in society. It therefore captures attitudes towards socially constructed gender hierarchies, which may contribute to unequal outcomes across different domains (Seguino, 2011). By contrast, an item such as "*A pre-school child suffers with a working mother*," also included in the IVS, elicits attitudes towards working mothers without providing a corresponding assessment of working fathers, and therefore does not allow for a direct comparison of attitudes towards male and female roles.

IVS data are available from 1981 onwards and therefore do not allow us to measure gender norms prevailing when the parents of second-generation immigrants lived in their countries of origin. Nevertheless, the use of contemporaneous measures of gender norms in the country of ancestry is common practice in the literature (Fernández & Fogli, 2009; González & Rodríguez-Planas, 2020; Rodríguez-Planas & Nollenberger, 2018). To ensure that the MGN reflects the gender norms prevailing among comparable generations in the country of ancestry, we compute it using IVS respondents who live in the country of ancestry and belong to the same birth cohorts as the second-generation immigrants observed in SHARE.

Figure 1 displays MGN values in all countries of ancestry. Sub-figure 1.A shows the average MGN value for individuals in each country where both parents were born in the same country. Sub-figures 1.B and 1.C display the average MGN for individuals whose mother or father, respectively, was born in the country. In all cases, the lowest MGN is held by Denmark where 6% of the population agree with giving a priority to men on the labour market when jobs are scarce, while it is the highest in Tunisia (88%) among individuals who have both parents born abroad and in the same country, in Algeria (78%) for individuals with a foreign-born mother only and in Egypt (96%) for those with a foreign-born father only.

[Figure 1 about here]

3. Empirical strategy

This paper aims at estimating the effect of gender norms on gender gaps in later-life cognitive health. To this end, we rely on the epidemiological approach developed by Fernández and Fogli (2009, 2011), which seeks to "*identify the effect of culture through the variation in economic outcomes of individuals who share the same economic and institutional environment, but whose social beliefs are potentially different*". This approach relies on the use of a sample of second-generation immigrants, defined as individuals who are born in their country of residence and have at least one parent born abroad. We consider a first estimation taking all second-generation immigrants into account in Section 3.2. We then allow the relationship of interest to vary according to whether both parents are foreign-born or not in Section 3.3., thereby following previous literature (Blau et al., 2013; Hauge et al., 2023; Huber & Paule-Paludkiewicz, 2024; Rodríguez-Planas & Nollenberger, 2018). By comparing individuals who face the same institutional environment but differ in their inherited cultural background, this approach allows us to disentangle the contribution of gender norms of that of institutions to the gender gap in later-life cognitive health. The validity of this approach relies on three main assumptions that we detail in Section 3.1.

3.1. Identifying assumptions

The first assumption is that parents (the first-generation immigrants) transmit the gender norms prevailing in their country of birth (the country of ancestry) to their children (the second-generation immigrants). First and foremost, this implies that, on average, parents share the same norms as the ones prevailing in their birth country. This assumption may be compromised by selection into migration: individuals who migrate may hold norms that systematically differ from the average norm in the country of origin. If parents do not transmit those norms, estimates of the parameter of interest are likely biased towards zero, and our results would reflect a lower bound estimate of the effect of gender norms on the gender gap in cognitive health. This threat to identification can be tested by checking that first-generation immigrants' norms are similar to the average norm in their country of birth. This check is possible using the IVS since the data permits to identify first-generation immigrants and measure their gender norms as well as those held by individuals living in their country of birth. Consistent with the first assumption, we show that gender norms held by first-generation immigrants are positively correlated with

norms prevailing in their country of birth, conditional on the country of birth and the country of residence (see Figure A1 in Appendix A). A related concern regarding this assumption is that parents might transmit other characteristics that are correlated with their norms and their children's cognitive functioning (e.g., parental level of education). If these parental characteristics are not considered and are correlated with men's and women's cognitive outcomes differently, our estimates could suffer from an omitted variable bias. We address this concern by adding individual controls and their interaction with gender in our regression as a robustness check. This point is further discussed in Appendix D. Similarly, gender norms prevailing in parental birth country could capture other country-level characteristics that could affect men and women differently and therefore confound our relationship of interest (e.g., economic development). This point is discussed in Appendix D, where we control for the interaction between additional country-level variables with gender.

The second assumption requires that second-generation immigrants internalise the norms transmitted by their parents. Since individual gender norms are not observed in the SHARE dataset, we are unable to directly test this relationship within our sample. However, the IVS dataset provides information on second-generation immigrants, which allows us to examine the correlation between gender norms held by these individuals and the prevailing norms in their ancestral countries, controlling for both country of birth and country of residence. Interestingly, Figure A2 in Appendix A shows a positive correlation among second-generation immigrants whose parents are both born in the same country, whereas no significant relationship is observed when only one parent is foreign-born. This finding aligns with previous literature finding a stronger transmission of norms when parents originate from the same country (Blau et al., 2013; Hauge et al., 2023; Huber & Paule-Paludkiewicz, 2024; Rodríguez-Planas & Nollenberger, 2018). Furthermore, it is important to note that while *vertical transmission* (i.e., from parents) plays an important role in our case, individuals may also be exposed to *horizontal transmission* (e.g., from their peers in the country of residence), which could influence or interfere with transmission of norms from the parents (Bisin & Verdier, 2011). With the epidemiological approach, the bias generated by horizontal transmission could depend on whether parents (first-generation immigrants) move to a country for reasons unrelated to the norms prevailing in the destination country or not. In Appendix A, we show that our results are likely to reflect a lower bound of the effect of gender norms on the cognitive gender gap if first-generation immigrants were to move to less conservative countries.

The third identifying assumption is that all second-generation immigrants living in the same country experience the same institutional and environmental settings. This assumption is strong considering that individuals are likely to be treated differently based on their parents' birthplace (e.g., hiring discrimination linked to country of origin). Although this assumption is challenging, it would be a concern for our estimates only if gender differences in institutional and environmental exposure in the country of residence vary systematically according to gender norms in the country of ancestry (e.g., the intensity of gender-based discrimination towards second-generation immigrants would differ according to the country of ancestry). While we cannot completely overrule this possibility, we argue that this source of bias should be limited.

3.2. Baseline estimation

First, we estimate the following regression using the Ordinary Least Squares (OLS) estimator among all second-generation immigrants[6]:

$$C_{igrta} = \alpha_0 + \alpha_1 Female_i + \alpha_2 Female_i * MGN_a + \gamma_a + \gamma_{rg} + \delta_t + \rho X'_{it} + \varepsilon_{igrta} \quad (1)$$

C_{igrta} is the cognitive test score of individual i of gender g living in country of residence r at time t who has at least one parent born in country of ancestry a. α_0 is the intercept, $Female_i$ the binary variable indicating individual i's gender equal to 0 for a man and to 1 for a woman, MGN_a the Measure of Gender Norms (MGN) in the country of ancestry a such that gender norms are more conservative when the index has a higher value, γ_a the country of ancestry fixed effect, γ_{rs} the country of residence by gender fixed effect, δ_t the interview wave fixed effect, X'_{it} the vector of individual control variables and ε_{igrta} the error term.

α_2 is the coefficient of interest as it captures the effect of traditional gender norms in the country of ancestry on the cognitive gender gap among second-generation immigrants. We standardise both the cognitive test score and the MGN to simplify the interpretation of the results. Consequently, α_2 represents the change in the gender difference in cognitive scores, expressed in standard deviations, associated with a one-standard-deviation increase in the MGN. α_2 is

[6] We also estimate the model using a more parametric specification by including the Measure of Gender Norms directly and omitting the fixed effects for the country of ancestry.

expected to be negative, suggesting that the female cognitive score is lower, relative to the male score, when gender norms in the country of ancestry are more conservative.

The regression includes country of ancestry fixed effects to account for country-specific characteristics that may influence cognitive performance in the same way for both men and women. The country of residence by gender fixed effect accounts for country characteristics contributing to the cognitive gender gap that affect men and women differently. Interview wave fixed effects account for time-specific characteristics that might be correlated with cognitive performances. The vector X'_{it} includes age and age squared to take the cognitive ageing process into account.

3.3. Heterogeneity by parental migration background

Because results are expected to differ according to whether the two parents are born in the same country or not (Blau et al., 2013; Hauge et al., 2023; Huber & Paule-Paludkiewicz, 2024; Rodríguez-Planas & Nollenberger, 2018), we distinguish second-generation immigrants who have both of their parents born in the same country from those with only one parent born abroad. We exclude individuals who have two parents born abroad but from different countries (see Section D for more details).

We construct a binary variable (One_i) equal to 1 if only one parent of individual *i* is born abroad and to 0 if both parents are born in the same country (abroad). This variable is added to the baseline model (1) and fully interacted with all the explanatory variables included in the model, giving:

$$C_{igrtao} = \beta_0 + \beta_1 Female_i + \beta_2 Female_i * MGN_a + \beta_3 One_i + \beta_4 One_i * Female_i + \beta_5 Female_i * MGN_a * One_i + \theta_{ao} + \theta_{rgo} + \varphi_{to} + X'_{it}\tau + One_i * X'_{it}\gamma + \mu_{igrta} \quad (2)$$

Here, β_2 and β_5 are of particular interest. β_2 represents the change in the gender difference in cognitive functioning when the MGN increases in the country of ancestry for individuals whose both parents are born in the same country. $\beta_2 + \beta_5$ captures the association between MGN and the gender difference in cognitive test scores for second-generation immigrants with only one parent born abroad (either the mother or the father). This model includes the same control

variables and fixed effects as in the baseline model and are all interacted with One_i (i.e. $\theta_{ao}, \theta_{rgo}, \varphi_{to}$).

In line with the previous literature, standard errors are corrected for clustering at the country of ancestry level. However, given that the number of countries of ancestry is relatively "small" (48 countries in the full sample), hypothesis testing about the coefficients might be inaccurate. We therefore also report p-values of the wild bootstrap test for the coefficients of interest that is robust even when the number of clusters is "small" (Cameron & Miller, 2015; Roodman et al., 2019). They are reported in brackets in the tables.

4. Graphical description

We first report a graphical representation of the association between the Cognitive Gender Gap (CGG) among second-generation immigrants and the MGN in the country of ancestry. For each country of ancestry *a*, CGG_a is the difference in Cognitive Score Index (see Section 2.2 for more details) between female and male second-generation immigrants and is defined as:

$$CGG_a = CSI_{fa} - CSI_{ma} \quad (3)$$

With CSI_{fa} is the female Cognitive Score Index and CSI_{ma} the male Cognitive Score Index among second-generation immigrants with country of ancestry *a.* A positive CGG_a represents a female advantage in CSI while a negative one represents a male advantage. This relationship is estimated using the OLS estimator, without any control variable nor specific effect.

Figure 2 displays this relationship for individuals with both foreign-born parents (Sub-figure 2.A), with foreign-born mothers only (Sub-figure 2B) with foreign-born fathers only (Sub-figure 2C). It shows that the CGG is negatively associated with the MGN among second-generation immigrants who have both parents born in the same country. In other words, the cognitive female advantage that exists among second-generation immigrants from a country of ancestry with a low MGN (i.e., less conservative countries) decreases while the MGN increases, and even becomes a male advantage in the most conservative countries. For second-generation immigrants with only one parent born in country of ancestry *a,* the relationship is not significant at any conventional level.

[Figure 2 about here]

5. Results

5.1. Main results

We report estimation results based on Equation 1 (see Section 3.2) in the first two columns of Table 2. Column 1 and 2 display results without and with country of ancestry fixed effects respectively. We then report estimation results related to Equation 2 (see Section 3.3) in Columns 3 and 4, without and with country of ancestry specific effects respectively. The outcome is the Cognitive Score Index described in Section 2.2. Results for each cognitive test and each group of second-generation immigrants separately are provided in Appendix C. Because both MGN and the CSI are standardised, coefficients are interpreted as changes in the CSI, expressed in standard deviations, associated with a one-standard-deviation increase in the MGN.

In columns 1 and 2, the coefficient associated with gender is not statistically different from 0, indicating no significant gender difference in the Cognitive Score Index (CSI) among second-generation immigrants living in Austria (the reference country of residence) with an average value of the Measure of Gender Norms (MGN).[7] Column 1 further shows that the MGN is not significantly associated with the CSI among male second-generation immigrants, the reference group. However, the negative coefficient on the interaction term between the MGN and Woman indicates that a one-standard-deviation increase in the MGN is associated with a decrease of 0.063 standard deviations in the CSI for women relative to men. This differential association is statistically significant at the 10% level. When country-of-ancestry fixed effects are included (Column 2), the interaction coefficient remains negative and similar in magnitude, but is no longer statistically significant at conventional levels.

When allowing the estimates to differ according to whether one or both parents were born abroad, we find that the MGN is negatively associated with the gender gap in cognitive health

[7] This interpretation follows from the inclusion of country-of-residence-by-sex fixed effects and the standardisation of MGN to have a mean of zero and a standard deviation of one.

only among second-generation immigrants with both parents born in the same country, i.e., the reference group (Columns 3 and 4). More precisely, a one-standard-deviation increase in the MGN is associated with a decrease of 0.213 to 0.219 standard deviations in the CSI for women relative to men in this group, depending on the specification. The latter estimate, stemming from our preferred specification that includes country-of-ancestry fixed effects, is equivalent to approximately 6 years of cognitive ageing at age 65[8], and to 35% of the cognitive score gap between individuals with and without tertiary education[9]. Among second-generation immigrants with only one foreign-born parent, the estimated differential association is much smaller and not statistically significant at conventional levels.[10] This finding is in line with the theory of stronger intergenerational transmission of cultural traits when both parents share the same background (Bisin & Verdier, 2011), which has received empirical support (Blau et al., 2013; Hauge et al., 2023; Huber & Paule-Paludkiewicz, 2024; Rodríguez-Planas & Nollenberger, 2018). This interpretation is further supported by Figure A2 in Appendix A, which shows that the association between second-generation immigrants' gender norms in the IVS and those prevailing in their country of ancestry is stronger when both parents originate from the same country than when only one parent was born abroad.

Since the relationship between inherited gender norms and gender gaps in later-life cognitive health is observed only among second-generation immigrants with two foreign-born parents, we restrict the remainder of the analysis to this group. We also retain the specification including country-of-ancestry fixed effects, in line with common practice in the literature using the epidemiological approach.

Table C1 in Appendix C reports the results for each cognitive test separately among second-generation immigrants with both parents born in the same country. To ensure comparability across tests, we use standardised cognitive test scores as dependent variables. The results show

[8] The cognitive-ageing equivalent is calculated using the estimated coefficients on age and age squared from the baseline regression. Specifically, we determine the increase in age from 65, the average age in the analytical sample, that yields the same predicted change in the Cognitive Score Index as the estimated coefficient on the interaction *MGN* × *Woman*.

[9] The education-gap equivalent expresses the magnitude of the estimate relative to the adjusted cognitive score gap between individuals with and without tertiary education. It is calculated by dividing the estimated coefficient on *MGN* × *Woman* from the baseline regression by the estimated coefficient on tertiary education from the same specification augmented with an education indicator.

[10] For second-generation immigrants with only one foreign-born parent, the differential association is given by the sum of the coefficients on *MGN* × *Woman* and *MGN* × *Woman* × *Only one parent born abroad*. In Column 3, this sum equals -0.032 with a standard error of 0.038.

that the MGN is most strongly associated with gender gaps in numeracy (-0.187 standard deviations) and delayed word recall (-0.176 standard deviations). Smaller amplitudes are found for verbal fluency (-0.146 standard deviations) and immediate word recall (-0.144 standard deviations). When correcting for clustering using the wild bootstrap approach, all these associations remain statistically significant at least at the 5% level, except for verbal fluency, which is no longer statistically significant. We find no evidence of a significant association with serial subtraction scores, regardless of the inference method used. Results for second-generation immigrants with only one foreign-born parent are reported in Tables C2 and C3 of Appendix C. For this group, none of the estimated coefficients is statistically significant at conventional levels across any of the cognitive tests.

We assess the robustness of the baseline results for second-generation immigrants whose parents were born in the same country by (i) using alternative measures of gender norms and cognitive functioning, (ii) including additional individual-, parental- and country-of-ancestry-level controls, (iii) modifying the estimation sample, (iv) considering alternative model specifications and (v) conducting placebo tests. Appendix D describes these robustness exercises and presents the corresponding results. The findings remain robust across the different checks.

[Table 2 about here]

Table 3 reports the results for our two indicators of pre-dementia symptoms. Column 1 presents the results using the less restrictive definition, based on a CSI at least 1.5 standard deviations below the mean. Column 2 uses the more restrictive definition, which additionally requires at least one limitation in instrumental activities of daily living (IADL). Results suggest that traditional inherited gender norms are associated with a higher probability of exhibiting symptoms of cognitive impairment among women relative to men. Specifically, a one-standard-deviation increase in MGN is associated with a 5.5-percentage-point increase in the probability of meeting the less restrictive criterion for women relative to men, equivalent to an increase from 9.5% to 15%. Under the more restrictive definition, the risk of reaching the threshold for mild-cognitive impairment increases by 2.8 percentage points, from 3.5% to 6.3%.

[Table 3 about here]

5.2. Potential pathways: Mediating factors

To explore the potential pathways linking inherited gender norms to gender disparities in later-life cognitive health, we examine several sources of cognitive stimulation throughout the life course (Bertogg et al., 2026). We first investigate whether inherited gender norms shape gender differences in educational attainment (early-life stage), in occupational skill levels (midlife stage) and in social participation and integration (later-life stage). To this aim, we estimate our baseline specification using each of these potential mediating factors as the dependent variable.

5.2.1. Early-life

We start with investigating whether inherited gender norms shape gender differences in educational attainment. Specifically, we assess whether gender norms are related to gender differences in the probability to have a primary, secondary or tertiary education level respectively, based on the International Standard Classification of Education (ISCED). More details on how the ISCED code is defined are given in Section 2.3.

The first three columns of Table 4 report the results of this analysis. We find no statistically significant association between inherited gender norms and gender differences in educational attainment, regardless of the educational threshold considered. As a complementary analysis, we estimate an ordered probit model using the ISCED code, that ranges from 0 (no education) to 6 (second stage of tertiary education), as the outcome. Table E1 in Appendix E reports the corresponding marginal effects for each education level. The signs of these effects suggest a pattern: more traditional inherited gender norms are associated with a higher probability, for women compared to men, to attain lower educational levels and a lower probability of attaining higher educational levels. Nevertheless, the weak statistical significance of these estimates provides little evidence of a systematic association between inherited gender norms and gender differences in educational attainment. Overall, our findings provide limited support for educational attainment as a pathway through which inherited gender norms contribute to gender disparities in later-life cognitive health. To go further, educational attainment is considered as a potential moderating factor in Section 5.3.

5.2.2. Midlife

We next investigate whether inherited gender norms shape gender differences in occupational skill levels. As described in Section 2.3, we classify individuals' current or last occupation according to its level of skill use, distinguishing between higher- and lower-skill occupations. We then estimate our baseline specification using a binary indicator for working (or having worked) in a higher-skill occupation as the dependent variable.

Column 4 of Table 4 shows that a one-standard-deviation increase in the MGN is associated with an 8.2-percentage-point decrease in the probability that women, relative to men, work or have worked in a higher-skill occupation. This estimate is statistically significant at the 5% level, including with the wild bootstrap inference method, and corresponds to approximately 20% of the average proportion of individuals working or having worked in higher-skill occupations (41.5%). Gender differences in cognitive stimulation through occupational experiences may therefore constitute an important pathway linking inherited gender norms to gender disparities in later-life cognitive health.

5.2.3. Later-life

Finally, we explore whether the relationship between inherited gender norms and gender gaps in later-life cognitive health could operate through social participation and integration in later life. We measure social participation in two ways. First, we use a broad measure based on a binary indicator taking the value of one if an individual engages in at least one of the activities described in Section 2.3 at least once a month. Using this measure as the outcome, Table 4 shows no statistically significant association between inherited gender norms and gender differences in overall social participation. Second, to investigate whether the estimate masks differences in results across specific activities, Table C4 in Appendix C presents separate estimates for binary indicators of participation in each activity at least once a month over the past twelve months. The results show that a one-standard-deviation increase in the MGN is associated with a 3.5-percentage-point decrease in the probability that women, relative to men, attend training courses at least monthly. This association is statistically significant at the 5% level, including under wild bootstrap inference. For the remaining activities, we find no statistically significant associations that hold under wild bootstrap inference. We also

investigate whether inherited gender norms shape gender differences in social integration. To do so, we use the Social Integration Index developed by Gruber et al. (2024), which combines information on social ties and participation in social activities (more details on this index are provided in Section 2.3). Column 6 of Table 4 shows no significant association between inherited gender norms and gender differences in this index.

Overall, these findings provide mixed evidence for later-life activities as potential pathways linking inherited gender norms to gender disparities in cognitive health. While we find no significant association with overall social participation or social integration, more traditional inherited gender norms are associated with lower participation in training courses among women relative to men, suggesting that gender differences in cognitive stimulation through continued learning at older ages may contribute to disparities in later-life cognitive health.

[Table 4 about here]

5.3. Potential pathways: Moderating factors

Beyond examining potential mediating factors, we also assess whether education and parenthood moderate the relationship between inherited gender norms and gender gaps in later-life cognitive health. These two analyses address distinct questions. While the analysis of potential mediators examines whether inherited gender norms shape gender differences in exposure to cognitive stimulation over the life course, the moderation analysis assesses whether the relationship between inherited gender norms and gender gaps in later-life cognitive health varies across groups of women and men sharing a given characteristic.

5.3.1. Education level

Specifically, we first examine whether educational attainment, which has been shown to have a protective effect on later-life cognitive health (Banks and Mazzonna, 2012; Cha et al., 2025; Crespo et al., 2014; Glymour et al., 2008; Gorman, 2023; Monnet et al., 2026; Schneeweis et al., 2014), may buffer women against the implications of traditional inherited gender norms for cognition, that might operate in later stages of life. We therefore examine whether the relationship differs between lower-educated and higher-education individuals (below tertiary

vs. tertiary education). As shown in Figure 3, the association between inherited gender norms and gender differences in later-life cognitive health is negative and statistically significant among individuals without tertiary education only, while the estimate is not significantly different from zero among those with tertiary education. This pattern suggests that higher educational attainment may attenuate the consequences of traditional inherited gender norms on women's cognitive health relative to men's, potentially by providing greater cognitive reserve against cognitive skill loss emerging later in life.

5.3.2. Parenthood status

Parenthood status may have a moderating role in the relationship between gender norms and gender gaps in later-life cognitive health. The underlying hypothesis is that this link may be concentrated among individuals with children, given that childbirth is harmful for work-related skill use, particularly among mothers (Jessen et al., 2026), and contributes to women's occupational sorting into lower-skilled jobs (Iakovlev & Tealdi, 2026; Pepin & VanderBerg, 2021). Figure 3 shows that the relationship between inherited gender norms and gender differences in later-life cognitive health is concentrated among individuals with children. Among individuals without children, the estimated effect is not statistically significant. This pattern is consistent with the hypothesis that parenthood may moderate the relationship between inherited gender norms and gender gaps in later-life cognitive health, potentially through its consequences for women's exposure to cognitive stimulation during adulthood.

[Figure 3 about here]

6. Conclusion

The aim of this paper is to examine whether inherited gender norms contribute to gender disparities in cognitive health at older ages. While previous research has documented substantial cross-country variation in gender differences in cognitive functioning (Bonsang et al., 2017; Lei et al., 2012; Weber et al., 2014), identifying the specific role of gender norms remains challenging because cultural beliefs are closely intertwined with institutional environments. Our study addresses this issue by adopting an epidemiological approach that exploits variation in

gender norms inherited from parents among second-generation immigrants living in the same host countries.

Our findings indicate that more traditional inherited gender norms are associated with poorer cognitive health among older women relative to men. Among second-generation immigrants with both parents both born in the same country, a one-standard-deviation increase in our measure of gender norms is associated with a decline of 0.22 standard deviations in women's Cognitive Score Index relative to men's. This estimate is equivalent to approximately 6 years of cognitive ageing at 65-year-old, and amounts to about 40% of the cognitive score gap between low and high-educated individuals. Results are robust to an array of standard tests used in the literature, including using alternative measures of gender norms, adding individual-, parental- and country of ancestry-level controls, making sample restrictions and using other specifications. We further find that more traditional inherited gender norms are associated with a higher probability of exhibiting symptoms of mild cognitive impairment, a pre-dementia stage, among women relative to men. With these findings, we extend the literature linking gender norms to gender disparities in health, which has primarily examined health behaviours, self-reported health and mental health outcomes (Bassoli, 2025; Caroli & Weber-Baghdiguian, 2016; Rodríguez-Planas & Sanz-de-Galdeano, 2019), by showing their relevance for cognitive health at older ages.

We explore potential pathways through which inherited gender norms may contribute to gender disparities in later-life cognitive health, considering several channels likely operating at different stages of the life course. We find little evidence that gender differences in educational attainment constitute a significant pathway. Instead, more traditional inherited gender norms are associated with a lower probability that women, relative to men, work or have worked in higher-skilled occupations. These results are in line with the documented persistence in gender gaps in education- and occupation-field choices (Bertrand, 2020) that are explained at least partly by traditional gender norms transmitted through generations (Aldén & Neuman, 2022; Wolter & Zöllner, 2025). Taken together, our results suggest that occupational sorting, rather than differences in educational attainment alone, may contribute to the relationship between inherited gender norms and gender disparities in later-life cognitive health.

Although educational attainment does not emerge as a clear mediating factor, the link between inherited gender norms and gender gaps in cognitive health is concentrated among men and women below tertiary education level. The protective role of education has been documented

in the literature (Banks & Mazzonna, 2012; Crespo et al., 2014; Schneeweis et al., 2014), suggesting that higher educational attainment may provide women with cognitive reserve that buffers against the consequences of traditional gender norms that might operate later in life. Additionally, we find that our results are fully concentrated among individuals with children. This is consistent with evidence that traditional gender norms reinforce labour-market child penalties (Kleven et al., 2019), while childbirth reduces work-related skill use and contributes to occupational sorting, particularly among mothers (Iakovlev & Tealdi, 2026; Jessen et al., 2026; Pepin & VanderBerg, 2021).

Finally, we investigate whether inherited gender norms shape gender differences in active lifestyles, social participation and integration at older ages. Previous research has emphasised the importance of physical and social activities for cognitive functioning (Adam et al., 2007; Cai, 2022; Fratiglioni et al., 2004; Huang et al., 2025) and gender differences in social participation have been advanced as a potential explanation for gender disparities in later-life cognition (Schmitz et al., 2026). Our findings provide mixed evidence for these pathways. Inherited gender norms are not significantly associated with gender differences in overall social participation or social integration. However, disaggregating social participation into single activities reveals that more traditional inherited gender norms are associated with lower participation in training courses among women relative to men. No statistically significant differences have been found for other social activities. This finding points towards gender differences in cognitive stimulation through continued learning that may, in turn, contribute to disparities in cognitive health at older ages.

Some limitations to this study should be acknowledged. First, our analysis focuses on second-generation immigrants, and the extent to which the findings generalise to individuals with native-born parents is uncertain. Nevertheless, the consistency of our findings with previous evidence based on cross-country and cross-cohort comparisons (Bonsang et al., 2017; Lei et al., 2012; Weber et al., 2014) suggests that the relationship may extend beyond our population of interest. Second, while the epidemiological approach helps disentangle inherited cultural influences from the institutional environment of the country of residence, it does not eliminate all potential sources of confounding. We therefore refrain from making causal claims and interpret our findings as robust evidence of a relationship between inherited gender norms and gender disparities in later-life cognitive health. Finally, our analyses of potential pathways are exploratory and do not allow to disentangle causal drivers of the relationship between inherited

gender norms and cognitive health. Other potentially relevant pathways may remain unaccounted for because they cannot be observed in our data.

Overall, this paper provides evidence that inherited gender norms are associated with gender disparities in cognitive health well into older age. By documenting this relationship among second-generation immigrants, our findings extend the literature on the intergenerational transmission of gender norms beyond educational, labour-market and behavioural outcomes, highlighting their potential long-term consequences for cognitive health. Our results suggest that these consequences may operate through gender differences in opportunities for cognitive stimulation along the life course.

References

Adam, S., Bonsang, E., Germain, S., & Perelman, S. (2007). Retraite, activités non professionnelles et vieillissement cognitif. Une exploration à partir des données de Share. *Economie et Statistique*, (403-404). https://orbi.uliege.be/handle/2268/9249

Aldén, L., & Neuman, E. (2022b). Culture and the gender gap in choice of major : An analysis using sibling comparisons. *Journal of Economic Behavior & Organization*, *201*, 346-373. https://doi.org/10.1016/j.jebo.2022.07.026

Alesina, A., & Giuliano, P. (2015). Culture and Institutions. *Journal of Economic Literature*, *53*(4), 898-944. https://doi.org/10.1257/jel.53.4.898

Angrisani, M., Lee, J., & Meijer, E. (2020). The gender gap in education and late-life cognition : Evidence from multiple countries and birth cohorts. *The Journal of the Economics of Ageing, Cross-Country Analysis of Retirement, Health, and Wellbeing*, *16*, 100232. https://doi.org/10.1016/j.jeoa.2019.100232

Angrist, J. D., & Pischke, J.-S. (2009). *Mostly Harmless Econometrics : An Empiricist's Companion*. Princeton University Press.

Banks, J., & Mazzonna, F. (2012). The Effect of Education on Old Age Cognitive Abilities : Evidence from a Regression Discontinuity Design. *The Economic Journal*, *122*(560), 418-448. https://doi.org/10.1111/j.1468-0297.2012.02499.x

Bassoli, E. (2025). How gender norms shape the health of women and men? *Social Science & Medicine*, *383*, 118479. https://doi.org/10.1016/j.socscimed.2025.118479

Bergvall, S. (2024). Cultural Norms and Neighborhood Exposure : Impacts on the Gender Gap in Math. *Journal of Human Resources*, *59*(6), 1893-1936. https://doi.org/10.3368/jhr.0920-11188R2

Bertogg, A., Tattarini, G., & Uccheddu, D. (2026). Understanding cognitive ageing : Individuals, institutions, and inequalities. *Social Science & Medicine*, *406*, 119650. https://doi.org/10.1016/j.socscimed.2026.119650

Bertrand, M. (2020). Gender in the Twenty-First Century. *AEA Papers and Proceedings*, *110*, 1-24.

Bisin, A., & Verdier, T. (2011). The Economics of Cultural Transmission and Socialization. In *Handbook of Social Economics* (Vol. 1, p. 339-416). Elsevier. https://doi.org/10.1016/B978-0-444-53187-2.00009-7

Blau, F., Kahn, L., Liu, A., & Papps, K. (2013). The transmission of women's fertility, human capital, and work orientation across immigrant generations. *Journal of Population Economics*, *26*(2), 405-435.

Bonsang, E., Adam, S., & Perelman, S. (2012). Does retirement affect cognitive functioning? *Journal of Health Economics*, *31*(3), 490-501. https://doi.org/10.1016/j.jhealeco.2012.03.005

Bonsang, E., Skirbekk, V., & Staudinger, U. M. (2017). As You Sow, So Shall You Reap : Gender-Role Attitudes and Late-Life Cognition. *Psychological Science*, *28*(9), 1201-1213. https://doi.org/10.1177/0956797617708634

Bradfield, N. I. (2023). Mild Cognitive Impairment : Diagnosis and Subtypes. *Clinical EEG and Neuroscience*, *54*(1), 4-11. https://doi.org/10.1177/15500594211042708

Cai, S. (2022). Does social participation improve cognitive abilities of the elderly? *Journal of Population Economics*, *35*(2), 591-619.

Cameron, A. C., & Miller, D. L. (2015). A Practitioner's Guide to Cluster-Robust Inference. *Journal of Human Resources*, *50*(2), 317-372. https://doi.org/10.3368/jhr.50.2.317

Caroli, E., & Weber-Baghdiguian, L. (2016). Self-reported health and gender : The role of social norms. *Social Science & Medicine*, *153*, 220-229. https://doi.org/10.1016/j.socscimed.2016.02.023

Cha, H., Farina, M. P., & Hayward, M. D. (2025). How Does the Risk of Dementia Change With Each Additional Year of Education? *Demography*, *62*(5), 1497-1521. https://doi.org/10.1215/00703370-12231508

Chen, Y., & O'Donnell, J. (2025). Education shapes episodic memory measurement via test specifications : Evidence from the China Health and Retirement Longitudinal Study. *Social Science & Medicine*, *383*, 118473. https://doi.org/10.1016/j.socscimed.2025.118473

Coe, N. B., von Gaudecker, H.-M., Lindeboom, M., & Maurer, J. (2012). The Effect of Retirement on Cognitive Functioning. *Health Economics*, *21*(8), 913-927. https://doi.org/10.1002/hec.1771

Crespo, L., López-Noval, B., & Mira, P. (2014). Compulsory schooling, education, depression and memory : New evidence from SHARELIFE. *Economics of Education Review*, *43*, 36-46. https://doi.org/10.1016/j.econedurev.2014.09.003

Cristofalo, A., Cascini, S., Cesaroni, G., Trappolini, E., Agabiti, N., & Bargagli, A. M. (2025). Educational disparities in dementia incidence and healthcare utilization : Evidence from a cohort study in Italy. *Social Science & Medicine*, *380*, 118233. https://doi.org/10.1016/j.socscimed.2025.118233

Cuberes, D., & Teignier, M. (2014). Gender Inequality and Economic Growth : A Critical Review. *Journal of International Development*, *26*(2), 260-276. https://doi.org/10.1002/jid.2983

Fernández, R., & Fogli, A. (2009). Culture : An Empirical Investigation of Beliefs, Work, and Fertility. *American Economic Journal: Macroeconomics*, *1*(1), 146-177. https://doi.org/10.1257/mac.1.1.146

Finseraas, H., & Kotsadam, A. (2017). Ancestry Culture and Female Employment—An Analysis Using Second-Generation Siblings. *European Sociological Review*, *33*(3), 382-392. https://doi.org/10.1093/esr/jcx048

Fortin, N. M. (2005). Gender Role Attitudes and the Labour-market Outcomes of Women across OECD Countries. *Oxford Review of Economic Policy*, *21*(3), 416-438. https://doi.org/10.1093/oxrep/gri024

Fratiglioni, L., Paillard-Borg, S., & Winblad, B. (2004). An active and socially integrated lifestyle in late life might protect against dementia. *The Lancet Neurology*, *3*(6), 343-353. https://doi.org/10.1016/S1474-4422(04)00767-7

Glymour, M. M., Kawachi, I., Jencks, C. S., & Berkman, L. F. (2008). Does childhood schooling affect old age memory or mental status? Using state schooling laws as natural experiments. *Journal of Epidemiology & Community Health*, *62*(6), 532-537. https://doi.org/10.1136/jech.2006.059469

González, L., & Rodríguez-Planas, N. (2020). Gender norms and intimate partner violence. *Journal of Economic Behavior & Organization*, *178*, 223-248. https://doi.org/10.1016/j.jebo.2020.07.024

Gorman, E. (2023). Does Schooling Have Lasting Effects on Cognitive Function? Evidence From Compulsory Schooling Laws. *Demography*, *60*(4), 1139-1161. https://doi.org/10.1215/00703370-10875853

Gruber, S., Wagner, M., & Batta, F. (2024). Scales and Multi-Item Indicators. In *Data Documentation* (Version 1.0, p. 53 pages) [Application/pdf]. SHARE Berlin Institute. https://doi.org/10.6103/SCMN.900

Guiso, L., Monte, F., Sapienza, P., & Zingales, L. (2008). Culture, Gender, and Math. *Science*, *320*(5880), 1164-1165. https://doi.org/10.1126/science.1154094

Hauge, K. E., Kotsadam, A., & Riege, A. (2023). Culture and Gender Differences in Willingness to Compete. *The Economic Journal*, *133*(654), 2403-2426. https://doi.org/10.1093/ej/uead033

Heise, L., Greene, M. E., Opper, N., Stavropoulou, M., Harper, C., Nascimento, M., Zewdie, D., Darmstadt, G. L., Greene, M. E., Hawkes, S., Heise, L., Henry, S., Heymann, J., Klugman, J., Levine, R., Raj, A., & Gupta, G. R. (2019). Gender inequality and restrictive gender norms : Framing the challenges to health. *The Lancet*, *393*(10189), 2440-2454. https://doi.org/10.1016/S0140-6736(19)30652-X

Holmlund, H., Rainer, H., & Reich, P. (2023). All geared towards success? Cultural origins of gender gaps in student achievement. *Journal of Economic Behavior & Organization*, *209*, 222-242. https://doi.org/10.1016/j.jebo.2023.03.008

Huang, W., Xiao, Q., Li, Z., Chen, Y., Wang, X., & Liu, Q. (2025). Positive association between hobby participation and objective and subjective cognition among adults aged 50 years and over in 24 countries. *Social Science & Medicine*, *383*, 118487. https://doi.org/10.1016/j.socscimed.2025.118487

Huber, S. J., & Paule-Paludkiewicz, H. (2024). Gender norms and the gender gap in higher education. *Labour Economics*, *87*, 102491. https://doi.org/10.1016/j.labeco.2023.102491

Hussenoeder, F. S., Conrad, I., Roehr, S., Fuchs, A., Pentzek, M., Bickel, H., Moesch, E., Weyerer, S., Werle, J., Wiese, B., Mamone, S., Brettschneider, C., Heser, K., Kleineidam, L., Kaduszkiewicz, H., Eisele, M., Maier, W., Wagner, M., Scherer, M., … Riedel-Heller, S. G. (2020). Mild cognitive impairment and quality of life in the oldest old : A closer look. *Quality of Life Research*, *29*(6), 1675-1683.

Iakovlev, V., & Tealdi, C. (2026). Overqualification and the child penalty : Unpacking gender mismatch gaps in the UK. *Labour Economics*, *102*, 102934. https://doi.org/10.1016/j.labeco.2026.102934

Jessen, J., Kinne, L., & Battisti, M. (2026). Child penalties in labour market skills. *European Economic Review*, *184*, 105245. https://doi.org/10.1016/j.euroecorev.2025.105245

Kawaguchi, D., & Toriyabe, T. (2022). Measurements of skill and skill-use using PIAAC. *Labour Economics*, *78*, 102197. https://doi.org/10.1016/j.labeco.2022.102197

Kleven, H., Landais, C., & Søgaard, J. E. (2019). Children and Gender Inequality : Evidence from Denmark. *American Economic Journal: Applied Economics*, *11*(4), 181-209. https://doi.org/10.1257/app.20180010

Lei, X., Hu, Y., McArdle, J. J., Smith, J. P., & Zhao, Y. (2012). Gender Differences in Cognition among Older Adults in China. *The Journal of human resources*, *47*(4), 951-971. https://doi.org/10.3368/jhr.47.4.951

Lövdén, M., Fratiglioni, L., Glymour, M. M., Lindenberger, U., & Tucker-Drob, E. M. (2020). Education and Cognitive Functioning Across the Life Span. *Psychological Science in the Public Interest*, *21*(1), 6-41. https://doi.org/10.1177/1529100620920576

Mair, C. A., & Ornstein, K. A. (2026). Family structure, "Kinlessness", and cognitive decline : Social connectedness and contextual variation in Europe. *Social Science & Medicine*, *394*, 118861. https://doi.org/10.1016/j.socscimed.2025.118861

Maurer, J. (2011). Education and Male-Female Differences in Later-Life Cognition : International Evidence From Latin America and the Caribbean. *Demography*, *48*(3), 915-930. https://doi.org/10.1007/s13524-011-0048-x

Mazure, C. M., & Swendsen, J. (2016). Sex differences in Alzheimer's disease and other dementias. *The Lancet Neurology*, *15*(5), 451-452. https://doi.org/10.1016/S1474-4422(16)00067-3

McGuire, L. C., Ford, E. S., & Ajani, U. A. (2006). Cognitive Functioning as a Predictor of Functional Disability in Later Life. *The American Journal of Geriatric Psychiatry*, *14*(1), 36-42. https://doi.org/10.1097/01.JGP.0000192502.10692.d6

Monnet, N., Nichols, E., Kieny, C., & Avendano, M. (2026). The impact of education on dementia : Evidence from compulsory schooling reforms in England. *Social Science & Medicine*, *395*, 119071. https://doi.org/10.1016/j.socscimed.2026.119071

O'Donovan, M. R., Cornally, N., & O'Caoimh, R. (2023). Validation of a Harmonised, Three-Item Cognitive Screening Instrument for the Survey of Health, Ageing and Retirement in

Europe (SHARE-Cog). *International Journal of Environmental Research and Public Health*, *20*(19), 6869. https://doi.org/10.3390/ijerph20196869

Pepin, G., & VanderBerg, B. (2021). *Occupational sorting, multidimensional skill mismatch, and the child penalty among working mothers*. https://www.aeaweb.org/conference/2023/program/paper/ntZK47Zy

Petersen, R. C., Caracciolo, B., Brayne, C., Gauthier, S., Jelic, V., & Fratiglioni, L. (2014). Mild cognitive impairment : A concept in evolution. *Journal of Internal Medicine*, *275*(3), 214-228. https://doi.org/10.1111/joim.12190

Prince, M., Bryce, R., Albanese, E., Wimo, A., Ribeiro, W., & Ferri, C. P. (2013). The global prevalence of dementia : A systematic review and metaanalysis. *Alzheimer's & Dementia*, *9*(1), 63-75.e2. https://doi.org/10.1016/j.jalz.2012.11.007

Rodríguez-Planas, N., & Nollenberger, N. (2018). Let the girls learn ! It is not *only* about math … it's about gender social norms. *Economics of Education Review*, *62*, 230-253. https://doi.org/10.1016/j.econedurev.2017.11.006

Rodríguez-Planas, N., & Sanz-de-Galdeano, A. (2019). Intergenerational transmission of gender social norms and teenage smoking. *Social Science & Medicine*, *222*, 122-132. https://doi.org/10.1016/j.socscimed.2018.11.005

Roodman, D., Nielsen, M. Ø., MacKinnon, J. G., & Webb, M. D. (2019). Fast and wild : Bootstrap inference in Stata using boottest. *The Stata Journal*, *19*(1), 4-60. https://doi.org/10.1177/1536867X19830877

Schmitz, A., Brandt, M., Levinsky, M., Wagner, M., & Cohn-Schwartz, E. (2026). Exploring gender disparities in cognitive performance in later life : The role of social participation across European welfare regimes. *Social Science & Medicine*, *394*, 119070. https://doi.org/10.1016/j.socscimed.2026.119070

Schneeweis, N., Skirbekk, V., & Winter-Ebmer, R. (2014). Does Education Improve Cognitive Performance Four Decades After School Completion? *Demography*, *51*(2), 619-643. https://doi.org/10.1007/s13524-014-0281-1

Sebastianutto, G., Boccuzzo, G., Salvi Bentivoglio, S., Montemurro, S., Pucci, V., & Mondini, S. (2026). Protective and risk factors for cognitive decline : The role of sex and occupational status. *Social Science & Medicine*, *389*, 118786. https://doi.org/10.1016/j.socscimed.2025.118786

Seguino, S. (2011). Help or Hindrance? Religion's Impact on Gender Inequality in Attitudes and Outcomes. *World Development*, *39*(8), 1308-1321. https://doi.org/10.1016/j.worlddev.2010.12.004

Shao, Z., Janse, E., Visser, K., & Meyer, A. S. (2014). What do verbal fluency tasks measure? Predictors of verbal fluency performance in older adults. *Frontiers in Psychology*, *5*. https://doi.org/10.3389/fpsyg.2014.00772

Stern, Y. (2002). What is cognitive reserve? Theory and research application of the reserve concept. *Journal of the International Neuropsychological Society*, *8*(3), 448-460. https://doi.org/10.1017/S1355617702813248

Stern, Y. (2012). Cognitive reserve in ageing and Alzheimer's disease. *The Lancet Neurology*, *11*(11), 1006-1012. https://doi.org/10.1016/S1474-4422(12)70191-6

Vecchio, N., Fitzgerald, J. A., Radford, K., & Fisher, R. (2016). The association between cognitive impairment and community service use patterns in older people living in Australia. *Health & Social Care in the Community*, *24*(3), 321-333. https://doi.org/10.1111/hsc.12212

Weber, D., Skirbekk, V., Freund, I., & Herlitz, A. (2014). The changing face of cognitive gender differences in Europe. *Proceedings of the National Academy of Sciences of the United States of America*, *111*(32), 11673-11678. https://doi.org/10.1073/pnas.1319538111

Wimo, A., Jönsson, L., Bond, J., Prince, M., Winblad, B., & International, A. D. (2013). The worldwide economic impact of dementia 2010. *Alzheimer's & Dementia*, *9*(1), 1-11.e3. https://doi.org/10.1016/j.jalz.2012.11.006

Winblad, B., Amouyel, P., Andrieu, S., Ballard, C., Brayne, C., Brodaty, H., Cedazo-Minguez, A., Dubois, B., Edvardsson, D., Feldman, H., Fratiglioni, L., Frisoni, G. B., Gauthier, S., Georges, J., Graff, C., Iqbal, K., Jessen, F., Johansson, G., Jönsson, L., … Zetterberg, H. (2016). Defeating Alzheimer's disease and other dementias : A priority for European science and society. *The Lancet Neurology*, *15*(5), 455-532. https://doi.org/10.1016/S1474-4422(16)00062-4

Wolter, S., & Zöllner, T. S. (2025). Are parents an obstacle to gender-atypical occupational choices? *Journal of Population Economics*, *38*(4), 1-19.

Wu, Y.-T., Teale, J., Matthews, F. E., Brayne, C., Woods, B., & Clare, L. (2016). Lifestyle factors, cognitive reserve, and cognitive function : Results from the Cognitive Function and Ageing Study Wales, a population-based cohort. *The Lancet*, *388*, S114. https://doi.org/10.1016/S0140-6736(16)32350-9

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Table 1. Description of the analytical sample

	Whole sample	Mother is born abroad	Father is born abroad	Both parents are born abroad
Cognitive test scores				
Immediate word recall	5.633	5.679	5.657	5.527
	(1.688)	(1.686)	(1.668)	(1.714)
Delayed word recall	4.321	4.379	4.380	4.144
	(2.141)	(2.141)	(2.143)	(2.128)
Verbal fluency	22.232	22.490	22.456	21.499
	(7.442)	(7.346)	(7.254)	(7.804)
Subtraction	3.989	4.076	3.967	3.886
	(1.636)	(1.574)	(1.654)	(1.699)
Numeracy	3.575	3.615	3.584	3.499
	(1.009)	(0.998)	(1.022)	(1.005)
Individual characteristics				
Age	66.355	66.687	66.788	65.205
	(9.509)	(9.496)	(9.378)	(9.624)
Woman	0.57	0.56	0.58	0.57
Potential pathways				
Early-life				
Primary education level	0.10	0.10	0.10	0.12
Secondary education level	0.63	0.60	0.62	0.66
Tertiary education level	0.27	0.30	0.28	0.21
Midlife				
Occupation with high skill level	0.34	0.36	0.36	0.30
At least one child	0.89	0.88	0.87	0.92
Later-life				
Engaging at least monthly in:				
Voluntary or charity work	0.14	0.16	0.16	0.10
Training courses	0.07	0.08	0.06	0.05
Sports or social club	0.26	0.28	0.27	0.21
Community-related organisation	0.05	0.05	0.05	0.03
Reading	0.81	0.85	0.81	0.73
Playing word or number games	0.49	0.52	0.49	0.45
Playing card games or chess	0.28	0.29	0.27	0.23
Social Integration Index	2.918	2.957	2.956	2.807
	(1.044)	(1.028)	(1.040)	(1.067)
Number of ancestry countries	48	47	31	48
Number of observations	14,567	5,741	5,203	3,623

Note: This table shows means with standard deviations in parentheses, or shares for binary variables. The number of observations reported in each column corresponds to the analytical sample used in the main estimations. For some variables used in the potential pathways analysis, missing values result in smaller sample sizes. Sample: Analytical sample described in Section 2.1. Source: Survey of Health, Ageing and Retirement in Europe (Waves 4-9).

Table 2. Main estimation results

	Cognitive Score Index			
	(1)	(2)	(3)	(4)
Woman	-0.029	-0.019	0.063	-0.012
	(0.095)	(0.094)	(0.275)	(0.272)
Measure of Gender Norms	0.012		0.077	
	(0.025)		(0.049)	
Measure of Gender Norms* Woman	-0.063*	-0.054	-0.213***	-0.219***
	(0.032)	(0.032)	(0.053)	(0.046)
	[0.092]	[0.151]	[0.002]	[0.002]
Only one parent is born abroad			0.623	0.347
			(0.827)	(0.865)
Only one parent is born abroad * Woman			-0.094	-0.014
			(0.258)	(0.260)
Only one parent is born abroad * Measure of Gender Norms			-0.062	
			(0.056)	
Only one parent is born abroad *Measure of Gender Norms * Woman			0.181***	0.184***
			(0.060)	(0.057)
			[0.009]	[0.016]
Country of ancestry FE	no	yes	no	yes
Country of residence FE	yes	yes	yes	yes
Country of residence by sex FE	yes	yes	yes	yes
Interview wave FE	yes	yes	yes	yes
Individual controls	yes	yes	yes	yes
R^2	0.171	0.179	0.186	0.201
Number of ancestry countries	48	48	48	48
Number of observations	14,567	14,567	14,567	14,567

Note: OLS estimates with standard errors corrected for clustering at the country of ancestry level in parentheses and corresponding wild bootstrap test p-values in brackets. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Sample: All second-generation immigrants. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + Integrated Values Surveys (1981-2020).

Table 3. Implications for dementia

	Cognitive Score Index at least 1.5 SD below average	Cognitive Score Index at least 1.5 SD below average + At least one IADL limitation
Woman	-0.029	0.007
	(0.057)	(0.028)
Measure of Gender Norms * Woman	0.055***	0.028***
	(0.013)	(0.007)
	[0.009]	[0.010]
Country of ancestry FE	yes	no
Country of residence FE	yes	yes
Country of residence by sex FE	yes	yes
Interview wave FE	yes	yes
Individual controls	yes	yes
R^2	0.161	0.087
Outcome mean	0.095	0.035
Number of ancestry countries	31	31
Number of observations	3,623	3,621

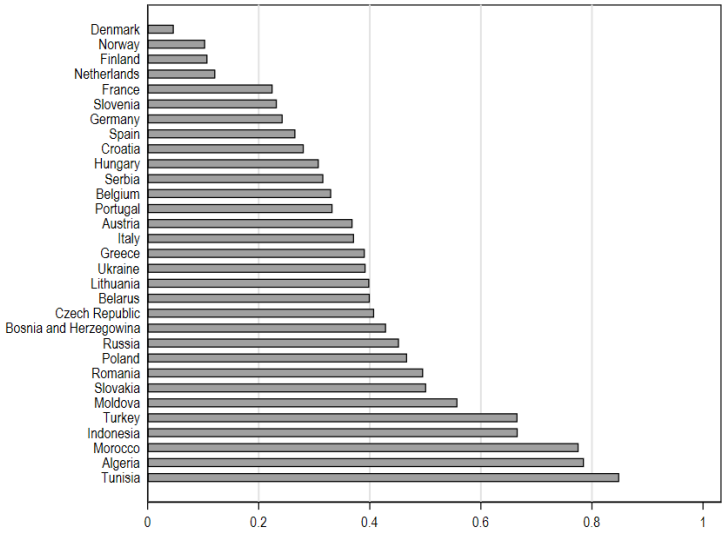
Note: OLS estimates with standard errors corrected for clustering at the country of ancestry level in parentheses and corresponding wild bootstrap test p-values in brackets. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Sample: Second-generation immigrants with both parents born abroad and in the same country. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + Integrated Values Surveys (1981-2022).

Table 4. Exploration of potential pathways: Mediating variables

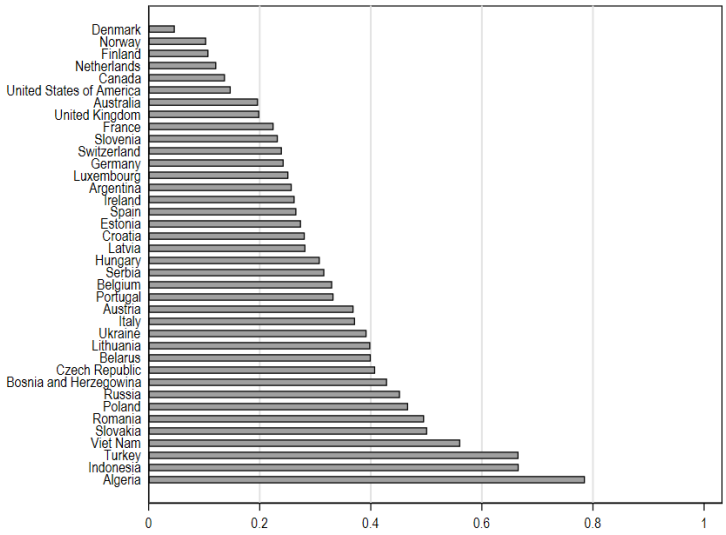
	Early life			Midlife	Later-life	
	Primary education level	Secondary education level	Tertiary education level	High-skill level occupation	Social participation	Social Integration Index
Woman	0.050	0.187	-0.237**	0.068	0.067	-0.049
	(0.088)	(0.114)	(0.087)	(0.233)	(0.069)	(0.326)
Measure of Gender Norms * Woman	0.055	-0.026	-0.029	-0.082***	0.020	-0.003
	(0.034)	(0.035)	(0.028)	(0.025)	(0.027)	(0.089)
	[0.161]	[0.501]	[0.320]	[0.033]	[0.569]	[0.982]
Country of ancestry FE	yes	yes	yes	yes	yes	yes
Country of residence FE	yes	yes	yes	yes	yes	yes
Country of residence by sex FE	yes	yes	yes	yes	yes	yes
Interview wave FE	yes	yes	yes	yes	yes	yes
Individual controls	yes	yes	yes	yes	yes	yes
R^2	0.264	0.120	0.102	0.104	0.139	0.128
Outcome mean	0.094	0.682	0.224	0.415	0.823	2.816
Number of ancestry countries	26	26	26	26	26	26
Number of observations	3,056	3,056	3,056	3,056	3,056	1,771

Note: OLS estimates with standard errors corrected for clustering at the country of ancestry level in parentheses and corresponding wild bootstrap test p-values in brackets. Missing values in the analytical sample for these variables result in smaller sample sizes. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Sample: Second-generation immigrants with both parents born abroad and in the same country. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + Integrated Values Surveys (1981-2020).

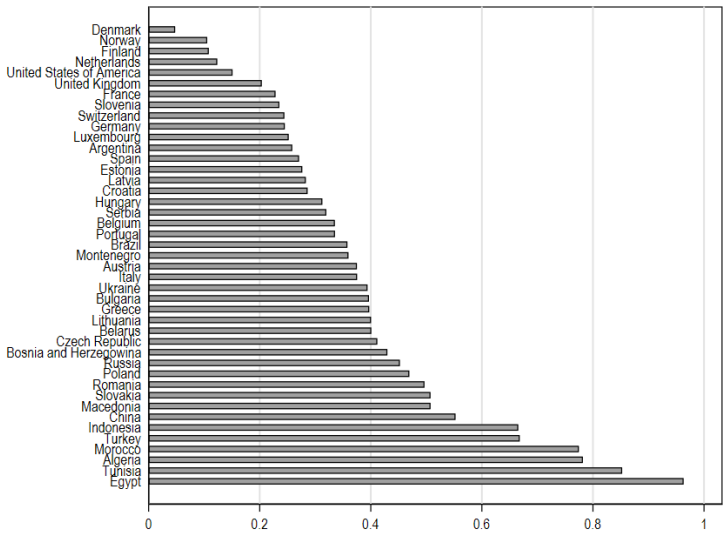
Figure 1. Measure of Gender Norms by country of ancestry



(a) Both parents are born abroad



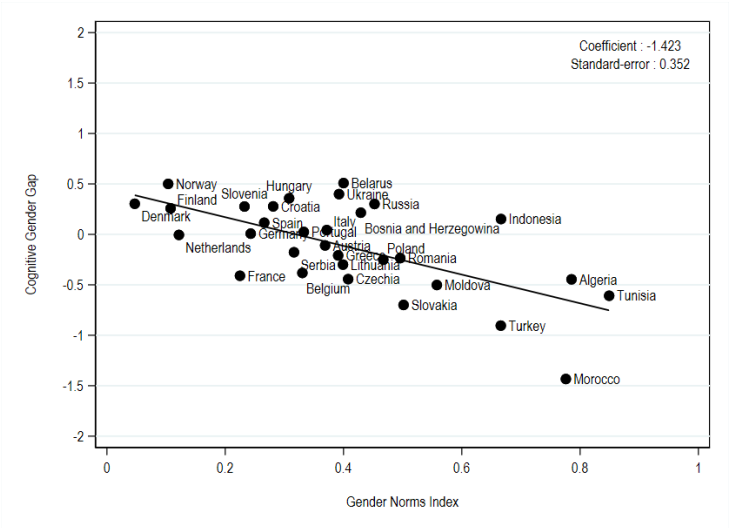
(b) Only the mother is born abroad



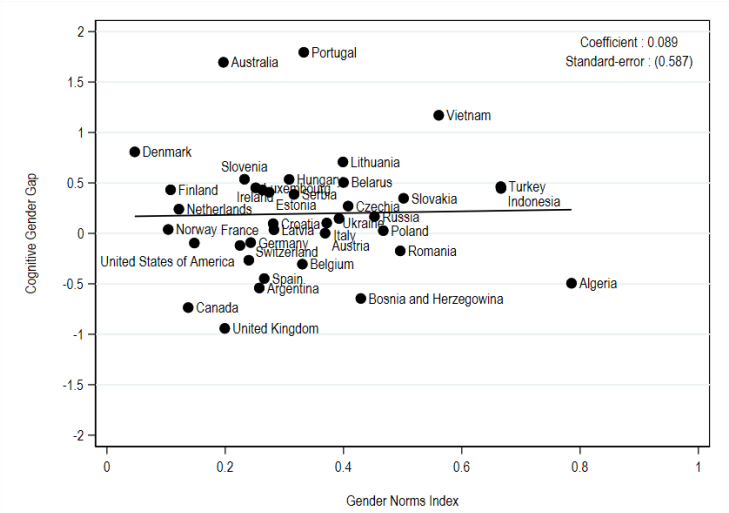
(c) Only the father is born abroad

Note: The Measure of Gender Norms is the proportion of individuals agreeing with the following statement: "When jobs are scarce, men should have more right to a job than women" in the countries of ancestry declared by the population of interest in SHARE. Samples: Second-generation immigrants with (a) both parents born abroad and in the same country, (b) foreign-born mothers only and (c) foreign-born fathers only. Source: Integrated Values Surveys (1981-2022).

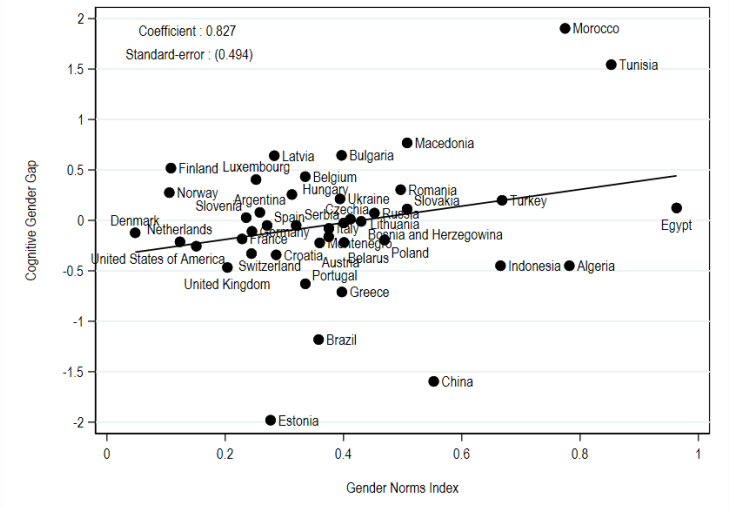
Figure 2. Association between the Measure of Gender Norms and the Cognitive Gender Gap



(a) Both parents are born abroad



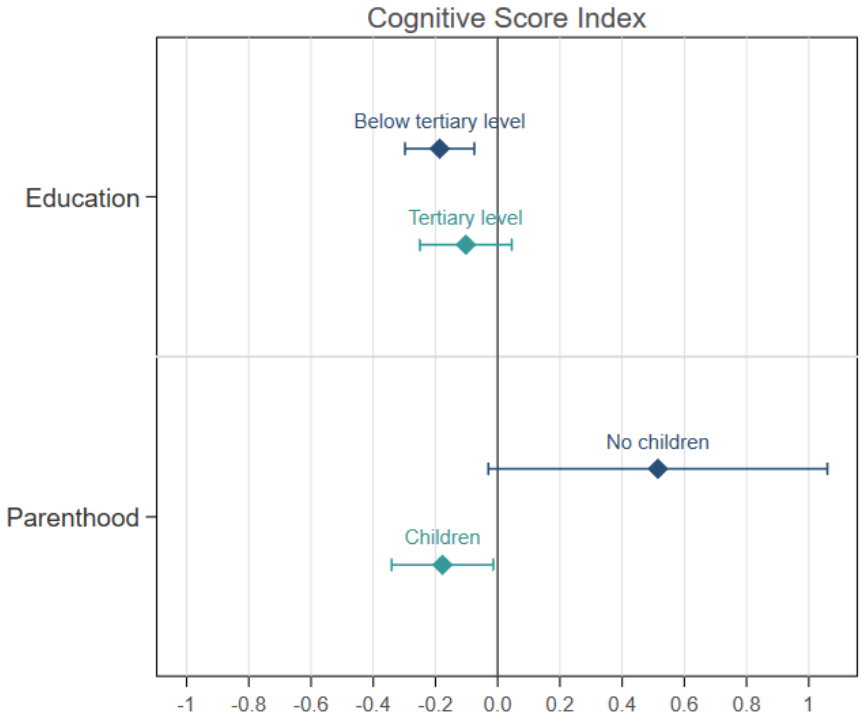
(b) Only the mother is born abroad



(c) Only the father is born abroad

Note: Scatterplot of the association between the Measure of Gender Norms and the Cognitive Gender Gap among second-generation immigrants with the best fitting regression line (OLS). Samples: Second-generation immigrants with (a) both parents born abroad and in the same country, (b) foreign-born mothers only and (c) foreign-born fathers only. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + Integrated Values Surveys (1981-2022)

Figure 3. Exploration of potential pathways: Moderating variables



Note: Estimated change in women's Cognitive Score Index (CSI) relative to men's associated with a one-standard-deviation increase in the Measure of Gender Norms (MGN), by educational attainment (top panel) and parenthood status (bottom panel). The reference groups (in dark blue) are individuals with below-tertiary education and childless individuals, respectively, while the non-reference groups (in light blue) are individuals with tertiary education and individuals with children. Estimates for the reference groups correspond to the coefficient of interest, i.e. the interacted term between MGN and gender. Estimates for the non-reference groups are obtained from the linear combination of this coefficient and its interaction with the moderating factor. Confidence intervals are shown at the level of 95%. Samples: Second-generation immigrants with both parents born abroad and in the same country. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + Integrated Values Surveys (1981-2022)

Appendix

A. Identification assumptions

The epidemiological approach can be interpreted as the estimation of a reduced-form equation within an instrumental variable framework. In this context, the endogenous explanatory variable is the norm (or cultural value) held by second-generation immigrant *i*, born in country *c*, with parents originating from country *a* (denoted as mgn_{ica}). The instrument is the average norm in the country of ancestry (mgn_a). A potential concern with the epidemiological approach arises if there is selective migration driven by cultural alignment. To formalize this, assume that the norm held by second-generation immigrant *i* (mgn_{ica}) is influenced by three components: the ancestral norms (mgn_a), the norms of the country of residence (mgn_c), and an idiosyncratic error term (η_{ica}) that is assumed to be uncorrelated with mgn_a and mgn_{ica}. In this context, we can write the first-stage equation as follows:[11]

$$mgn_{ica} = \gamma_1 \, mgn_a + \gamma_2 \, mgn_c + \eta_{ica}, \quad (1)$$

Where γ_1 and γ_2 represent the importance of the norms inherited from the country of ancestry and the norms in the country of residence.

The aim of the (simplified) model is to estimate the effect of norms on outcome y_{ica}, which gives:

$$y_{ica} = \beta \, mgn_{ica} + \varepsilon_{ica}, \quad (2)$$

where ε_{ica} capture unobserved individual-level variation and is assumed to be uncorrelated with mgn_a, for simplicity.

Replacing mgn_{ica} by the expression in (1) gives:

$$y_{ica} = \beta\gamma_1 \, mgn_a + \beta\gamma_2 \, mgn_c + \beta\eta_{ica} + \varepsilon_{ica}. \quad (3)$$

Given that we do not observe mgn_{ica}, but mgn_a, the effect of norms is estimated based on the following model by OLS, as generally done in the epidemiological approach:

$$y_{ica} = \theta \, mgn_a + \tau_{ica}, \quad (4)$$

Equation 4 is the reduced-form equation, usually estimated with the epidemiological approach. It gives:

[11] We omit to include the intercept in the equations for simplicity.

$$\hat{\theta} = \frac{cov(\, mgn_a, y_{ica})}{Var(mgn_a)} \quad (5)$$

$$= \frac{cov(\, mgn_a, \beta\gamma_1\, mgn_a + \beta\gamma_2\, mgn_c + \beta\eta_{ica} + \varepsilon_{ica})}{Var(mgn_a)}$$

$$= \beta\gamma_1 + \beta\gamma_2 \frac{cov(mgn_a, mgn_c)}{Var(mgn_a)}, define\ \rho = \frac{cov(mgn_a, mgn_c)}{Var(\, mgn_a)}$$

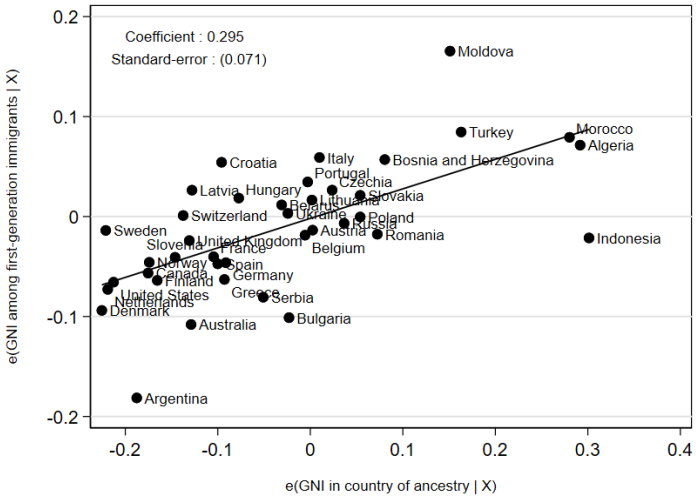
$$= \beta(\gamma_1 + \gamma_2\rho) \quad (6)$$

This expression demonstrates that the estimated coefficient identifies the intention-to-treat (ITT) effect. The parameter ρ represents the importance of selective migration due to cultural alignment, i.e., immigrants tend to move in countries with similar norms. First, the sign of the estimated effect would only be incorrect if $(\gamma_1 + \gamma_2\rho) < 0$, which appears unlikely, as γ_1, γ_2, and ρ can reasonably be assumed to be positive. Second, the expression indicates that the epidemiological approach would overestimate the true effect of norms on the outcome variable only if $(\gamma_1 + \gamma_2\rho) > 1$. This condition would imply that the first-stage estimate exceeds one, given that the expression corresponds to the first-stage regression coefficient:

$$\frac{cov(\, mgn_a, mgn_{ica})}{Var(\, mgn_a)} = \frac{cov(\, mgn_a, \gamma_1\, mgn_a + \gamma_2\, mgn_c + \eta_{ica})}{Var(mgn_a)} = \gamma_1 + \gamma_2\rho \quad (7)$$

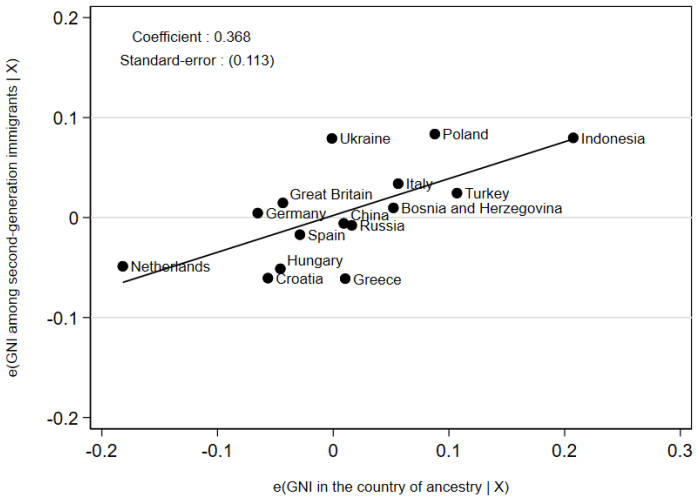
Since the association between gender norms in the country of origin and those held by second-generation immigrants, as shown in Figure A2, is approximately 0.368, it is implausible that the true first-stage parameter exceeds one. It is important to note that the association presented in Figure A2 does not correspond to the first-stage estimate underlying the reduced-form results reported in this paper. This is because it is derived from a different sample of countries and does not account for the same set of control variables, among other differences. Nevertheless, it provides a useful indication of the strength of the correlation between the norms held by second-generation immigrants and the average norms in their countries of origin. Moreover, it is important to note that we are not advocating for the use of a two-stage least squares (2SLS) estimator in the epidemiological approach, as it would require stronger assumptions than those underpinning the ITT estimate adopted here. The purpose of this section is merely to highlight the potential sources of bias in the epidemiological approach. It is also important to note that this potential issue is partially mitigated by the inclusion of gender-specific country-of-residence fixed effects in the model, which account for cross-country variation in gender differences in cognitive functioning that may arise from institutional or cultural factors.

Figure A1. Association between first-generation immigrants' gender norms and gender norms prevailing in the country of ancestry

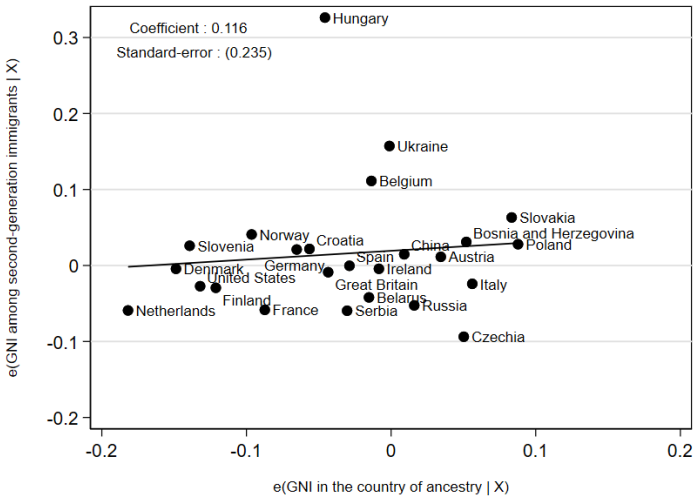


Note: Scatterplot of the association between the Measure of Gender Norms among first-generation immigrants and the average Measure of Gender Norms in the country of ancestry, conditional on country of residence and country of ancestry (X vector), with the best fitting regression line (OLS). Sample: First-generation immigrants. Sources: Integrated Values Surveys (1981-2022)

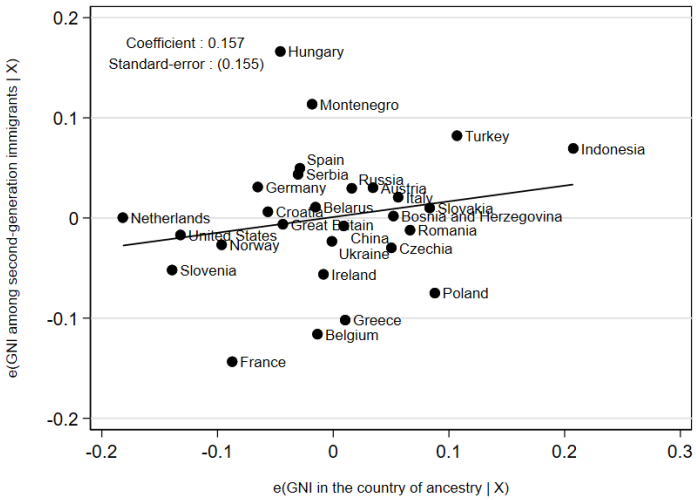
Figure A2. Association between second-generation immigrants' gender norms and gender norms prevailing in the country of ancestry



(a) Both parents are born abroad



(b) Only the mother is born abroad



Note: Scatterplot of the association between the Measure of Gender Norms among second-generation immigrants and the average Measure of Gender Norms in the country of ancestry, conditional on country of residence and country of ancestry (X vector) with the best fitting regression line (OLS). Samples: Second-generation immigrants with (a) both parents born abroad and in the same country, (b) foreign-born mothers only and (c) foreign-born fathers only. Sources: Integrated Values Surveys (1981-2022)

B. Data

B.1. Description of the numeracy test score

This section describes the flow of the numeracy test presented in Section XX of the manuscript. The test starts as follows:

1) *If the chance of getting a disease is 10%, how many people out of 1,000 would be expected to get the disease?"*

If the individual gives a wrong answer, they get the following question:

2) *"In a sale, a shop is selling all items at half price. Before the sale, a sofa costs 300 (local currency). How much will it cost in the sale?"*

After this question, the numeracy test is stopped, independently of whether the answer is correct or not. If the first question is correctly answered, the following question is asked:

3) *"A second-hand car dealer is selling a car for 6,000 (local currency). This is two-thirds of what it costs new. How much did the car cost new?"*

Only if both the first and second numeracy questions are correctly answered, there is a last question:

4) *"Let's say you have 2,000 (local currency) in a savings account. The account earns 10% interest each year. How much would you have in the account at the end of two years?"*

B.2. Summary Statistics

Table B1. Number of observations by country of ancestry

Parental country of birth	Both parents	Only mother	Only father
Algeria	44	47	45
Argentina	0	35	17
Australia	0	12	0
Austria	84	302	190
Belgium	49	198	119
Bosnia and Herzegovina	148	58	116
Brazil	0	0	21
Bulgaria	0	0	41
Belarus	60	41	48
China	0	0	19
Canada	0	32	0
Croatia	100	154	164
Czech Republic	29	145	179
Denmark	17	58	104
Egypt	0	0	15
Estonia	0	21	10
Finland	29	204	66
France	40	529	346
Germany	208	1,020	606
Greece	11	0	15
Hungary	73	77	161
Indonesia	44	39	20
Ireland	0	11	0
Italy	605	295	508
Latvia	0	68	53
Lithuania	32	41	41
Luxembourg	0	50	28
Macedonia	0	0	194
Moldova	12	0	0
Montenegro	0	0	18
Morocco	12	0	15
Netherlands	50	168	145
Norway	12	111	56
Poland	233	347	394
Portugal	22	17	27
Romania	80	58	66
Russia	1,132	762	700
Serbia	25	51	54
Slovakia	58	89	72
Slovenia	124	168	126
Spain	118	40	96
Switzerland	0	96	68
Tunisia	24	0	13
Turkey	63	28	59
Ukraine	85	153	194
United Kingdom	0	74	52
United States of America	0	116	98
Vietnam	0	26	0
Total	3,623	5,741	5,203

Note: Number of individuals by group of second-generation immigrants. Countries with less than 10 individuals are excluded. Source: Survey of Health, Ageing and Retirement in Europe (Waves 4-9).

C. Additional results

We report results by group of second-generation immigrants for each cognitive test score and the Cognitive Score Index. Results are commented in Section 5.1 of the manuscript. For each group of second-generation immigrants *g* (i.e., both parents are born abroad, only the mother is born abroad or only the father is born abroad), we run the following regression using the OLS estimator:

$$C_{isrta}^{g} = \alpha_0^g + \alpha_1^g Female_i^g + \alpha_2^g Female_i^g * MGN_a^g + \gamma_a^g + \gamma_r^g + \gamma_{rs}^g + \delta_t^g + \rho^g X_{it}' + \varepsilon_{isrta}^g \quad (2)$$

For each *g*, the specification is similar to the one described in Equation 1. Results are available in Tables C1, C2 and C3.

Table C1. Estimation results: Both parents are born abroad

	Both parents are born abroad					
	Immediate word recall	Delayed word recall	Verbal fluency	Serial subtraction	Numeracy	Cognitive Score Index
Woman	0.107	0.100	0.097	-0.305**	-0.038	-0.012
	(0.160)	(0.294)	(0.315)	(0.131)	(0.367)	(0.275)
Measure of Gender Norms * Woman	-0.144***	-0.176***	-0.146**	-0.100	-0.187***	-0.219***
	(0.041)	(0.047)	(0.069)	(0.064)	(0.064)	(0.046)
	[0.027]	[0.014]	[0.115]	[0.221]	[0.029]	[0.008]
Country of ancestry FE	yes	yes	yes	yes	yes	yes
Country of residence FE	yes	yes	yes	yes	yes	yes
Country of residence by sex FE	yes	yes	yes	yes	yes	yes
Interview wave FE	yes	yes	yes	yes	yes	yes
Individual controls	yes	yes	yes	yes	yes	yes
R^2	0.191	0.179	0.181	0.081	0.152	0.224
Number of ancestry countries	31	31	31	31	31	31
Number of observations	3,623	3,623	3,623	3,623	3,623	3,623

Note: OLS estimates with standard errors corrected for clustering at the country of ancestry level in parentheses and corresponding wild bootstrap test p-values in brackets. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Sample: Second-generation immigrants with both parents born abroad and in the same country. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + Integrated Values Surveys (1981-2022).

Table C2. Estimation results: Only mother is born abroad

	Only mother is born abroad					
	Immediate word recall	Delayed word recall	Verbal fluency	Serial subtraction	Numeracy	Cognitive Score Index
Woman	0.088	0.198*	-0.022	-0.149	-0.230***	-0.033
	(0.145)	(0.106)	(0.133)	(0.164)	(0.081)	(0.129)
Measure of Gender Norms * Woman	-0.040	-0.002	-0.034	0.001	-0.064	-0.040
	(0.043)	(0.031)	(0.045)	(0.040)	(0.049)	(0.044)
	[0.400]	[0.946]	[0.483]	[0.994]	[0.316]	[0.391]
Country of ancestry FE	yes	yes	yes	yes	yes	yes
Country of residence FE	yes	yes	yes	yes	yes	yes
Country of residence by sex FE	yes	yes	yes	yes	yes	yes
Interview wave FE	yes	yes	yes	yes	yes	yes
Individual controls	yes	yes	yes	yes	yes	yes
R^2	0.189	0.185	0.191	0.051	0.102	0.205
Number of ancestry countries	38	38	38	38	38	38
Number of observations	5,741	5,741	5,741	5,741	5,741	5,741

Note: OLS estimates with standard errors corrected for clustering at the country of ancestry level in parentheses and corresponding wild bootstrap test p-values in brackets. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Sample: Second-generation immigrants with foreign-born mothers only. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + Integrated Values Surveys (1981-2022).

Table C3. Estimation results: Only father is born abroad

	Only father is born abroad					
	Immediate word recall	Delayed word recall	Verbal fluency	Serial subtraction	Numeracy	Cognitive Score Index
Woman	0.158	0.118	0.077	-0.257***	-0.191	-0.028
	(0.107)	(0.134)	(0.081)	(0.077)	(0.125)	(0.098)
Measure of Gender Norms * Woman	-0.028	-0.002	0.048	0.008	-0.060	-0.010
	(0.038)	(0.053)	(0.038)	(0.046)	(0.053)	(0.052)
	[0.453]	[0.965]	[0.227]	[0.874]	[0.317]	[0.841]
Country of ancestry FE	yes	yes	yes	yes	yes	yes
Country of residence FE	yes	yes	yes	yes	yes	yes
Country of residence by sex FE	yes	yes	yes	yes	yes	yes
Interview wave FE	yes	yes	yes	yes	yes	yes
Individual controls	yes	yes	yes	yes	yes	yes
R^2	0.157	0.170	0.187	0.070	0.146	0.196
Number of ancestry countries	43	43	43	43	43	43
Number of observations	5,203	5,203	5,203	5,203	5,203	5,203

Note: OLS estimates with standard errors corrected for clustering at the country of ancestry level in parentheses and corresponding wild bootstrap test p-values in brackets. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Sample: Second-generation immigrants with foreign-born fathers only. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + Integrated Values Surveys (1981-2022).

Table C4. Exploration of potential pathways: Social participation

	Doing voluntary or charity work	Attending training courses	Going to a sports or social club	Engaging in a community	Reading books, magazines and newspapers	Playing word and number games	Playing card games and chess
Woman	-0.068	-0.040	-0.057	-0.050	0.080	-0.048	0.069
	(0.081)	(0.079)	(0.145)	(0.061)	(0.082)	(0.214)	(0.192)
Measure of Gender Norms * Woman	-0.014	-0.035***	-0.016	-0.006	0.001	0.033	0.055**
	(0.023)	(0.011)	(0.028)	(0.019)	(0.031)	(0.038)	(0.027)
	[0.555]	[0.036]	[0.616]	[0.778]	[0.969]	[0.459]	[0.101]
Country of ancestry FE	yes	yes	yes	yes	yes	yes	yes
Country of residence FE	yes	yes	yes	yes	yes	yes	yes
Country of residence by sex FE	yes	yes	yes	yes	yes	yes	yes
Interview wave FE	yes	yes	yes	yes	yes	yes	yes
Individual controls	yes	yes	yes	yes	yes	yes	yes
R^2	0.097	0.055	0.080	0.042	0.128	0.096	0.085
Outcome mean	0.095	0.053	0.207	0.032	0.737	0.452	0.225
Number of ancestry countries	26	26	26	26	26	26	26
Number of observations	3,056	3,056	3,056	3,056	3,056	3,056	3,056

Note: OLS estimates with standard errors corrected for clustering at the country of ancestry level in parentheses and corresponding wild bootstrap test p-values in brackets. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Sample: Second-generation immigrants with both parents born abroad and in the same country. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + Integrated Values Surveys (1981-2022).

D. Robustness checks

This section assesses the robustness of the baseline findings presented in Section 5.1 of the manuscript. Specifically, we examine the sensitivity of our results to alternative proxies for gender norms (Section D.1), additional controls for individual, parental and country-of-ancestry characteristics (Section D.2), modifications to the estimation sample (Section D.3), an alternative measure of cognitive functioning (Section D.4), alternative model specifications (Section D.5) and placebo tests (Section D.6).

D.1. Alternative proxies for gender norms

First, we check whether our results hold when using alternative measures of gender norms. Following previous literature, we use the *World Economic Forum*'s Gender Gap Index (GGI).[12] We also check whether our results remain stable when using the share of women in the labour force using the *World Development Indicators*.[13] In both cases, data is made available by the World Bank.

D.1.1. Share of women in the labour force

Several studies in the literature use female labour force participation, defined as the proportion of working-age women who participate in the labour force, as a proxy for prevailing gender norms in the country of ancestry (Finseraas & Kotsadam, 2017; Hauge et al., 2023). However, low female labour force participation may not necessarily reflect traditional gender norms if male labour force participation is also low. We therefore prefer to use the share of women in the total labour force, which captures women's representation in the labour market relative to men's. We focus on the period 2016–2021 to maximise country coverage in our sample. For each country of ancestry, we calculate the average female share of the labour force over this period and standardise the resulting measure to have a mean of zero and a standard deviation of one, as for our baseline Measure of Gender Norms (MGN).

Column 1 of Table D2 reports the results obtained using this alternative proxy for gender norms. The findings are consistent with our baseline results: a one-standard-deviation increase in the female share of the labour force in the country of ancestry is associated with a 0.113-standard-

[12] https://www.weforum.org/reports/global-gender-gap-report-2023/
[13] https://databank.worldbank.org/source/world-development-indicators

deviation increase in women's Cognitive Score Index (CSI) relative to men's. We also assess the sensitivity of our findings to the choice of reference year by estimating the specification using the female share of the labour force measured in each year separately, rather than its average over 2016–2021. As shown in Figure D1, results remain stable across years, suggesting that our findings are not sensitive to the choice of measurement year.

D.1.2. Gender Gap Index

The GGI is commonly used in the gender norms literature (González & Rodríguez-Planas, 2020; Guiso et al., 2008; Hauge et al., 2023; Rodríguez-Planas & Nollenberger, 2018). It measures gender gaps in 4 categories: political empowerment, economic participation and opportunity, educational attainment, and health and survival. Each of them is composed of different sub-indices:

i. **Political empowerment** ($GGI_{politics}$): Female-to-male ratios in parliamentary seats, ministerial positions and years served as head of state.
ii. **Economic participation and opportunity** ($GGI_{economics}$): Gender gaps in labour force participation, estimated earned income, wage equality for similar work, and representation in managerial, senior official, legislative and professional positions.
iii. **Educational attainment** ($GGI_{education}$): Female-to-male ratios in literacy rates and enrolment in primary, secondary and tertiary education.
iv. **Health and survival** (GGI_{health}): Gender differences in healthy life expectancy and the sex ratio at birth.

Each sub-index ranges from 0 to 1, with higher values indicating greater gender equality. Unlike our baseline Measure of Gender Norms (MGN), higher GGI values therefore reflect less traditional gender inequalities and the coefficient of interest is expected to be positive. As with the female share of the labour force, we use data from 2016 to 2021 to maximise country coverage. For each country of ancestry, we calculate the average value of each sub-index over this period and use it as an alternative proxy for gender norms. We also assess the sensitivity of our results to the choice of measurement year by estimating the specifications separately for each year.

Table D2 reports the results obtained using the four GGI sub-indices. Interestingly, the relationship between inherited gender norms and gender differences in later-life cognitive health is statistically significant only for the economic participation and opportunity sub-index. A one-standard-deviation increase in this measure is associated with a 0.116-standard-deviation increase in women's Cognitive Score Index (CSI) relative to men's. This result is robust to the choice of measurement year, as shown in Figure D2. For the other three sub-indices, the estimated coefficients are positive but not statistically significant.

These findings are consistent with our results using the female share of the labour force and the MGN, suggesting that gender inequalities in the labour market may play an important role in the relationship between inherited gender norms and gender disparities in later-life cognitive health. However, the absence of statistically significant results for the educational attainment and health and survival sub-indices should be interpreted cautiously, as these measures exhibit limited cross-country variation, with average values close to their upper bound and relatively small standard deviations (see Table D1).

D.1.3. Alternative coding of the Measure of Gender Norms

We assess the robustness of our findings to alternative treatments of undecided responses when constructing the Measure of Gender Norms (MGN). Specifically, we consider two alternative coding approaches in which these responses are treated as either disagreement or agreement with the statement. As shown in Table D3, results remain stable across both specifications, confirming that our main findings are not sensitive to the treatment of undecided responses.

D.2. Additional controls

We also check if our results are sensitive to controlling for other potential factors that could confound the relationship between gender norms in the country of ancestry and the cognitive health gender gap among second-generation immigrants.

D.2.1. Individual- and parental-level controls

If less (or more) educated parents invest more in their sons' human capital than in their daughters' and that their education level is correlated with the level of gender norms conservatism in their country of birth, omitting parental education levels as well as their

interactions with gender might lead to biased estimates. It is nonetheless important to note that parental education may itself be influenced by gender norms prevailing in the country of ancestry, in which case controlling for it could introduce *bad-control bias* by conditioning on a variable potentially affected by inherited gender norms (Angrist & Pischke, 2009). With this caveat in mind, we assess the sensitivity of our results by including indicators for each parent's educational attainment, based on the ISCED-97 classification[14], and their interactions with the gender indicator. Moreover, if gender norms affect gender differences in cognitive scores later in life through different cognitive ageing processes between men and women, our estimate of interest might capture both level and ageing effects if gender norms interfere with cognitive ageing of men and women. We control for interactions between gender and age (and age squared) to allow for gender-specific slopes in cognitive test score.

Table D4 presents the results controlling for the mother's, the father's and both parents' education levels and their interactions with gender in Column 1, 2, and 3. Both mother's and father's levels of education are positively correlated with the individual's Cognitive Score Index (CSI), but not differently between men and women. The coefficient of interest has a slightly lower amplitude compared with the baseline specification but remains significantly different from zero across all three specifications. Column 4 provides the results controlling for gender-specific cognitive ageing and shows that the estimate remains close to the baseline, indicating that our main findings are robust to accounting for gender differences in the relationship between age and cognitive functioning.

D.2.2. Country of ancestry-level controls

We also check that our results are not explained by country-of-ancestry characteristics that would affect men and women differently in their country of residence. If such characteristics are correlated with inherited gender norms, omitting them could bias our coefficient of interest and cast doubt on the role of intergenerational gender norm transmission in explaining gender disparities in later-life cognitive health. To address this concern, we extend our baseline specification by including interactions between the female indicator and three country-of-ancestry characteristics: economic development, measured by gross domestic product (GDP)

[14] For more details, see https://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-1997-en_0.pdf

per capita at purchasing power parity; economic inequality, measured by the Gini index; and labour market conditions, measured by the total unemployment rate.

These indicators are sourced from the *World Development Indicators* database. We use these indicators from 2009 to 2019 to maximise country coverage. As done previously in Section D.1.2, we take the average value over the whole period for each indicator (Table D6) and conduct sensitivity analyses using single-year measures (Figure D3).

This analysis reveals that controlling for interactions between gender and country-of-ancestry level variables systematically amplifies the magnitude of our coefficient of interest. The coefficient equals -0.346 when controlling for the interaction between gender and GDP (Column 1), -0.236 for the Gini index (Column 2), -0.224 for the unemployment rate (Column 3) and -0.413 when controlling for all three interacted terms (Column 4) (see Table D6). This result suggests a positive omitted variable bias for each measure, which implies that our baseline result reflects a lower bound of the effect of gender norms on the gender gap in later-life cognitive health.

To explore further this bias, we examine the correlations between the MGN and the three country-of-ancestry characteristics (Table D5). The results indicate that the GDP is negatively correlated with the MGN (-0.672), consistent with the documented negative relationship between gender inequality and economic development (Cuberes & Teignier, 2014). By contrast, the Gini index and the unemployment rate are positively correlated with the MGN, with correlation coefficients of 0.445 and 0.029, respectively. Taken together with the changes in our coefficient of interest when these variables are included, these patterns are consistent with economic development in the country of ancestry being negatively related to women's cognitive health relative to men's, while economic inequality and unemployment may be positively related to this gender gap.

D.3. Sample modifications

D.3.1. Additional restrictions to the analytical sample

We further assess the robustness of our findings to several modifications of the estimation sample. The corresponding results are reported in Table D7.

First, we examine whether our results are driven by a small number of countries of ancestry. o this end, we exclude Russia, which accounts for 31% of observations in our sample (see Table B1). We also exclude countries of ancestry characterised by the most traditional gender norms and the largest gender gaps in cognitive health.[15] Both of these exclusions aim at checking that results are not driven by a few countries. Excluding Russia yields results very similar to our baseline estimates (Column 1), while excluding the countries with the most conservative gender norms slightly reduces the magnitude of our coefficient of interest, which nevertheless remains statistically significant regardless of the inference method used (Column 2). Second, we assess whether our findings are sensitive to the inclusion of observations collected around the COVID-19 pandemic. Given the exceptional circumstances surrounding data collection during this period, we exclude Waves 8 and 9 of SHARE. As shown in Column 3, the estimated coefficient remains virtually unchanged, suggesting that our results are not driven by observations collected during this period. Finally, because the numeracy test is administered only during respondents' first interview, we report individuals' first numeracy test score in the subsequent waves in the analytical sample for efficiency reasons (see Section 2.2). As a robustness check, we restrict the sample to individuals' first observations. Results, reported in Column 4, remain similar to our baseline estimates.

D.3.2. Inclusion of second-generation immigrants with parents born in different foreign countries

In the main analysis, individuals with both parents born abroad and from different countries are excluded (see Section 2.1). We check whether our results are sensitive to their inclusion. Including these individuals requires to assign a single country of ancestry to each respondent. We therefore consider two alternative specifications, using either the mother's or the father's country of birth as the country of ancestry. Columns 5 and 6 of Table D7 report the results using the mother's and father's country of birth, respectively. In both cases, the estimated coefficient remains negative but is smaller in magnitude than in our baseline specification, reaching -0.147 standard deviations when gender norms are measured using the mother's country of birth and -0.201 standard deviations when using the father's. These findings are consistent with the

[15] In our sample of second-generation immigrants with both parents born in the same country, it covers the following countries of ancestry: Algeria, Morocco, Tunisia and Turkey (see Figure 2).

possibility that the intergenerational transmission of gender norms is stronger when both parents share the same country of ancestry.

D.4. Alternative measure of cognitive functioning

We further assess the robustness of our findings to using an alternative measure of cognitive functioning. The corresponding results are reported in Table D8 and are discussed in Section 5.1.

First, we use an alternative summary measure of cognitive functioning instead of the standardised Cognitive Score Index (CSI) described in the Data section. Specifically, we adopt the SHARE-Cog instrument developed by O'Donovan et al. (2023), which evaluates the accuracy of several SHARE cognitive tests in assessing individual cognitive health, with a particular focus on dementia diagnosis. Drawing on clinical knowledge and a dominance analysis examining the relative contribution of immediate and delayed word recall and verbal fluency to explained variation in cognitive health (R^2), O'Donovan et al. recommend assigning different weights to each subtest when constructing a composite measure of cognitive functioning. Specifically, each word recalled in the immediate recall test is assigned one point, each animal named in the verbal fluency test receives 0.5 points (up to a maximum of 30 animals), and each word recalled in the delayed recall test is assigned two points, yielding a maximum total score of 45 points. Following these guidelines, we construct the SHARE-Cog score and use it as the dependent variable. As shown in Column 1 of Table D8, a one-standard-deviation increase in the MGN is associated with a 1.435-point decrease in women's SHARE-Cog score relative to men's. Given the standard deviation of SHARE-Cog in our estimation sample (7.763 points), this corresponds to a decrease equivalent to 19% of a standard deviation, closely matching the magnitude of our baseline estimate using the CSI (-0.219 standard deviations or 22% of a standard deviation).

D.5. Alternative specifications

Since our data include repeated observations of the same individuals across SHARE waves, individuals interviewed more frequently contribute more observations to the estimation sample. This may affect our results if the number of participations is correlated with gender differences in cognitive functioning or inherited gender norms. We therefore assess the robustness of our

findings using three alternative specifications that account for differences in the number of observations per individual.

First, we collapse the data at the individual level by averaging cognitive scores across all available waves, so that each individual contributes a single observation. Second, we reweight observations by the inverse of the number of times an individual appears in the sample, thereby giving equal weight to each individual regardless of their number of interviews. Third, we retain only each individual's first observed cognitive test score, again ensuring that every individual contributes a single observation.

Columns 2 to 4 of Table D8 report the results of these three specifications. The estimated coefficients remain very close to our baseline estimate. A one-standard-deviation increase in the MGN is associated with a decrease in women's Cognitive Score Index (CSI) relative to men's of 0.202 standard deviations when averaging cognitive scores across waves (Column 2), 0.237 standard deviations when reweighting observations (Column 3), and 0.222 standard deviations when restricting the sample to first interviews (Column 4).

D.6. Placebo test

We further investigate whether our findings could be explained by gender differences in characteristics that may be influenced by inherited gender norms but are unrelated to cognitive abilities. One potential concern relates to language proficiency. If traditional gender norms restrict women's social interactions relative to men's, women may have fewer opportunities to develop or maintain proficiency in the language spoken in their country of residence. Consequently, their lower performance on cognitive tests could partly reflect difficulties understanding or responding to questions rather than differences in cognitive functioning.

To examine this possibility, we use three indicators of potential difficulties during the interview: whether the respondent asks for clarification, has difficulty understanding the interviewer's questions, or demonstrates poor willingness to answer. We estimate our baseline specification using each of these indicators as the dependent variable.

Table D9 reports the results for the probability of requesting clarification (Column 1), experiencing difficulties understanding questions (Column 2), and demonstrating poor willingness to answer (Column 3). Across all three outcomes, the interaction between the MGN and the gender indicator is not statistically significant.

Table D1. Correlations between indicators of gender norms

	Measure of Gender Norms	Share of women in labour force	Gender Gap Index – Politics	Gender Gap Index – Economics	Gender Gap Index – Education	Gender Gap Index – Health
Measure of Gender Norms	1					
Share of women in labour force	-0.487	1				
Gender Gap Index – Politics	-0.652	-0.112	1			
Gender Gap Index – Economics	-0.342	0.862	-0.179	1		
Gender Gap Index – Education	-0.332	0.743	-0.225	0.594	1	
Gender Gap Index – Health	0.174	0.564	-0.583	0.716	0.334	1
Mean	0.400	0.452	0.213	0.685	0.994	0.976
Standard deviation	0.119	0.047	0.123	0.079	0.009	0.005

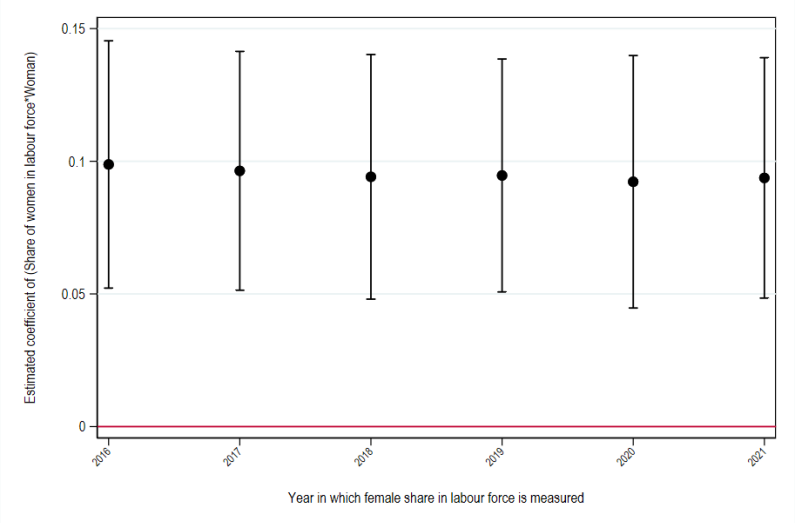
Note: Correlations are reported for each pair of indicators. The last two rows display the average value and standard deviation of each indicator. Sample: Countries of ancestry of second-generation immigrants with both parents born abroad and in the same country. Sources: Integrated Values Surveys (1981–2022) + World Economic Forum, World Bank (2016-2021) + World Development Indicators, World Bank (2016-2021)

Table D2. Estimation results: Alternative gender norms proxies

	Cognitive Score Index				
	(1)	(2)	(3)	(4)	(5)
Woman	-0.021	0.064	0.015	-0.001	0.045
	(0.260)	(0.277)	(0.234)	(0.253)	(0.260)
$GGI_{politics}$ * Woman	0.071				
	(0.088)				
	[0.479]				
$GGI_{economics}$ * Woman		0.116**			
		(0.054)			
		[0.091]			
$GGI_{education}$ * Woman			0.065		
			(0.063)		
			[0.467]		
GGI_{health} * Woman				0.081	
				(0.077)	
				[0.384]	
Share of women in labour force * Woman					0.113***
					(0.027)
					[0.070]
Country of ancestry FE	yes	yes	yes	yes	yes
Country of residence FE	yes	yes	yes	yes	yes
Country of residence by sex FE	yes	yes	yes	yes	yes
Interview wave FE	yes	yes	yes	yes	yes
Individual controls	yes	yes	yes	yes	yes
R^2	0.219	0.221	0.219	0.219	0.221
Number of ancestry countries	31	31	31	31	31
Number of observations	3,623	3,623	3,623	3,623	3,623

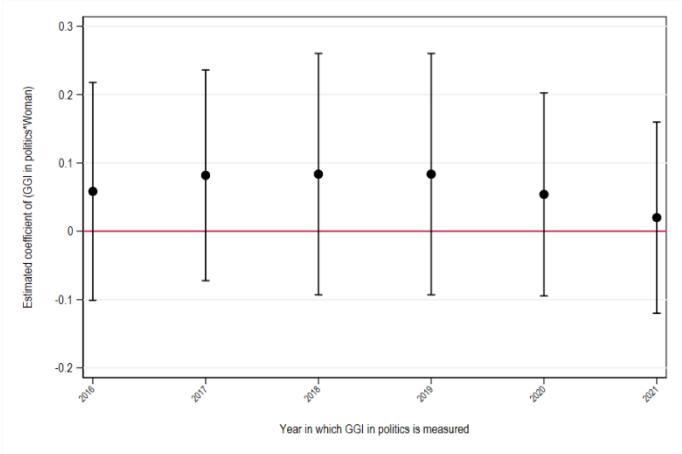
Note: This table reports estimates from the baseline specification using alternative indicators to the Measure of Gender Norms (MGN). OLS estimates with standard errors corrected for clustering at the country of ancestry level in parentheses and corresponding wild bootstrap test p-values in brackets. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Sample: Second-generation immigrants with both parents born abroad and in the same country. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + World Economic Forum, World Bank (2016-2021) + World Development Indicators, World Bank (2016-2021)

Figure D1. Estimation results by year of measurement for the female share in labour force

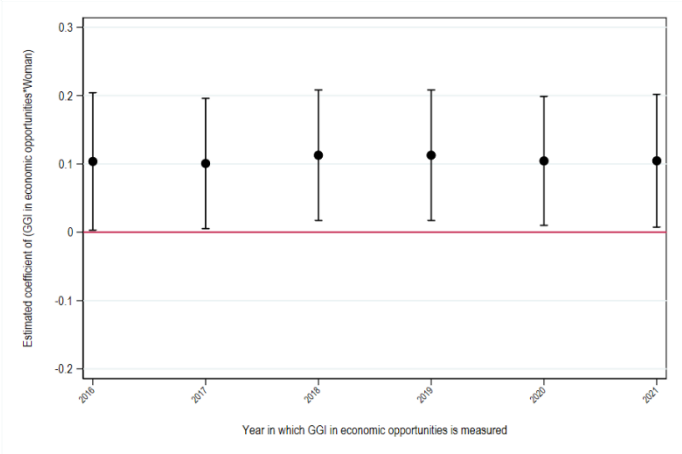


Note: Estimated coefficients of the interaction between gender and the share of women in the labour force in both parents' country of birth. Standard-errors are corrected for clustering at the country of ancestry level. Sample: Second-generation immigrants with both parents born abroad and in the same country. Source: World Development Indicators, World Bank (2016-2021).

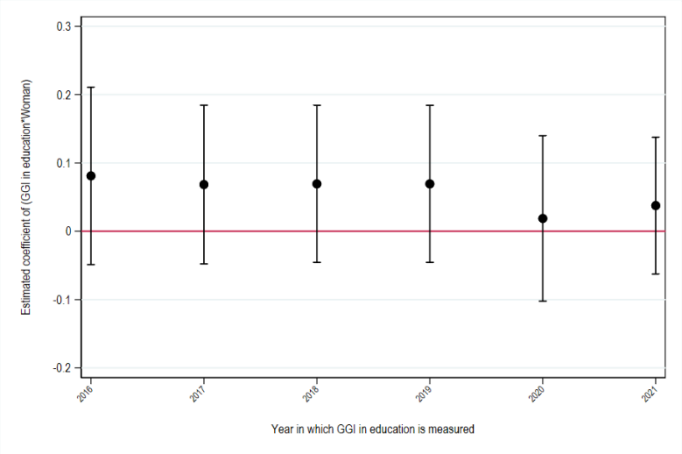
Figure D2. Estimation results by year of GGI measurement



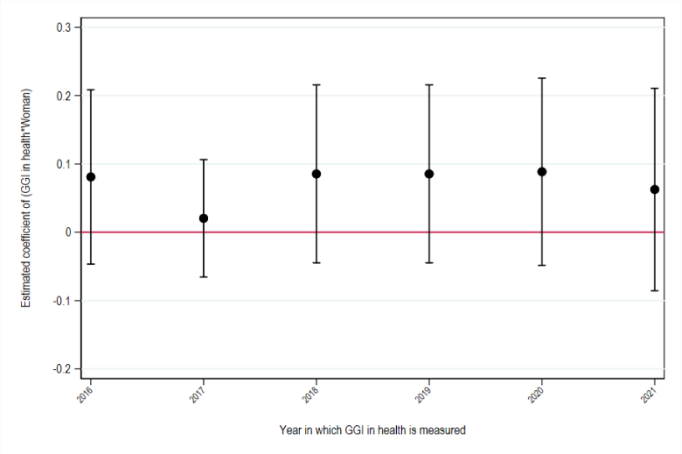
(a) Results with GGI in politics



(b) Results with GGI in economic opportunities



(c) Results with GGI in education



(d) Results with GGI in health opportunities

Note: Estimated coefficients of the interaction between gender and the Gender Gap Index (GGI) by year of measurement. Sub-figure (*a*) (resp. (*b*), (*c*) and (*d*)) reports the coefficient of the interaction with the GGI in politics (resp. economic opportunities, education and health opportunities). Only years for which data is available for all countries of ancestry are used in the analyses. Standard-errors are corrected for clustering at the country of ancestry level. Sample: Second-generation immigrants with both parents born abroad and in the same country. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + World Economic Forum, World Bank (2016-2021).

Table D3. Robustness check: Alternative coding of the Measure of Gender Norms

	Cognitive Score Index	
	Undecided responses are considered as disagreeing	Undecided responses are considered as agreeing
Woman	-0.016	-0.003
	(0.274)	(0.269)
Measure of Gender Norms * Woman	-0.224***	-0.212***
	(0.044)	(0.052)
	[0.005]	[0.016]
Country of ancestry FE	yes	yes
Country of residence FE	yes	yes
Country of residence by sex FE	yes	yes
Interview wave FE	yes	yes
Individual controls	yes	yes
R^2	0.224	0.223
Number of ancestry countries	31	31
Number of observations	3,623	3,623

Note: This table reports estimates from the baseline specification using alternative codings of the Measure of Gender Norms (MGN). In Column 1, undecided responses are treated as disagreement with the traditional statement, while in Column 2, they are treated as agreement. OLS estimates with standard errors corrected for clustering at the country of ancestry level in parentheses and corresponding wild bootstrap test p-values in brackets.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Sample: Second-generation immigrants whose parents were both born abroad and in the same country. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) and Integrated Values Surveys (1981-2022).

Table D4. Robustness check: Controlling for individual and parental characteristics

	Cognitive Score Index			
	(1)	(2)	(3)	(4)
Woman	-0.077	-0.051	-0.063	-0.708
	(0.273)	(0.264)	(0.265)	(1.636)
Measure of Gender Norms * Woman	-0.181***	-0.181***	-0.178***	-0.223***
	(0.045)	(0.045)	(0.044)	(0.045)
	[0.006]	[0.006]	[0.006]	[0.007]
Mother's level of education	0.171***		0.118***	
	(0.025)		(0.038)	
Mother's level of education * Woman	-0.037		-0.047	
	(0.027)		(0.045)	
Father's level of education		0.140***	0.075**	
		(0.016)	(0.030)	
Father's level of education * Woman		-0.028	0.001	
		(0.032)	(0.052)	
Age				0.068*
				(0.037)
Age squared				-0.001**
				(0.000)
Age * Woman				0.026
				(0.049)
Age squared * Woman				-0.000
				(0.000)
Country of ancestry FE	yes	yes	yes	yes
Country of residence FE	yes	yes	yes	yes
Country of residence by sex FE	yes	yes	yes	yes
Interview wave FE	yes	yes	yes	yes
Individual controls	yes	yes	yes	yes
R^2	0.251	0.252	0.261	0.224
Number of ancestry countries	31	31	31	31
Number of observations	3,546	3,443	3,419	3,623

Note: OLS estimates with standard-errors corrected for clustering at the country of ancestry level in parentheses and corresponding wild bootstrap test p-values in brackets. Column 1 (resp. 2) reports estimation results controlling for maternal (resp. paternal) education level and its interaction with gender. In Column 3, both parents' levels of education are included. In Column 4, interactions between gender and age, and gender and age squared respectively are added as covariates. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Sample: Second-generation immigrants with both parents born abroad and in the same country. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + Integrated Values Surveys (1981-2022)

Table D5. Correlations between the Measure of Gender Norms and country-level measures

	Measure of Gender Norms	Gross Domestic Product per capita	Gini Index	Unemployment rate
Measure of Gender Norms	1			
Gross Domestic Product per capita	-0.672	1		
Gini index	0.445	-0.228	1	
Unemployment rate	0.029	-0.147	-0.002	1

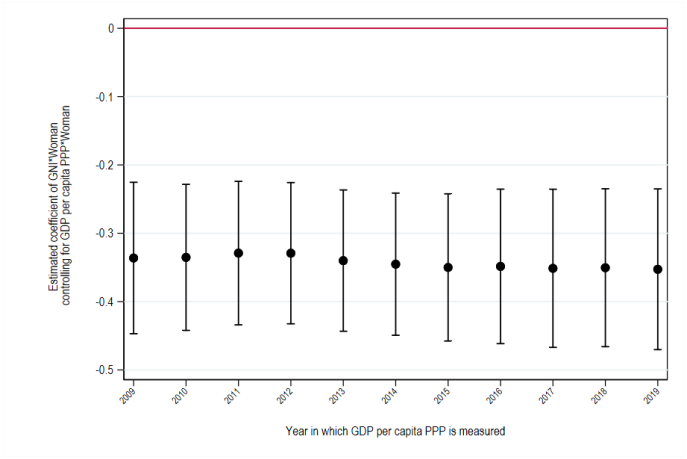
Sample: Second-generation immigrants with both parents born abroad and in the same country. Sources: World Economic Forum, World Bank (2016-2021) + World Development Indicators, World Bank (2016-2021)

Table D6. Robustness check: Controlling for country of ancestry's characteristics

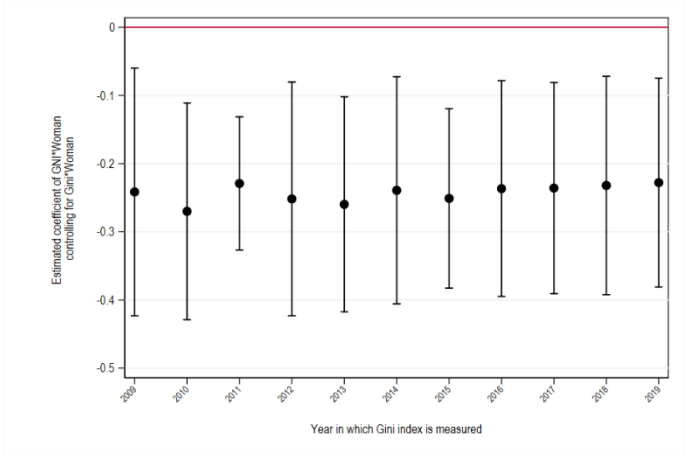
	Cognitive Score Index			
Woman	-0.055	-0.020	-0.034	-0.075
	(0.258)	(0.272)	(0.264)	(0.250)
Measure of Gender Norms * Woman	-0.346***	-0.236***	-0.224***	-0.413***
	(0.056)	(0.044)	(0.045)	(0.064)
	[0.000]	[0.008]	[0.003]	[0.002]
Gross Domestic Product per capita * Woman	-0.278***			-0.363***
	(0.061)			(0.085)
	[0.010]			[0.011]
Gini index * Woman		0.069		0.132**
		(0.063)		(0.055)
		[0.303]		[0.047]
Unemployment rate * Woman			0.070**	-0.030
			(0.033)	(0.031)
			[0.066]	[0.423]
Country of ancestry FE	yes	yes	yes	yes
Country of residence FE	yes	yes	yes	yes
Country of residence by sex FE	yes	yes	yes	yes
Interview wave FE	yes	yes	yes	yes
Individual controls	yes	yes	yes	yes
R^2	0.227	0.224	0.225	0.228
Number of ancestry countries	31	31	31	31
Number of observations	3,623	3,623	3,623	3,623

Note: OLS estimates with standard errors corrected for clustering at the country of ancestry level in parentheses and corresponding wild bootstrap test p-values in brackets. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Sample: Second-generation immigrants with both parents born abroad and in the same country. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + Integrated Values Surveys(1981-2022).

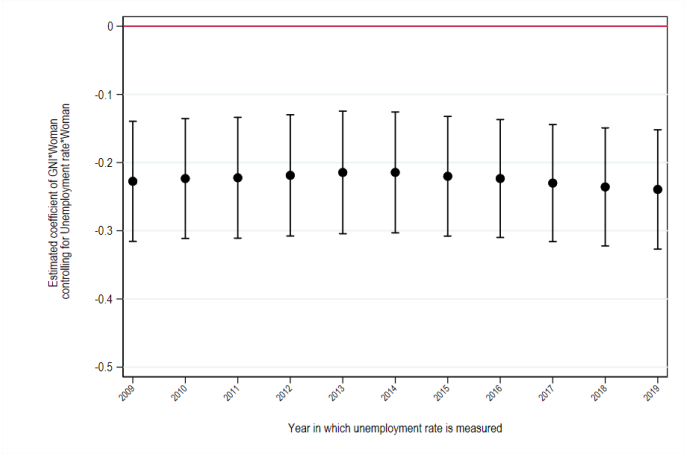
Figure D3. Estimation results by year of country level control measurement



(a) Results controlling for Gross Domestic Product per capita



(b) Results controlling for Gini index



(c) Results controlling for unemployment rate

Note: Estimated coefficients of the interaction between the individual's sex and the Measure of Gender Norms (MGN) controlling for (a) the GDP per capita, (b) the Gini index and (c) the unemployment rate in the country of ancestry by year of measurement. Only years for which data is available for all countries of ancestry are used in the analyses. Sample: Second-generation immigrants with both parents born abroad and in the same country. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + World Bank (1995-2021).

Table D7. Robustness check: Sample modifications

	Cognitive Score Index					
	Excluding largest country of ancestry	Excluding outliers	Excluding covid-19 affected waves	Including all waves (1 to 9)	Adding second-generation immigrants with parents coming from different countries	
					MGN at mother's level	MGN at father's level
Woman	-0.006	-0.028	0.043	0.162	-0.049	-0.032
	(0.283)	(0.277)	(0.291)	(0.318)	(0.264)	(0.239)
Measure of Gender Norms*Woman	-0.217***	-0.182**	-0.233***	-0.191***	-0.147***	-0.201***
	(0.048)	(0.076)	(0.061)	(0.053)	(0.053)	(0.042)
	[0.012]	[0.028]	[0.015]	[0.022]	[0.050]	[0.000]
Country of ancestry FE	yes	yes	yes	yes	yes	yes
Country of residence FE	yes	yes	yes	yes	yes	yes
Country of residence by sex FE	yes	yes	yes	yes	yes	yes
Interview wave FE	yes	yes	yes	yes	yes	yes
Individual controls	yes	yes	yes	yes	yes	yes
R^2	0.284	0.210	0.218	0.231	0.210	0.209
Number of ancestry countries	30	27	31	31	31	31
Number of observations	2,491	3,480	2,107	3,842	4,255	4,246

Note: OLS estimates with standard errors corrected for clustering at the country of ancestry level in parentheses and corresponding wild bootstrap test p-values in brackets. $*p < 0.1$, $**p < 0.05$, $***p < 0.01$. Sample: Second-generation immigrants with both parents born abroad and in the same country (Columns 1, 2, 3 and 4), second-generation immigrants with both parents born abroad and in the same country or in different countries (Columns 5 and 6). Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + Integrated Values Surveys (1981-2022).

Table D8. Robustness check: Alternative outcome and specifications

		Cognitive Score Index		
	SHARE-Cog	Average CSI	Reweighted	First participation
Woman	0.702	-0.116	-0.165	-0.033
	(1.981)	(0.343)	(0.314)	(0.388)
Measure of Gender Norms * Woman	-1.435***	-0.202***	-0.237***	-0.222***
	(0.385)	(0.070)	(0.050)	(0.067)
	[0.021]	[0.011]	[0.003]	[0.028]
Country of ancestry FE	yes	Yes	Yes	Yes
Country of residence FE	yes	Yes	Yes	Yes
Country of residence by sex FE	yes	Yes	Yes	Yes
Interview wave FE	yes	Yes	yes	Yes
Individual controls	yes	Yes	Yes	Yes
R^2	0.243	0.299	0.259	0.255
Outcome mean	24.260			
Number of ancestry countries	31	31	31	31
Number of observations	3,623	1,445	3,623	1,445

Note: OLS estimates with standard errors corrected for clustering at the country of ancestry level in parentheses and corresponding wild bootstrap test p-values in brackets. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Sample: Second-generation immigrants with both parents born abroad and in the same country. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + Integrated Values Surveys (1981-2022).

Table D9. Placebo test

	Asks for clarification	Does not understand	Has a poor willingness to answer
Woman	0.084	-0.001	0.033
	(0.064)	(0.024)	(0.023)
Measure of Gender Norms * Woman	-0.008	0.011	-0.016
	(0.018)	(0.007)	(0.013)
	[0.722]	[0.256]	[0.277]
Country of ancestry FE	yes	yes	yes
Country of residence FE	yes	yes	yes
Country of residence by sex FE	yes	yes	yes
Interview wave FE	yes	yes	yes
Individual controls	yes	yes	yes
R^2	0.106	0.052	0.074
Outcome mean	0.178	0.042	0.056
Number of ancestry countries	31	31	31
Number of observations	3,621	3,620	3,620

Note: OLS estimates with standard errors corrected for clustering at the country of ancestry level in parentheses and corresponding wild bootstrap test p-values in brackets. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Sample: Second-generation immigrants with both parents born abroad and in the same country. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + Integrated Values Surveys (1981-2022).

E. Potential pathways

This section presents results of the ordered probit regression when using the education level, measured by the ISCED code, as an outcome. Results are presented in Section 5.2 of the manuscript.

Table E1. Exploration of potential pathways: Marginal effects of ordered probit model for education

	Pr(ISCED=0)	Pr(ISCED=1)	Pr(ISCED=2)	Pr(ISCED=3)	Pr(ISCED=4)	Pr(ISCED=5)	Pr(ISCED=6)
ME	0.004*	0.025*	0.029	0.009	-0.011	-0.051*	-0.006
SE	(0.002)	(0.015)	(0.018)	(0.006)	(0.008)	(0.030)	(0.004)
N	3,056	3,056	3,056	3,056	3,056	3,056	3,056

Note: The first row reports marginal effects of ordered probit regression with the 1997-ISCED code as the outcome, ordered as follow: ISCED 0: "Pre-primary education", ISCED 1: "Primary education", ISCED 2 "Lower secondary education", ISCED 3 "Upper secondary education", ISCED 4 "Post-secondary non-tertiary education", ISCED 5 "First stage of tertiary education" and ISCED 6 "Second stage of tertiary education". The second row displays standard errors corrected for clustering at the country of ancestry level. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$. Sample: Second-generation immigrants with both parents born abroad and in the same country. Sources: Survey of Health, Ageing and Retirement in Europe (Waves 4-9) + Integrated Values Surveys (1981-2020).