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# Gender, Age, and Attitude toward Competition

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## Abstract

A large body of literature has shown the existence of a gender gap in competitiveness and a handful of experimental works investigating the impact of age on this gap lead to inconclusive results. We propose an empirical investigation on that, which is based on survey data and complementary to experimentation. Using individual data from a very large survey (European Value Study on 48 countries from 1990 to 2008), we examine how age influences the gender gap in attitude toward competition. After confirming the existence of a strongly significant gender gap, we find evidence of a gendered effect of age on attitude toward competition. Attitude toward competition has a U-shaped relation with age for men with a least-negative view around 53 years but becomes more and more positive over age for women. We therefore observe a U-shaped pattern of the gender gap with age with a minimum around 60 years. Finally, we show that the gender gap and its change with age are sensitive to both individual and national gender stereotypes, suggesting influences of cultural factors.

**JEL Codes:** J16.

**Keywords:** gender; competitiveness; attitude toward competition; age; gender gap.

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## 1. Introduction

One needs explanations for the highly persistent differences in labor market outcomes of men and women, including long-lasting, though narrowing, wage gap (see Blau and Kahn, 2017, for a recent review) but also low representation of women among top positions in firms (Bertrand and Hallock, 2001). In addition to discrimination by recruiters and preferences differences for child rearing, gender differences in the attitudes toward competition have been frequently mentioned as one possible explanation for these lower labor market outcomes of women.

An important turning point was the publication of the influential book ‘*Women Don’t Ask*’ by Babcock and Laschever (2003). According to these authors, a key explanation for the persistent gender differences in labor market outcomes resides in the specific behavior of women in the workplace, especially in the bargaining of wages. More specifically, women do not ask in the sense that they negotiate less often, less toughly and finally less successfully than men.<sup>1</sup>

Since then, a large body of literature in experimental economics has grown on the gender gap in competitiveness (Niederle and Vesterlund, 2011, Niederle, 2016). Basically, this literature shows with laboratory experiments that men have more inclination towards competition than women, a result further confirmed by field studies (Ors et al., 2013; Flory et al., 2015). The causes of these attitude differences are of course an important, and still largely open, question; in particular, further experimental investigations have tried to disentangle the roles of biology and culture in the explanations of this gap.

While the gender gap in competitiveness is now a well-established result, a key question is the effect of age on this gap. It is a very important issue since the vast majority of experimental studies have been done on young adults while, in the workplace, a lot of competitive situations (e.g., competitions for promotions in firms’ top positions) involve more mature adults. Endocrinological changes across the life span can affect competitiveness, in line with evidence that competitive behavior is affected by hormones (Apicella et al., 2011; Buser, 2012; Wozniak et al., 2014). Therefore, hormonal changes differing for men and women during life, the gender gap in competitiveness could vary with age.

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<sup>1</sup> For example, Babcock et al. (2003) asked graduates from Carnegie-Mellon University whether they negotiate their starting salary: only 8% of women answered that they do, while 57% of men do so. Such gender differences in negotiations have been further confirmed by field data (Hernandez-Arenaz and Iriberry, 2018) and experimental research (Leibbrandt and List, 2015; Exley et al., 2020).

Surprisingly, only two studies, both using field experimental approach, have examined the effect of age on the gender gap in competitiveness. Mayr et al. (2012) find no influence of age on the gender gap while Flory et al. (2018) conclude to the disappearance of the gender gap at age 50. Therefore, literature about the age effect on the gender gap in competitiveness is inconclusive and the question deserves further investigation. As noted by Niederle (2016, p. 494), “the effects of age and work experience on competitiveness and its effect on the gender gap in competitiveness are clearly not completely resolved”.

The purpose of this paper is to fill this loophole in the literature. To this end, we examine the effect of age on the gender gap in attitude toward competition (ATC thereafter) through a cross-country analysis on a broad and representative sample of individuals. We use data from the European Value Study (EVS thereafter) from 48 countries with men and women of all adult ages. Our investigation is based on the use of survey data, which distinguishes our work from many studies in the strand of literature on gender and competition. The use of survey data presents three key advantages for our research question. First, we investigate the question on a large cross-country sample, which is of major benefit as local or national culture can influence how individuals perceive competition. Second, we have respondents of all adult ages in large numbers, which is of major importance to examine finely the effect of age in terms of representativeness. Third, we have a great diversity in the characteristics of the respondents given the large number of periods and countries covered by the EVS. In a nutshell, working on large international surveys provides opportunities of refinement which is complementary to experiment settings.

The use of survey data implies that, unlike experimental studies, we do not consider behavioral competitiveness measures but rely on an ATC measure taken from the EVS. Respondents give their opinion on competition by answering the following 1-10 scale question: “How would you place your views on this scale? 1) competition is good. It stimulates people to work hard and develop new ideas; 10) competition is harmful, it brings out the worst in people”. This measure captures the main aspects of the individual ATC. Recent works have shown that survey-based measures on competition preferences are highly correlated with laboratory measures of competitiveness (e.g., Bönnte et al., 2017). Moreover, this measure has been commonly utilized in former works examining economic preferences (Guiso et al., 2003; Fisman and O’Neill, 2009; Pirinsky, 2013). In particular, Fortin (2005) used this measure “to capture potential gender differences in competitiveness” (p. 423) and find high positive correlations between the attitude toward competition provided by EVS and labor market outcomes (probability of being employed, probability of having a full-time job).

This supports our approach to consider the ATC measure provided by EVS as a relevant proxy for competitiveness.

Our empirical strategy is as follows. We first examine how gender and age affect ATC in our large cross-country sample. Through this analysis, we can check the presence of a gender gap in ATC, but also the nature of the relation between age and ATC. Here, our contribution is to verify whether the gender gap in competitiveness documented in the experimental literature also shows up in the attitudes towards competition of subjects across a much broader sample. We then investigate the effect of age on the gender gap. To this end, we perform estimations of the impact of age on ATC by gender. Our purpose is to take advantage of our broad sample to add new insights about the effect of age on ATC in addition to the rather inconclusive experimental literature. We additionally explore four underlying mechanisms: a potential cohort effect, a gendered difference in risk aversion, a gendered difference in perception of success and the impact of social norms.

Our findings support the view that age does affect the gender gap in ATC. First, we confirm the existence of a gender gap in ATC: men have a more positive view of competition than women<sup>2</sup>. Second, we find a gendered effect of age on ATC. Age has a U-shaped impact for men with a minimum around 53 years, but its impact is continuously increasing for women. As a result, the gender gap in ATC has a U-shaped relation with age with a minimum around 60 years. It is however positive for all ages, meaning a more positive ATC for men whatever the considered age. Third, we provide some clues on the related mechanisms. We do not find evidence that the gendered relation between ATC and age is driven by gender differences in risk perception or success perception. Furthermore, our results do not seem to be explained by a cohort effect. And in addition, we show that the gendered effect of age on ATC depends on gender stereotypes, both defined at individual level and national level. According to the gender stereotype of the respondent and of the respondent's country, age impacts differently ATC. So, the gender gap evolves differently with age depending on gender stereotypes. It suggests that a physiological determinant of competitiveness such as age can be influenced by cultural context.

Compared to the previous literature, our contribution is threefold. First, we confirm the existence of a strong gender gap in ATC. In other words, we establish that ATC is characterized by a gender gap that is similar to the gender gap highlighted in laboratory or

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<sup>2</sup> Note that, in the whole paper, we phrase the gender gap in competitiveness interchangeably as “men being more competitive than women” or “women being less competitive than men”. Anyway, we do not intend to tackle the normative dimension of the topic and to address the question of a potential optimal level of competitiveness.

field settings. Second, we obtain new results concerning the effect of age: while the experimental literature is inconclusive, we get a clear pattern of a U-shaped relationship between age and the gender gap in ATC thanks to a large dataset covering many countries. Besides, this result does not fit with the hypothesis or results obtained by previous studies. Third, we are able to detect a potential role for cultural factors (namely, gender stereotypes) on the gender gap in ATC.

The remainder of the paper is organized as follows. Section 2 presents the background of the research question. Section 3 develops data and methodology. Section 4 reports results for the determinants of the ATC. Section 5 presents evidence on the gendered effect of age on the ATC. Section 6 discusses the potential mechanisms explaining the gendered effect of age. Section 7 concludes.

## **2. Background**

This section is devoted to the background for our research question. We first briefly review the main results about the gender gap in competitiveness, then we report the literature specifically devoted to the effect of age on this gender gap. We finally present four potential predictions on the gendered effect of age on attitude toward competition.

### **2.1. The gender gap in competitiveness**

There is a fast-growing literature on the gender differences in competitiveness.<sup>3</sup> In a seminal paper, Gneezy et al. (2003) show that men, contrary to women, increase their effort level and their performances when the environment becomes more competitive, more precisely when the compensation system switches from a piece-rate payment scheme to a more competitive tournament payment scheme. When the level of competition increases, men improve their performances far more than women so that they finally perform better in the competitive environment while it was not the case in the non-competitive one.

Another aspect of the preference for competition by men has been shown by many experiments where subjects have to select the compensation scheme. In another seminal paper, Niederle and Vesterlund (2007) observe that men are more likely to self-select into

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<sup>3</sup> For more thorough surveys, see Niederle and Vesterlund (2011) and Niederle (2016).

competitive environments than women. When given the choice between the competitive tournament and the noncompetitive piece-rate compensation schemes, 73% of the male subjects choose the tournament while only 35% of the female subjects make the same choice. Moreover, this gap is not due to differences in the actual performances on the task or in risk aversion but rather to the overconfidence of men who tend to overestimate their relative abilities. According to the authors, their results show that “women shy away from competition and men embrace it”. These results have been confirmed by numerous further experimental studies (e.g., Healy and Pate, 2011; Niederle et al., 2013).

Of course, these results have been obtained in the context of laboratory and the question of external validity arises. Some research tries to correlate the experimental measures of competitiveness and some real-world choices. In particular, some papers show that the standard laboratory experimental measure of competitiveness from the Niederle-Vesterlund design, namely the choice by the subject to enter a tournament instead of a piece-rate payment, predicts quite well students’ choice of highly competitive academic tracks (Buser, Niederle and Oosterbrek, 2014; Buser, Peter and Wolter, 2017).

Also, in order to get more external validity, some field experiments have tried to replicate the findings from the laboratory. Briefly sketched, the results obtained in the laboratory tend to be confirmed in the field. For example, Flory et al. (2015) propose a natural field experiment where 9,000 job-seekers are randomly assigned to different compensation schemes and find that, as in the laboratory, women tend to self-select into environments with lower competitive pressure. According to this field study, therefore, highly competitive ‘real-world’ workplaces tend actually to deter female workers. Some non-experimental studies have also been carried out to assess the robustness of the gender gap in competitiveness found by the experimental research. For example, Ors et al. (2013), who use real-world data on exams, confirm that female students perform worse in more competitive environments.

In a nutshell, the literature investigating the gender gap in competitiveness finds that men are more willing to compete than women. This well-established result mainly rests on laboratory and field experiments. An important, largely open, question deals with the reasons for these gender differences in attitudes toward competition. Two main explanations have been invoked: the biological one and the cultural one, in line with the long-lasting nature-nurture debate. Say differently, the question is to know whether women are less competitive than men from birth or become so through socialization.

There are intensive debates in evolutionary biology and sociobiology about the origin of competitiveness differences between males and females. A long-lasting leading theory,

known as the Bateman's principle, argued that males are promiscuous and females are choosy because of differences in the cost of reproduction: while this cost is very low for males, making them inclined to compete in order to mate with many partners, it is far higher for females, leading them to be coy instead of competitive. However, this theory about coy females and competitive males is more and more debated and discussed. Recent research tests the limits of the theory and leads to nuance its arguments, pointing out some examples of species with reversed types of behavior but also revealing new complexities and potential explanations of the Bateman principle (Knight, 2002).

Some experimental research seems to confirm that the differences in the attitudes toward competition are strongly rooted in the early life and could thus be for some part innate. For example, in a field study on children in Israel, Gneezy and Rustichini (2004) find that young girls are less efficient than boys in running during a sports session in school but only under competitive pressure. Further studies in other countries and/or on different tasks have not confirmed these results (e.g., Cárdenas et al., 2012; Khachatryan et al., 2015) but Sutter and Glätzle-Rützler (2015) find, with subjects from age 3 to 18, that gender differences in the willingness to compete emerge early in life and tend to persist over time.

Another strand of the literature investigates more specifically the influence of biological factors. For example, it is shown that testosterone, the main male hormone, is positively correlated with risk taking (Apicella et al., 2008; Sapienza et al., 2009) and that the progesterone, one of the main female hormones, has a negative impact on competitiveness (Buser, 2012). Furthermore, the level of competitiveness exhibited in the laboratory by the standard choice of selecting a more or less competitive environment is significantly impacted by the menstrual cycle and the intake of hormonal contraceptives (Buser, 2012; Wozniak et al., 2014). Apicella et al. (2011), however, find opposite results at least for men, since these authors find no correlation between the hormonal variables and the level of competitiveness from a sample of male subjects. Bönte, Procher, Urbig and Voracek (2017) find that the digit ratio (2D:4D), considered as a biomarker of the prenatal exposure to testosterone and androgen, predicts quite well self-reported measures of competitiveness but not behavioral measures from laboratory experiments.

Another type of explanations for the differences in competitiveness between men and women resides in the sociocultural factors. The idea is that, for both men and women, the attitudes toward competition are shaped by culture. Some results seem to confirm the role of nurture in explaining the gender gap in competitiveness. The gap disappears for girls attending single-sex schools (Booth and Nolen, 2012) and is even reversed in matrilineal



societies (Gneezy et al., 2009). Other studies try to confirm the effect of culture on the gender gap in competitiveness with mixed results: Cárdenas et al. (2012) do not observe clear differences among boys and girls in Colombia and Sweden, but both Booth et al. (2019) and Zhang (2019) find that the gap is narrower in China perhaps due to the communist culture.

## **2.2. The impact of age on the gender gap in competitiveness**

The vast majority of research on the gender gap in competitiveness relies on lab or field experiments involving young adults (typically, undergraduate students). Yet, in the workplace, a lot of competitive situations involve more mature adults. For example, in their paper on the gender gap in achieving top positions in firms, Bertrand and Hallock (2001) report, in their sample of managers, an average age of 52.6 years for men and 47.5 years for women. Curiously, however, relatively few papers investigate the impact of age on the gender gap in competitiveness. Does the gap decrease or increase across the life span? The few research works devoted to this question lead to ambiguous results.

Mayr et al. (2012) use a field experimental approach on a sample of 543 US individuals. They find an inverted U relationship, both for men and women, with a peak around age 50. In other words, they conclude that the gender gap remains unchanged with age. They argue that their findings are striking because some theories on life-span changes in preferences suggest instead a gradual decline of competitiveness with age. They conjecture that their result of a mid-life peak both for men and women could come from the evolution across age of some personality traits, especially that of social dominance that seems to increase gradually from early adulthood to age 50 (Roberts et al., 2006).

Flory et al. (2018) adopt a field experiment based on the classical Nierdele-Vesterlund design on two distinct populations: 700 people from rural Malawi and 84 people from urban US population. They conclude that the gender gap in competitiveness disappears at age 50 because women over this age become as competitive as men. More precisely, the level of competitiveness does not significantly change with age for men but exhibits an increase at age 50 for women, making the gender gap completely disappear at age 50. The main explanation for this result deals with the argument of menopause occurring around this age of 50.

They refer to evolutionary and hormonal arguments to explain why women may tend to become less competition averse after the childbearing period, thus around the period of menopause. As explained above, the literature in evolutionary biology emphasizes the differences in the cost of reproduction as a main reason why men are more competitive than

women. Then, a plausible conjecture is that this effect of a lower competitiveness of women coming from the reproductive costs tends to dissipate after menopause. The other argument, compatible with the evolutionary one, deals with hormones mechanisms. Some studies show that the gender gap in competitiveness appears at the age of puberty (Andersen et al., 2013). Yet, puberty and menopause are two periods of sharp hormonal changes. Hence, hormonal changes may be the major reasons for both the decline in competitiveness among women compared with men at adolescence and a “catching-up” at the age of menopause. Concerning the last effect, Flory et al. (2018) invoke the hormone cortisol whose levels tend to rise with menopause and appear to be positively correlated with women’s competitiveness (Buser, Dreber and Mollerstrom, 2017; Zhong et al., 2018).

To sum it up, the results of the literature about the age effect are mixed, even if it supports the view that age influences competitiveness and can thus affect the gender gap in competitiveness.

### **2.3. Extensions to the relationships between ATC, gender and age**

Following the arguments and results of the literature, we can extract the four competing predictions for the gendered effect of age on ATC. Then, these predictions have to be deemed according to the cultural context.

As our purpose is to take benefit from large survey to investigate the relationship between age and competitiveness, we must shift our subject from competitiveness to ATC that is measured within such survey. The measure of competitiveness from the EVS is not a behavioral trait but it probably captures the main aspects of the individual attitude toward competition. Recent research shows that survey measures often correlate quite well with laboratory measures of competitiveness (e.g., Bönte, Lombardo and Urbig, 2017). Furthermore, several works have similarly interpreted the answer to the EVS question about competition as a measure of competitiveness. This question has been commonly used in the literature to investigate economic attitudes. Guiso et al. (2003) used the same question as one of their measures of “attitudes toward the market” in their study of the influence of religion on economic attitudes. Fisman and O’Neill (2009) also used the same question as a measure of competitiveness in their study of the gender differences in beliefs on the returns to effort, as well as Pirinsky (2013) in his study of the link between confidence and economic attitudes, and Barrios (2015) examining the relation between happiness and attitude toward

competition. In particular, and as mentioned above, Fortin (2005) used this measure “to capture potential gender differences in competitiveness” (p. 423) in her study based on the World Values Survey and the EVS. We interpret her findings of a good correlation between the EVS measure of ATC and labor market outcomes (probability of being employed, probability of having a full-time job) as an indicator that the measure in question can be relevantly used as a proxy for competition preferences.

Assuming that ATC measures competition preferences, we are able to sum up the literature through four main predictions about the relationship between age and ATC and the corresponding gender gap. We graphically present the four competing predictions in Figure 1.

### FIGURE 1

The first prediction (P1), called the gradual decline prediction, states that the ATC should gradually become more and more negative with age both for men and women, leaving the gender gap unchanged. The theories of life-span changes in preferences suggest a gradual decline with age of the willingness to compete. Indeed, there is some evidence that confidence, motivation and goals tend to decline with age, and this could be the main reason for a decline of the competitiveness across the life span.

The second prediction (P2), the mid-life peak prediction, establishes that competition is perceived more and more positively from early adulthood to age 50 and then is perceived gradually more and more negatively both for men and women, once again leaving the gender gap unchanged. This prediction is motivated by the observation that some personality traits (e.g., social dominance motivation) increase gradually from young adulthood to the fifties (Roberts et al., 2006). This mid-life peak prediction corresponds to the inverted U relationship (without impact of age on the gender gap) found by Mayr et al. (2012).

The third prediction (P3) is related to the menopause assumption and states that attitude toward competition for women should become suddenly more positive at the age of menopause, contributing to strongly reduce the gender gap around age 50. This is the assumption defended by Flory et al. (2018) with empirical evidence and arguments based on evolution and hormones mechanisms.

The fourth prediction (P4) is based on a hormonal assumption. It states that i) the ATC should be gradually more and more negative with age for men, and ii) women experience three periods: a slightly more favorable ATC with age under 35 years old, then a stronger improvement between 35 and 50 years old, and no more improvement with age after 50 years.

The two gendered patterns contribute to reduce the gender gap with age. This prediction also deals with hormones but focuses on testosterone. It is motivated by the findings that testosterone promotes competitiveness (Eisenegger et al., 2017) while for women progesterone hampers competitiveness (Buser, 2012). Yet, biological research clearly shows a gradual decline with age of testosterone in men and a decline of progesterone in women with a very sharp drop (75% reduction) between age 35 and 50. Hence, the prediction is based on the positive relation for testosterone and the negative relation for progesterone with competitiveness.

Among these four predictions, we do not have any prime hypothesis and our purpose is to know which one fits better with our measure of ATC. In other words, we organize a horse race between these predictions.

### **3. Data and methodology**

In this section, we present our empirical study in three stages. Firstly, we describe the measure of the attitude toward competition. Second, we present a first descriptive insight of the gender gap in ATC. Lastly, we present our empirical strategy to gauge the gender gap and the effect of age.

#### **3.1. The measure of the attitude toward competition (ATC)**

To scrutinize the gender gap in competitiveness, we study the ATC as measured by the European Value Study. To measure competition view, the survey uses a 1-10 scale question where the respondent has to give his opinion on the effects of competition. The question is worded as follows: “How would you place your views on this scale? 1) competition is good. It stimulates people to work hard and develop new ideas; 10) competition is harmful, it brings out the worst in people”. We reverse the scale in order to facilitate the comments, so that a response of 10 indicates a more positive ATC while a response of 1 means a negative ATC.

The question has been asked in three waves of the survey<sup>4</sup> and once, two or three times in most European countries and very few other countries (including the US), which

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<sup>4</sup> 1990-1993, 1998-2001, and 2008-2010.

leads to a sample of 48 countries.<sup>5</sup> So our large set of countries limits the influence of local or country-specific cultural factors. Finally, 139,382 people are included into our sample given the availability of various studied variables. As we decided to keep both the ‘refuse’ and ‘do not know’ responses as particular items of our categorical explanatory variables, the loss of observations is very limited.

As we noted earlier, we are confident that our measure of competition preferences from the EVS captures the main aspects of the individual attitude toward competition even if we have no formal clues about how it correlates with experimental measures of competitiveness. Even if it does not use the same survey question, recent research shows that survey measures often correlate quite well with laboratory measures of competitiveness (e.g., Bönnte, Lombardo and Urbig, 2017). We have to mention that although we do not see any obvious reason why the potential gap between the behavioral and survey measures could be dependent on age, gender, or stereotypes, we cannot exclude the possibility of correlation between all these variables. For instance, it could be the case that women, if they actually shy away from competition in their real-life behavior, have then fewer opportunities to update their beliefs about competition during their lifespan, so that there could be subtle differences in the way the behavioral and survey measures of competitiveness evolve with age, depending on gender.<sup>6</sup>

A major advantage of our survey approach is to rely on representative samples, which is of primary importance when looking at age patterns in different countries. Note that, while there is a burgeoning literature that investigates economic decision-making from representative samples of population (Dohmen et al., 2011; Falk et al., 2018), there are few research works of this strand of literature dealing with competitiveness. To our knowledge, only three studies on competitiveness use a representative sample<sup>7</sup>. Bönnte (2015) carries out a cross-country study designed to investigate the differences between countries of the gender gap in competitiveness. He also uses survey data, but from the Flash Eurobarometer Survey on Entrepreneurship of the European Commission that includes a somewhat different question on competition since respondents are asked to use a scale ranging from 1 (strongly disagree)

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<sup>5</sup> Albania, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia Herzegovina, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Great Britain, Greece, Hungary, Iceland, Ireland, Italy, Kosovo, Latvia, Lithuania, Luxembourg, Macedonia, Malta, Moldova, Montenegro, Netherlands, Northern Ireland, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, and USA. The detailed description of observations per country and EVS wave is given in Section A1 of the Appendix.

<sup>6</sup> We thank one reviewer for this suggestion.

<sup>7</sup> We do not include the paper by Almås et al. (2016) since they study competitiveness in a representative sample but only of adolescents in Norway.

to 4 (strongly agree) to indicate their level of agreement with the statement “I like situations in which I compete with others”. He confirms that, in all countries, men report a higher level of agreement than women and finds that this gender gap differs largely across countries. However, he does not identify specific cultural factors explaining these differences. Running regressions for three different age groups, he concludes that differences among men and women seem not to be strongly affected by age. Buser et al. (2018) use a representative sample of Dutch households to address the specific issue of the effect of sexual orientation on competition preferences. Although they do not focus on the effect of age, they note that gender differences in competitiveness appear to be weaker for older people. Boschini et al. (2019) use a representative sample of the Swedish population to investigate the gender differences in risk preferences and in competitiveness. They do not report clear patterns concerning the effect of age, nor try to take into account cultural factors such as stereotypes. To sum it up, our study is the first attempt to investigate the role of age and cultural factors on the gender gap in ATC from representative samples of different countries.

Another advantage of our approach with a survey measure of ATC is that this measure is probably less context-dependent than the experimental measures of competitiveness. Indeed, some experimental research clearly emphasizes that the gender gap in competitiveness does appear in ‘male’ tasks, such as maze solving in Gneezy et al. (2003) or running in Gneezy and Rustichini (2004), but tends to disappear in gender-neutral or ‘female’ tasks (Günther et al., 2010; Shurchkov, 2012; Iriberry and Rey-Biel, 2012; Dreber et al, 2014). Yet, research on survey data does not reveal clear gender differences in the perception of survey questions, so that we are quite confident that our measure of ATC is rather less dependent on the context than the standard experimental measures of competitiveness.

### **3.2. Some descriptive insights of the gender gap in ATC**

Out of our respondent sample, there are 64,599 men and 74,783 women and their respective perception of competition is divergent. The average of the competition rate is 7.32 for men and 7.02 for women over time and nations.<sup>8</sup> Put differently, men’s rate is 4 percent more positive than women’s rate, or the average gender gap in competitiveness, measured through opinion, is 4%. Like in lab experiment settings, we thus observe a significant gender

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<sup>8</sup> The men’s mean is significantly different from the women’s mean at 0.00001%.

gap in ATC using large international surveys and with competition preferences measured by a very simple question.

Figure 2 shows that the difference between men and women comes primarily from the highest rates. The proportion of women is dominant up to rate 7, while above this rate the proportion of men is higher. The largest differences stand at rate 6, where women are more numerous, and rate 10, where men are more numerous.

## FIGURE 2

Over time, according to the EVS wave, we still observe a gender gap in competition rate (Figure 3). Even if the ATC becomes less and less positive over time,<sup>9</sup> the gender gap is stable. Or at least, it is not possible to underline a pattern in the gender gap. The difference in competition rate averages according to respondent's gender is 0.28 at the oldest wave, 0.33 at the intermediate and 0.26 at the most recent one.

## FIGURE 3

Note however that the cross-section nature of our data does not enable us to get clear insights about the evolution of age patterns through time and finally into the underlying nature-nurture debate. Indeed, without panel data, we cannot assess exactly the individual evolution through age of the ATC. As in other studies on age and competitiveness, we cannot ignore the possibility that the attitudes toward competition evolve through time and, hence, that the ATC of 50-years-old subjects in the waves is not fully comparable to the ATC of the 20-years-old subjects when they will be 50 years old. However, we consider a possible cohort effect in the estimations by investigating the results for each wave of the survey separately.

Over countries, we logically observe more differences. The general ATC varies over the nations scrutinized (Figure 4). Azerbaijan is the nation with the most negative opinion of competition, and Romania with the most positive. Beyond these average differences of level, we observe a difference between men and women in all countries studied. In almost every country, the rate given by men is higher than that given by women. Sometimes, the gender gap is small, like in Azerbaijan or in France, sometimes it is large, like in Sweden or Norway. In a first look, we do not remark any clear relationship between general characteristics of

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<sup>9</sup> This observation pleads to include a time effect into the regressions.

nations and the magnitude of the gender gap. It is either small or large in countries with established free-market economy or in countries formerly with a communist regime. It is either small or large in nations with gender egalitarianism tradition or in nations with catholic tradition, etc.

#### FIGURE 4

So, even if we observe at a first glance a general gender gap in each wave and country studied, this gender gap may vary. Yet, we have to be sure that the gender gap holds in multivariate analysis and to investigate the gendered relationship between age and competition perception in accordance with the predictions highlighted previously.

### 3.3. Estimation strategy and method

Our econometric strategy is twofold. First, we assess the presence of the gender gap in ATC –measured by the question presented above– by running the model on the full sample, i.e. men and women together. The gender gap is thus estimated by the coefficient associated to the dummy gender variable *Female*. This first stage tests the existence of a gender gap in ATC as observed in competitiveness by the experimental literature. It also informs us about the influence of age on ATC, independently from gender.

In a second step, we apply our model on two gender-based subsamples: men versus women. The purpose is to know if age plays a similar role in ATC for men and women. More precisely, it enables us to test the various predictions (P1 to P4) detailed above and deduced from the literature survey.

As summed up previously, the literature-deduced predictions establish various possible relationships between competitiveness and age with potential differences between males and females. We consider the multiple potential relationships by testing three functional forms between competition rate and age: linear, log transformation of age and a quadratic transformation. We do it for each specification or sub-sample of respondents and present the results either in the main text or in the Appendix.

Beyond, a quadratic relationship needs more specific empirical tests to make us confident about its existence. To achieve it, we perform three usual tests each time we implement a quadratic relationship. First, the test proposed by Lind and Mehlum (2010) relies on two necessary conditions, namely that the second derivative has the right sign and that the



extremum point is within the data range. Second, we use the Fieller's (1954) method to estimate the 95% confidence interval of the estimated extreme point –a maximum or a minimum according to the shape– of the relationship to be sure that it belongs to the range of the variable values. In a third test, we split the sample in two sets according to the extreme value of the relationship: the observations below the extreme value and those above. For each subsample, we estimate our linear model to check if the estimated coefficients have the same signs as those obtained in the overall sample. If the estimated relationship passes all the three tests, we are confident on the existence of a quadratic form.

As estimation method, we use OLS with correction of the standard errors that are clustered by countries to reduce the influence on error terms of unobserved heterogeneity related to respondents' country. Even if the explained variable is an ordered categorical variable –but with a large scale from 1 to 10–, this choice of OLS estimates has huge advantages. OLS model is useful to gauge non-linear relationship since the estimated coefficients obtained through *logit* model and likelihood maximum method are not meaningful. We also estimate an ordered *logit* model as a robustness check; we comment it in the main text and display the detailed outcomes in the Appendix.

Finally, we include usual control variables: income, education, work status, religiosity, and family characteristics (to live with someone, and to have at least one child). All variables are described in Section A2 of the Appendix. Moreover, we add into our specification a fixed effect by country and a fixed effect by EVS wave to capture invariant unobservable factors related to national effects and survey period<sup>10</sup>. As a result, our empirical model explains ATC measured with the rate (from 1 to 10) given by each respondent '*i*' living in country '*j*' during the '*t*' EVS wave as follows:

$$Competition_{i,j,t} = \alpha Female_i + \beta Age_i + \lambda X_{i,j,t} + \mu_j + \gamma_t + \varepsilon_{i,j,t},$$

where the *Competition* variable corresponds to the competition rate,  $\alpha$  measures the gender gap in ATC –and we expect that  $\hat{\alpha} < 0$  because *Female*<sub>*i*</sub> takes the value of one for female respondents–, *Age*<sub>*i*</sub> the age of the respondent,<sup>11</sup>  $X_{i,j,t}$  a vector of variables describing the respondent's characteristics,  $\mu_j$  country fixed effects,  $\gamma_t$  EVS wave fixed effects and  $\varepsilon_{i,j,t}$  the error term that is assumed identically and independently distributed. Beyond his gender and age, the respondent's characteristics are his income level in 4 categories, his work status in 9

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<sup>10</sup> Since we do not intend to compare countries, we do not use population weights.

<sup>11</sup> For the quadratic relationship, our specification is  $\beta_0 + \beta_1 Age + \beta_2 Age^2$ .

categories, a binary variable indicating if he lives with someone and another if he has at least one child, and lastly his religiosity.

Let us discuss briefly the limitations of our method. Since we work on survey data, we have no identification strategy to move from correlation to causality so that we discuss our results carefully without making explicit causal claims. Of course, it is possible that unobservable variables could influence the estimated relationships so that some of the observed patterns may be due to other factors. However, we are rather confident in our estimations because we introduce a lot of control variables that cover a large range of factors (education, family situation, economic success, and religiosity). Moreover, in Section 6, we will investigate some potential mechanisms of ATC, especially risk aversion that we will discuss in details.

#### **4. A gender gap in ATC and its U-shaped relationship with age**

Our investigation starts with the analysis of the determinants of ATC. We want to explore the presence of a gender gap in ATC in our large cross-country sample. We also examine the nature of the relation between age and ATC.

In Table 1, we report the estimations of the three functional forms: the linear specification with *Age* alone, the logarithmic specification with *Log (Age)*, and the quadratic specification with *Age* and *Age*<sup>2</sup>. Two main conclusions emerge.

**TABLE 1**

The first key result is the gender gap in ATC: we observe that Female is significantly negative in all estimations. More precisely, men have a more positive ATC than women, in line with former literature. In terms of economic significance, women have an ATC which is lower by 0.26 point in all estimations, all other things being constant. For example, the computation of the predicted ATC for each gender with the third specification yields a value of 7.30 for men to be compared with 7.04 for women. In other words, men rate competition 4% more positively than women. This gender gap of 4% is comparable to what is found in the literature, even though we need to be careful in any claim about the economic relevance of gender gaps in preferences (Nelson, 2015).

It could be interesting to relate this figure to other measures. There are recent works in experimental literature on the intensity of the competitiveness gap (Petrie and Segal, 2015; Ifcher and Zarghamee, 2016; Saccardo, Pietrasz and Gneezy, 2018). However, their results cannot be compared with ours, since the dimension of our historical measures is too different from the dimension of these experimental measures. We can however compare our measure with the one obtained in Fortin (2005) on labor market outcomes, always keeping in mind the need to be very careful in making claims of economic relevance. Using the same question about competition from the EVS, Fortin (2005) found that agreement with ‘competition is good’ increases the probability of being employed by about 3 to 4% and decreases the probability of working part-time by about 5%.”

We can question the persistence of this gender gap in ATC across time and space.<sup>12</sup> To this end, we perform additional estimations. First, we redo the estimations by considering separately the three waves of EVS. We find a significantly negative coefficient for *Female* in all three waves, with a coefficient ranging between -0.27 and -0.30. Therefore, we can conclude that gender differences in ATC are stable over time. Second, we perform the estimations by considering separately respondents of each country of the sample. We observe that the gender gap is very stable over the countries since *Female* is negative in all but three countries (Georgia, Kosovo, Macedonia, where the coefficient is positive but not significant) and significant in the vast majority of them. More accurately, the coefficient is significant in two thirds of countries of our sample. This finding is of importance since the gender gap tends to be observed whatever the country with local variation in terms of significance and magnitude.

The second key result deals with age. We find no significant coefficient for *Age* in the first specification and for *Log (Age)* in the second specification. However, *Age* is significantly negative and *Age*<sup>2</sup> is significantly positive in the third specification. Hence, these results suggest a U-shaped relation between age and ATC. This finding is of prime importance for our study. We thus perform three tests to check the relevance of our conclusion, which are detailed in Section A4 of the Appendix. They provide clear evidence that the relevance of the U-shaped relation between age and ATC. We illustrate this relation in Figure 5 which depicts the nonlinear impact of age on predicted ATC from our model with quadratic functional form. We note that the minimum predicted competition rate is reached at 44.1 years.

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<sup>12</sup> All details are provided in Section A3 of the Appendix.

## FIGURE 5

In analyzing the other variables, we note that income and education are positively associated with ATC, in line with the intuition that economic success favors a positive attitude toward competition. Interestingly, the variables dealing with the personal situation are also significant: living with someone and having at least one child favor a positive ATC.

As a robustness check of our results, we run an ordered logit model as an alternative method. This model estimates the impact of explanatory variables on the probability of climbing the scale of competition rate. As detailed in Section A6 of the Appendix, for the three functional forms of the variable *Age*, we obtain the same findings as in the main estimations with the OLS model, when we employ an ordered *logit* model instead. First, we observe again a gender gap in ATC with the significantly negative coefficient for *Female* in all estimations. Second, we obtain evidence for the U-shaped relation between age and ATC. While *Age* and *Log (Age)* are not significant in the two first specifications, *Age* is significantly negative and *Age*<sup>2</sup> is significantly positive in the third specification. Thus, our key findings about the determinants of attitude toward competition are confirmed with the use of the ordered logit model. There is a gender gap in ATC, women perceiving less positively competition than men, and there is a U-shaped relationship between ATC and respondent's age.

Furthermore, we observe the U-shaped relation between age and ATC for two EVS waves out of three (see section A3 of the Appendix): the two last ones. For the first one, the relation seems positive but significant at 5% threshold.

Note that even if the estimated coefficients, as well as the adjusted R-squares, are small, they are similar and comparable to those found in the literature (see, e.g., Guiso et al., 2003). We find high significance for a large number of explaining variables, suggesting we have identified relevant relationships.

### **5. Is there a gendered effect of age on competitiveness?**

In this section, we question the stability of the relationship between age and ATC in regard with the gender of the respondents.

## 5.1. A gendered effect of age on ATC

We investigate how age influences the gender gap in ATC. To compare the impact of age for each gender, we perform separate regressions for men and for women. We adopt separate regressions by gender rather than one unique regression with interactive variables for the full sample for three reasons. First of all, separate regressions enable us to analyze the change by gender of the ATC with age. Including an interaction term between gender and age in the estimations would only inform about how the gender gap evolves with age. Our empirical strategy enables us to analyze the change of the gender gap with age, but also to examine how ATC changes with age for each gender. Second, the other variables can also vary by gender, which means that a regression on the full sample would require interaction terms between the variable *Female* and all other variables than age. However, such an approach would make more difficult the readability of the interaction term between age and gender, because other interaction terms with gender would be correlated with it. Third, we have a very large number of observations allowing separate regressions.

Table 2 reports the estimations. We use again the three functional forms (linear, logarithmic, and quadratic) for age to check to what extent age influences ATC.

### TABLE 2

The key finding is the gendered effect of age on ATC. We find evidence that age has a different influence for men and women. With the linear and the logarithmic functional forms, we observe that age has a significantly negative impact for men and a significantly positive impact for women. *Age* and *Log (Age)* are always significant; however, they are negative for men and positive for women. With the quadratic functional form, we again confirm the positive impact of age on ATC for women: we find no significant coefficient for *Age* but a significantly positive one for *Age*<sup>2</sup>. However, we find support for a U-shaped relation between age and ATC for men: the coefficients are significantly negative for *Age* and significantly positive for *Age*<sup>2</sup>. Our results thus show that age favors ATC for women, while it exerts a nonlinear effect on ATC for men with a U-shaped form.

We must however perform additional tests as before to confirm the U-shaped form for the relationship between age and ATC for men. These tests are reported in Section A4 of the Appendix. The three tests confirm the U-shaped relation between age and ATC for men. By

contrast, the tests provided for the subsample of women respondents conclude to the absence of a quadratic relationship.

Therefore, ATC has a U-shaped form with age for men, but becomes more positive with age for women. This clear result shows a gendered effect of age on ATC, which has several implications. First, the U-shaped relation between age and ATC we found for the entire population (Table 1) is explained by the U-shaped relation observed for men only. Second, the analysis of the gender gap in ATC should not be done without taking age into account. Since age influences the gender gap in ATC, any finding on the gender gap in competitiveness can be driven by the average age of respondents in the sample used for the study. Third and foremost, these findings lead to a U-shaped form for the gender gap with age.

## **5.2. A non-linear gender gap in ATC over age**

The gender gap is reducing with age as long as ATC becomes less positive with age for men since in the meantime ATC becomes more positive for women. But once the ATC increases with age for men (over 53 years), the gender gap is first reducing slower and then is increasing once the increase of ATC for men becomes higher than the one for women.

We can represent the gender gap in ATC over age based on our findings. For women, our investigation has shown that the quadratic functional form is not the most relevant one, given the non-significant coefficient for *Age* (see Table 2). We adopt the linear functional form rather than the logarithmic one, since the coefficient of *Age* is more significant in the former. For men, we obviously adopt the U-shaped relationship and, hence, the quadratic functional form.

Figure 6 depicts the change of the predicted ATC with age. As expected, ATC increases with age for women, while it has a U-shaped form for men with a minimum around 53 years. So, the gender gap in ATC is a U-shaped curve with a minimum value around 60 years. Therefore, the gender gap in ATC is not constant over age and reaches a minimum for 60-year-old people.

### **FIGURE 6**

How to explain our findings? We can turn to the four predictions derived from the literature. Our results reject the gradual decline assumption (prediction P1) since we do not

observe such decline with age of ATC. They are also at odds with the mid-life peak assumption (prediction P2) supported by Mayr et al. (2012) in the absence of an inverted U relation for both genders. We also reject the menopause assumption (prediction P3). While Flory et al. (2018) argue that ATC of women relative to men should be reduced after menopause, we do not observe a major change in ATC for women around age 50.

Our results loosely support the hormonal assumption (prediction P4), at least partly. For men, hormonal reasons rely on the influence of testosterone on competitiveness (Eisenegger et al., 2017). Since there is a gradual decline with age of testosterone after the age of 25, we should then observe a gradual reduction of ATC with age. This prediction is however at odds with our finding of a U-shaped form with a minimal value at 53. In other words, hormonal reasons can rationalize part of the general pattern, but do not provide a complete explanation for our findings for men. They can explain the reduction of ATC with age until 53 but fail to elucidate the increase of ATC when men become older.

For women, biological explanations related to hormones are based on the negative relation between progesterone and competitiveness (Buser, 2012). The sharp reduction of progesterone between 35 and 50 hence suggests increased ATC during that period. We do observe this change; however, hormonal reasons cannot explain why the increase continues over age 50.

In a nutshell, our key finding of a U-shaped relation between age and the gender gap in ATC is not fully explained by any of the four predictions provided by the previous literature. Moreover, our findings do not confirm previous empirical results based on experiments. The contrast between our results and those from former works might come from the fact that our investigation is performed on a large cross-country sample which contains large quantity of respondents in terms of age. Obviously, further investigations, especially with experimental methods, are needed to assess the validity of our results.

### **5.3. Additional comments and results**

While our analysis is focused on the gendered effect of age, it is noteworthy to check whether we observe gendered differences for the additional determinants of ATC. To this end, we comment the results for the other explaining variables. Figure 7 presents the most interesting variables and the total outcomes are given in Section A5 of the Appendix. We find mostly similar results for men and women. We notably observe the same positive association between income and ATC for both genders. Interestingly, we point out however two

differences. First, education is only associated with higher ATC for women. It is not significantly related to ATC for men. Second, the variables dealing with the personal situation matter more for ATC of men than of women. Having at least one child is only significantly positive for men, and the statistical and economic significance of the positive coefficient for living with someone is higher for men.

## FIGURE 7

For robustness sake, we perform estimations with an ordered logit model. We have adopted an OLS model even if our dependent variable is an ordered polynomial one. This specification was notably motivated by the interpretation of the non-linear relationship. We can however question whether the choice of this model has an impact on our findings. That is why we run an ordered logit model as an alternative method. The results are detailed in Section A6 of the Appendix. We observe that results are similar to our findings in the main estimations with the OLS model. We find again evidence of the gendered effect of age on ATC. The linear and logarithmic specifications show that age exerts significant effects which are respectively negative for men and positive for women. With the quadratic specification, there is again evidence of a U-shaped relation between age and ATC for men and confirmation of the positive relation for women. Namely  $Age$  is significantly negative for men but not significant for women, while  $Age^2$  is significantly positive for both genders. Hence, the main conclusion about estimations performed with the ordered logit model is that they corroborate the findings obtained with the OLS model and thus strengthen the robustness of our conclusions.

## 6. Discussing the potential mechanisms

This section is devoted to the discussion of several potential mechanisms which can underlie the gendered link between age and ATC. We alternatively investigate a cohort effect, the differences in risk aversion, the differences in the perception of success, and the influence of social norms through gender stereotypes.

### 6.1. A cohort effect?



A cohort effect can explain our results in the sense that the 50-year-olds in the waves have a different ATC than the 20-year-olds will have when they will be 50. In other words, what we interpret as the age effect would indeed be a cohort effect.

Because of the cross-section nature of our data, we cannot investigate the evolution of age patterns through time. However, we can examine the results for each wave of the survey separately – see Section A7 of the Appendix for the details.

First, we have shown above that the gender gap in ATC is stable across the waves of the survey. On Figure 3, we observe that the gender gap in ATC is respectively of 0.28, 0.33, and 0.26 for the 1990-1993, 1999-2001, 2008-2010 waves. Hence, we do not observe any change in the gender gap in ATC over the waves.

Second, we investigate the relation between age, gender, and ATC separately for each wave of the survey to check whether we observe changes across waves. To this end, we only keep countries included in all three waves of the survey: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Great Britain, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, and Sweden.

Figure 8 depicts the change of the predicted ATC with age for each wave of the survey. Interestingly, we observe that the gender gap is decreasing with age for the first wave while it has a U-shaped form for the two last waves. If there was a cohort effect, we should see that the gender gap in ATC is moving with age across the wave surveys. We however do not find such evidence. For instance between the 1999-2001 wave and the 2008-2010 wave, we observe that the minimum age for the gender gap in ATC increases of 4 years (from 52 to 56 years) while there is a gap of 8 to 10 years between both generations.

## **FIGURE 8**

These findings tend not to support a cohort effect to explain our results. First, we find that the gender gap in ATC is stable across the three waves: we have not observed any increasing or decreasing trend across the three waves. Second, we do not observe a change with age of the gender gap in ATC in line with the aging of generations.

However, we do observe some differences across waves. For example, the first wave displays an increasing ATC for men and a decreasing ATC for women, resulting in a clearly decreasing gender gap in ATC, while the two further waves display the U-shaped pattern of

the gender gap. It is difficult to find clear explanations for such differences but it can be related to changes across time in the norms of men and women regarding competition, potentially in connection with the mechanism of gender stereotypes explored below (§6.4).

## **6.2. Differences in risk aversion**

Previous research shows a gender gap in risk aversion, with women being less tolerant than men towards risk (e.g., Croson and Gneezy, 2009; Niederle, 2016) but also that, both for men and women, risk aversion evolves with age. More specifically, recent results confirm that risk aversion tends to increase with age: there is a continuous trend to greater risk aversion from the onset of adulthood to old age, though this trend tends to smoothen after age 65 (Dohmen et al., 2017; Schildberg-Hörisch, 2018). Clearly, this age pattern of risk aversion does not fit in any way with the age patterns for ATC that we observe.

We can propose an empirical way of testing the influence of risk on our results and conclusions. As we do not have any variable dealing with risk perception into the survey, we propose to use a respondent characteristic that we suppose correlated to risk, namely self-employment. Indeed, the vast behavioral research about entrepreneurship and self-employment clearly points out that self-employed people tend to exhibit lower risk aversion (e.g., Cramer et al., 2002; Hvide and Panos, 2014; see Åstebro et al., 2014, for an overview)<sup>13</sup>. Yet, among our survey respondents, we can distinguish people who are self-employed from other people. Even if some of them have this working status by obligation (and not by choice), we assume, following the literature, that self-employment could provide a reasonable proxy for identifying higher risk-tolerant people. Of course, a limit of our strategy is that the working status becomes more and more “retired” with age, implying that the category “self-employed” contains fewer old people.

Nevertheless, beyond those limits, the results may inform us about the potential interference of risk. Therefore, we estimate the gender gap in ATC and the functional form of the relation between ATC and age by distinguishing two subsamples: the self-employed respondents and the others. Then, we apply our model to four subsamples according to the self-employed status and the respondent gender.

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<sup>13</sup> Note that in this strand of research, self-employment is often used as a proxy for entrepreneurship. For example, Cramer et al. (2002) define their entrepreneurship variable as a dummy variable taking on the value of one for individuals who have ever been self-employed.

The detailed outcomes are presented in Section A8 of the Appendix. Several conclusions emerge. First, we observe a gender gap in ATC for the self-employed respondents and for the other respondents (Table A8.1). Moreover, the gap is larger for the self-employed sample where it reaches -0.33, to be compared with -0.26 for the other respondents. In addition, the estimated functional forms of the relation between ATC and age are very similar. The quadratic relation is not confirmed for the self-employed respondents and highly significant for the other respondents. However, the estimated coefficients are close across the two subsamples and one of two is significant. It is possible that the lack of significance comes from the smaller sample (7,900 observations versus 131,000) and from the fact that old people are less present in the subsample due to the definition of the category “self-employed”. Second, when we distinguish the men from the women and compare the two subsamples (Table A8.2), we note no difference for women. For men, the linear and log functional relations are not observed, and the quadratic form is only for other respondents. However, the coefficients estimated for the self-employed are not statistically different and have very similar values than the coefficients estimated for other respondents. Once again, the lack of significance can be explained by the size and the characteristics of the subsample containing the self-employed respondents.

To sum it up, previous literature and the empirical investigation tend to show that the gendered relation between age and ATC is not primarily related to risk perception.

### **6.3. Differences in the perception of success**

Another possible mechanism deals with the general idea that men could be more sensitive to the dynamics of success and to social comparisons (Schmidt et al., 2015). Accordingly, the perception and influence of success can be different for men and women. More specifically, the way they interpret their economic and/or family success may differ. Yet, our estimations (Figure 7) tend to confirm that the impact of success variables is different for men and women. Indeed, we find that women ATC is *less* sensitive both to family success and to economic success. For family success, having at least one child has a significant positive effect on ATC only for men, and the positive coefficient for living with someone is higher for men. For economic success, the value and significance of the negative coefficients for the variable “unemployed” are always lower for women.

Hence, it could be the case that the difference of impact of age on ATC is linked to the way men and women interpret their family and/or economic success in terms of aspirations

fulfillment and values self-reinforcement. Since men appear to be more sensitive to success, it could explain why they are more stressed with competition until age 50 when they are under the pressure of the race (in terms of work, family, etc.), but that they are more and more positive from age 50 when the game is closer to the end. On the other side, if women are less sensitive to success, they may exhibit a more stable ATC through time.

#### **6.4. The impact of social norms: gender stereotypes**

Our findings suggest that the gendered effect of age on ATC is at best only partly explained by biological factors. Complementarily, we then turn to the cultural influence on the impact of age. We tackle the question whether culture may have an impact on the evolution of ATC of men and women over age. One key cultural factor which affects the gender differences is the existence of gender stereotypes. Bordalo et al. (2019) have recently shown that gender stereotypes contribute to gender gaps by shaping the beliefs of individuals. That is why we investigate the influence of gender stereotypes rather than other values.

To do it, we propose two measures of stereotypes: one defined at the individual level, the second at the nation level. Indeed, the influence of stereotypes can occur at the individual level through personal values, beliefs, and opinions, but also at the country level through the values of the society and its norms that influence individual attitudes.

We measure gender stereotypes with a question asked in each EVS wave and dealing with the role of male and female into a household. The wording is “People talk about the changing roles of men and women today. For the statement ‘Both the husband and wife should contribute to household income’, can you tell me how much you agree?”, with four items of answer: “agree strongly”, “agree”, “disagree” and “disagree strongly”. Starting from this question and the answers given by respondents, we calculate two measurements of gender stereotypes.

This question, also used by Guiso et al. (2003) as a “measure of attitude toward women” (p. 240), is a good candidate to catch gender stereotypes, because of at least four reasons. First, the wording is large enough to embrace potentially a lot of dimensions of sexism. Second, the question does not deal directly with gender fight, or other current demands. Third, there is enough variation into the answers given by respondents, meaning that there is no consensus on this point. And lastly, the question is rather neutral and not marked as favorable to one side or the other.

The individual-level stereotype is a dummy variable which takes the value of one if the respondent answers any other item than “agree strongly” to the statement. Out of our sample of respondents, 64% have gender stereotypes (see Section A9 of the Appendix). Unsurprisingly, women have less frequently gender stereotypes than men.

The second variable is also a dummy variable indicating if the respondent lives in a country with high gender stereotypes. First, we calculate the mean of the answer to the question by nation and EVS wave.<sup>14</sup> Second, we compare the national-wave mean for each respondent with the overall mean in our sample, and we consider that the respondent lives in a country with high gender stereotypes when the national-wave mean exceeds the overall mean. According to this definition, 47% of the respondents live in a country with high gender stereotypes. Logically, the proportion is very close between men and women.

Our purpose is to use these two new variables to distinguish four sub-samples of respondents: people having gender stereotypes versus people not having gender stereotypes, and people living in countries with low gender stereotypes versus high gender stereotypes. The idea is to check if stereotypes have a direct effect on ATC. So, we include into our baseline specifications the new variables of gender stereotypes. The detailed results are presented in Section A9 of the Appendix. In a first specification, we introduce simultaneously the two new variables, in the two others we introduce successively one of the variables. First of all, the gender gap measured by the coefficient associated to the variable *Female* does not change regardless of the specification,<sup>15</sup> and the impact of age as well. Then, only the individual-level gender stereotype is significant with a negative sign. It means that respondents with gender stereotypes have worst opinion on competition than people without such stereotypes.

Before testing the stability of the age-competitiveness relationship according to gender stereotypes, we also estimate the gender gap for all the four sub-samples in order to check its stability. We sum up the results in Figure 9.<sup>16</sup>

## FIGURE 9

Beyond the high significance of the gender gap regardless of the subsample, some remarks arise. Focusing on the raw estimated coefficient, we observe a tiny difference

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<sup>14</sup> The values attributed to the items are 1 for ‘agree strongly’, 2 for ‘agree’, 3 for ‘disagree’, and 4 for ‘disagree strongly’. The average across the nations and waves of our sample is 1.84.

<sup>15</sup> According to the specification, the estimated coefficient is -0.27 or -0.26.

<sup>16</sup> For the detailed results, see Section A9 of the Appendix.

between respondents according to their individual gender stereotype (-0.26 and -0.27) and larger difference according to the national stereotype (-0.24 and -0.29). Yet, we turn to the beta coefficient that considers the differences in variance across the subsamples, and more marked results emerge. Indeed, we see that the gender gap is larger when respondents have individual stereotypes or live in a country with high stereotypes. Furthermore, the spread between subsamples is greater for national than for individual stereotypes. At a first glance, the gender gap thus appears to be impacted by cultural factors: it is larger with strong stereotypes, either individual or national. This result suggests that stereotypes could exacerbate the differences in competition preferences between men and women.

Now, we consider the relationship between age and ATC by gender according to the individual gender stereotypes. Here, we present the most relevant results we obtain once we distinguish the various subsamples. The detailed discussion is available in Section A9 of the Appendix that displays the estimations and the test dealing with the quadratic functional form.

Without making a distinction between men and women, we observe that the quadratic form of the impact of age is only relevant for respondents with individual stereotypes. The relationship between age and ATC has a U-shaped form for this sub-set of respondents. For respondents without individual gender stereotypes, alternative functional forms show that the best fit is obtained with a linear relationship. The ATC of respondents without gender stereotypes is more and more positive with age, without depletion of the marginal effect over age. Once we distinguish men and women, the outcomes are more complex and summed up by Figure 10. It shows that for men with stereotypes, the U-shaped form of the relationship between age and ATC is the most relevant, while male respondents without individual gender stereotypes experience no impact of age on their ATC. The situation is simpler for women. Regardless of their individual gender stereotypes, women have a positive relationship between age and ATC. Their attitude toward competition is more and more positive, independently from the gender stereotype they have.

### **FIGURE 10**

So, individual gender stereotypes affect the relation between age and ATC for men but not for women. The U-shaped relation is only observed for men with stereotypes while no relation is found for men without stereotypes.<sup>17</sup> As a consequence, the U-shaped form of the

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<sup>17</sup> We obtain equivalent conclusions if we change the estimation method.

gender gap in ATC is only observed for people with individual gender stereotypes, as illustrated in Figure 10. For respondents without stereotypes (panel at the top of Figure 10), the gender gap continuously decreases with age since ATC increases with age for women and does not change with age for men. The gender gap is however still observed for the oldest persons and thus does not disappear. For respondents with stereotypes (panel at the bottom of Figure 10), the gender gap has a U-shaped form with a minimum at 57 years.

We turn to the estimations with national-level gender stereotypes summed up in Figure 11. Once again, the details are available in section A9 of the Appendix. On the entire sample, we observe a distinction about the impact of age according to this stereotype, which is strictly similar to our conclusion made with the prior distinction based on individual stereotypes. Age has no impact on ATC for people living in a country with low stereotypes and has a U-shaped relationship with ATC for people living in a country with high stereotypes. The results are confirmed by the specific tests on the U-shaped form. Therefore, regardless of the gender stereotype measurement, we obtain identical relationship between age and ATC. These first results hide a more nuanced situation once we distinguish men and women as in Figure 11. On the one hand, we obtain the same findings for men living in countries with high and with low stereotypes: a U-shaped relation between age and ATC. On the other hand, a striking difference emerges for women: the improvement of ATC with age for women is only observed in countries with high gender stereotypes.

### FIGURE 11

Consequently, a similar effect of age on the gender gap in ATC is observed for both groups of countries and is thus not conditional to the level of country stereotypes.<sup>18</sup> However, the minimum age for the gender gap differs for both types of countries. In countries with low stereotypes, the not-significant impact of age for women leads to the fact that the curves representing ATC for men and for the gender gap have similar evolutions with age. The age minimizing the gender gap in ATC is then 54 years. In contrast, in countries with high stereotypes, the rising of ATC with age for women increases the minimum age of the gender gap around 60 years.

To sum up the conditioned effects by gender stereotypes, we find that such stereotypes alter the gendered effect of age on ATC. In the main estimations, we showed that the relation

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<sup>18</sup> We obtain equivalent conclusions if we change the estimation method.

of age with ATC has a U-shaped form for men and is linearly positive for women. While these results are observed in the presence of high stereotypes, they change in the presence of low stereotypes: the relation is not significant for men with low individual stereotypes and for women with low collective stereotypes. These preliminary findings suggest that cultural factors may play a significant role on the gendered effect of age on competitiveness.

## 7. Conclusion

In this paper, we investigate the effect of age on the gender gap in attitude toward competition. We use survey data to perform a cross-country analysis on a broad and representative sample of individuals. Our key finding is the gendered effect of age on ATC. Indeed, we observe that ATC has a U-shaped relation with age for men with a minimum around 53 years, while it increases with age for women. Both these results generate a U-shaped pattern for the relation between age and the gender gap in ATC. The minimum gender gap is obtained at age 60, with men having a more positive ATC than women at all ages. Our findings are not in full accordance with any of the hypotheses considered in the literature, and also do not confirm the results from the experimental works, so that further investigations, especially based on experimental methods, are required to assess their validity.

In addition to these new results concerning the effect of age on competition preferences, we have two other contributions to the literature. First, we show that the gender gap in competitiveness highlighted by the experimental literature also appears in the attitudes toward competition across a large cross-country sample. Second, we are able to detect a potential role for cultural factors (namely, gender stereotypes) on the gender gap in attitudes toward competition.

Finally, the central message from our analysis is the importance of age in understanding the relation between gender and competitiveness. From a policy perspective, it underlines the importance of considering age to appraise the influence of gender preferences differences on labor market outcomes. Policy implications of the literature on the gender gap in competitiveness deal primarily with the implementation of affirmative actions (Niederle et al., 2013; Balafoutas and Sutter, 2012; Sutter et al., 2016; Balafoutas et al., 2018). In this respect, our findings support actions focused on the early period of the career, where the gender differences in attitudes toward competition are likely to be more pronounced.



From a research perspective, our analysis stresses the importance to investigate the gender gap in competitiveness for various ages. Our research is an initial step towards understanding the effects of age on the gender gap in competitiveness. Further work is needed to check the relevance of our results in experimental and survey-based studies.

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**Table 1. Gender gap in ATC.**

	Linear specification coef. (s.e.)	Log transformation coef. (s.e.)	Quadratic specification coef. (s.e.)
Female	-0.26*** (0.024)	-0.26*** (0.024)	-0.26*** (0.024)
Age	0.0010 (0.0012)		-0.016*** (0.0044)
Log Age		-0.00021 (0.049)	
Age <sup>2</sup>			0.00018*** (0.0001)
Income level (low as reference):			
medium	0.14*** (0.031)	0.14*** (0.031)	0.15*** (0.031)
high	0.35*** (0.043)	0.35*** (0.043)	0.35*** (0.043)
dk refuse	0.22*** (0.046)	0.21*** (0.046)	0.21*** (0.046)
age completed education (no education as reference):			
14 y and less	-0.027 (0.13)	-0.031 (0.13)	-0.0025 (0.12)
[15 - 16]	0.018 (0.12)	0.0090 (0.12)	0.051 (0.12)
[17 - 18]	0.082 (0.13)	0.071 (0.13)	0.11 (0.13)
[19 - 20]	0.24* (0.13)	0.23* (0.13)	0.27** (0.13)
21 y and more	0.33** (0.13)	0.32** (0.13)	0.36*** (0.13)
dk refuse	-0.023 (0.15)	-0.030 (0.14)	0.0044 (0.15)
work status (full time as reference):			
part time	-0.100** (0.044)	-0.100** (0.044)	-0.11** (0.043)
self employed	0.20*** (0.050)	0.20*** (0.050)	0.20*** (0.050)
retired	0.022 (0.035)	0.047 (0.037)	-0.037 (0.036)
housewife	-0.014 (0.047)	-0.011 (0.047)	-0.031 (0.046)
student	0.13*** (0.045)	0.12** (0.047)	0.070 (0.046)
unemployed	-0.18*** (0.059)	-0.19*** (0.059)	-0.19*** (0.058)
other	-0.16*** (0.057)	-0.16*** (0.057)	-0.17*** (0.057)
dk refuse	-0.20 (0.19)	-0.20 (0.19)	-0.22 (0.19)
Living with someone (1 if yes)	0.035* (0.018)	0.035* (0.018)	0.054*** (0.019)
Having child (1 if yes)	0.029 (0.023)	0.041* (0.022)	0.059*** (0.021)
religiosity (religious person as reference):			
not religious person	-0.0033 (0.035)	-0.0054 (0.035)	-0.0023 (0.035)
convinced atheist	-0.17*** (0.061)	-0.18*** (0.061)	-0.17*** (0.061)
dk refuse	-0.12*** (0.046)	-0.12*** (0.045)	-0.12*** (0.045)
Constant	7.64*** (0.17)	7.68*** (0.26)	7.94*** (0.18)
Country fixed effects	Yes	Yes	Yes
EVS wave fixed effects	Yes	Yes	Yes
Observations	139,382	139,382	139,382
Adjusted R-squared	0.073	0.073	0.074

Notes: Attitude toward competition (ATC) is measured through the question: “How would you place your views on this scale? 1) competition is harmful, it brings out the worst in people; 10) competition is good. It stimulates people to work hard and develop new ideas”. The sample contains respondents from 48 nations and three European Value Survey waves (1990-1993, 1999-2001 and 2008-2010). Method estimation is OLS. Standard errors in brackets are clustered by country. \*, \*\* and \*\*\* mean respectively  $p < 0.1$ ,  $p < 0.05$  and  $p < 0.01$ .

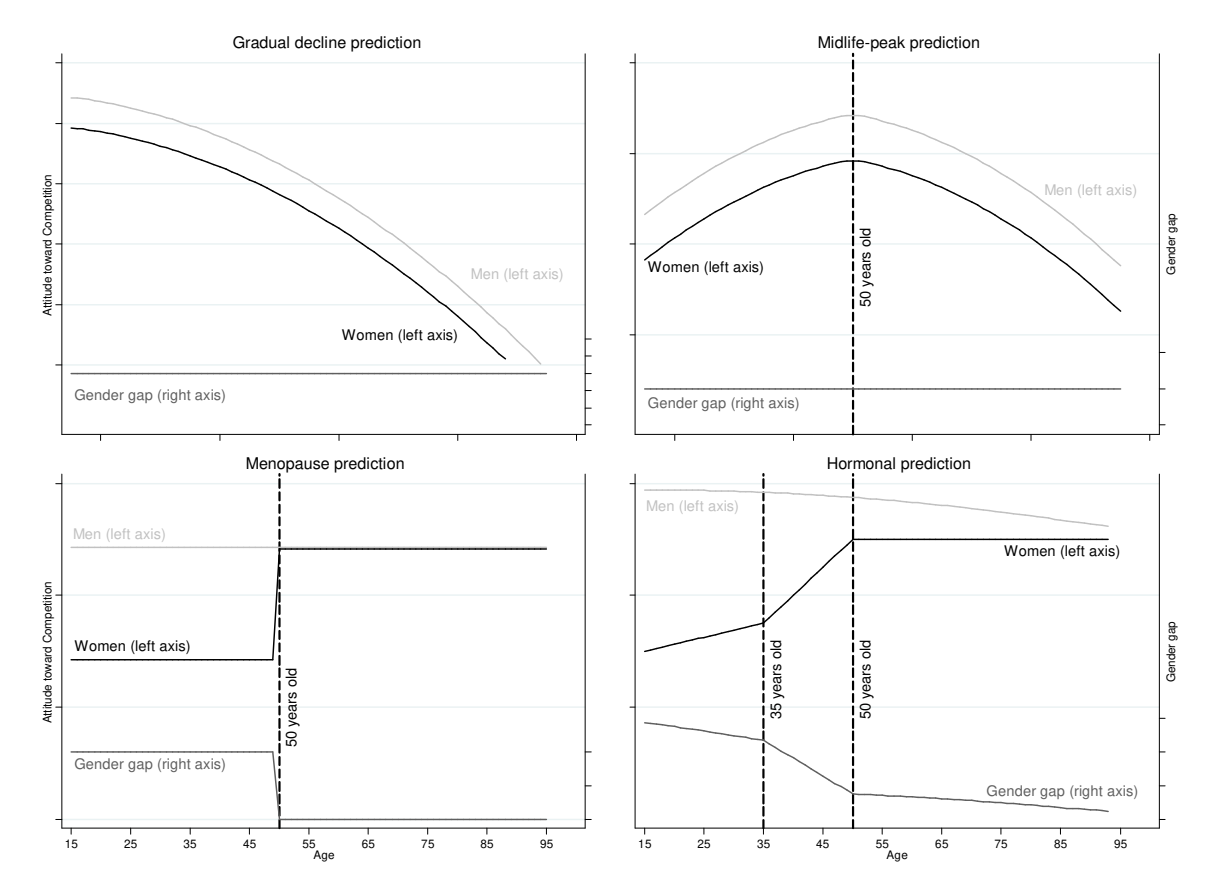
**Table 2. The effect of age on ATC by gender.**

	Linear		Log transformation		Quadratic	
	Men coef (se)	Women coef (se)	Men coef (se)	Women coef (se)	Men coef (se)	Women coef (se)
Age	-0.0032** (0.0015)	0.0037*** (0.0013)			-0.027*** (0.0050)	-0.0073 (0.0051)
Log Age			-0.18*** (0.062)	0.12** (0.054)		
Age <sup>2</sup>					0.00025*** (0.000048)	0.00012** (0.000051)
Control variables	yes	yes	yes	yes	yes	yes
Country fixed effects	yes	yes	yes	yes	yes	yes
EVS wave fixed effects	yes	yes	yes	yes	yes	yes
Observations	64,599	74,783	64,599	74,783	64,599	74,783
Adjusted R-squared	0.074	0.068	0.074	0.068	0.074	0.068

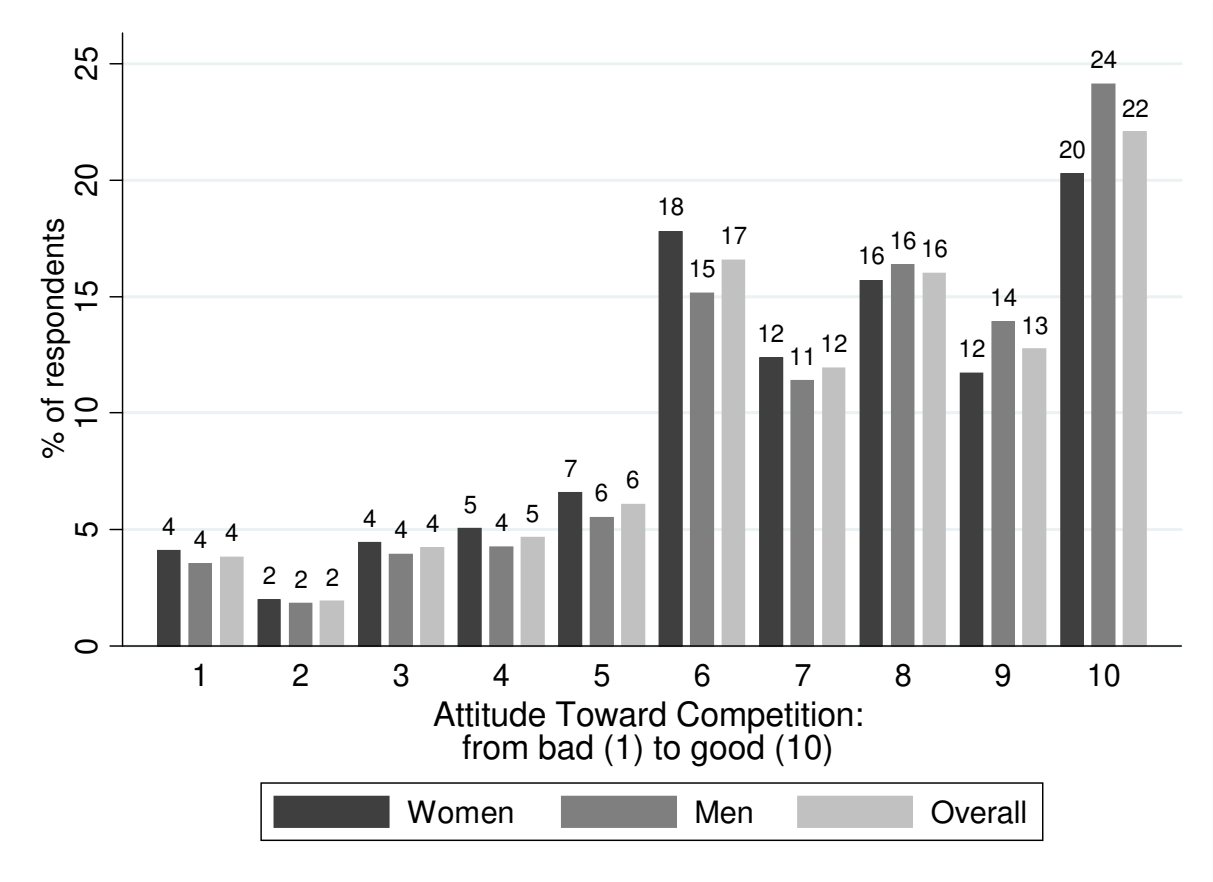
Notes: Attitude toward competition (ATC) is measured through the question: “How would you place your views on this scale? 1) competition is harmful, it brings out the worst in people; 10) competition is good. It stimulates people to work hard and develop new ideas”. The sample contains respondents from 48 nations and three European Value Survey waves (1990-1993, 1999-2001 and 2008-2010). Control variables are identical to those of the baseline estimation (see Table 1). Method estimation is OLS. Standard errors in brackets are clustered by country. \*, \*\* and \*\*\* mean respectively  $p < 0.1$ ,  $p < 0.05$  and  $p < 0.01$ . The most important results dealing with the control variables are depicted in Figure 7. The detailed outcomes are presented in Section A5 of the Appendix.



**Figure 1. Gender gap in ATC according to the literature predictions.**

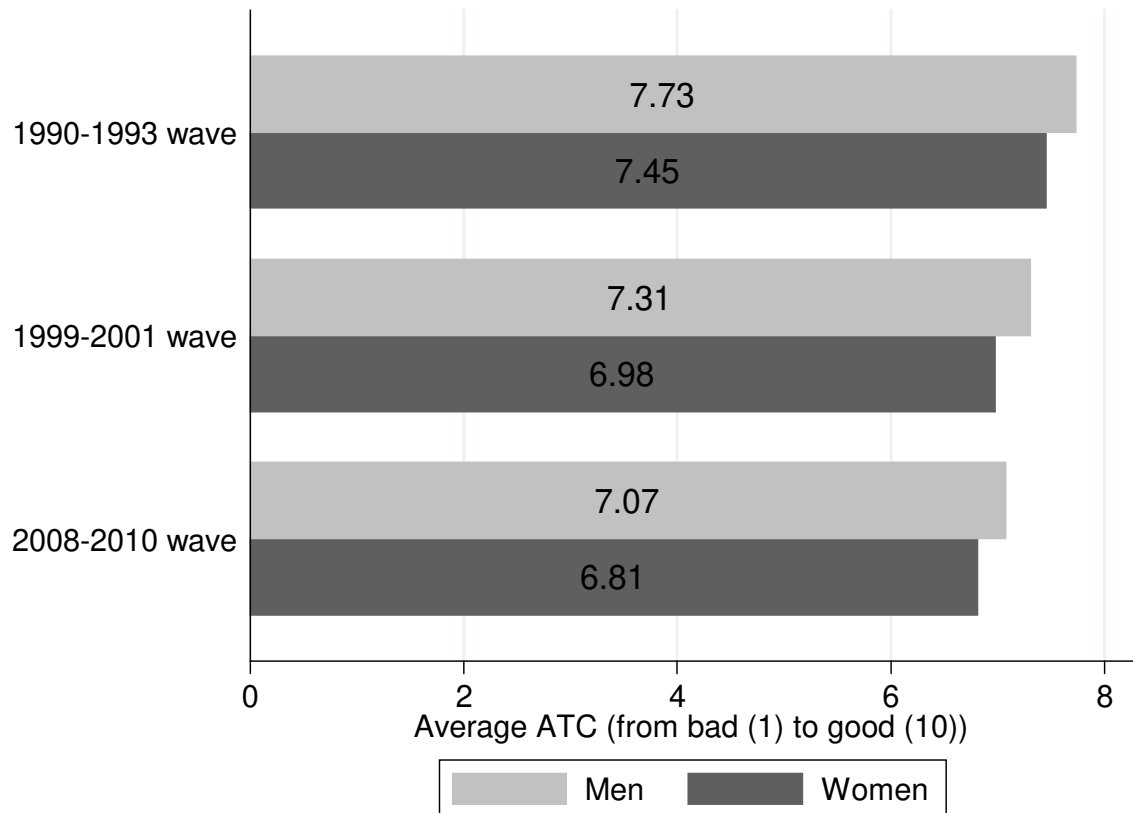


**Figure 2. Respondents' distribution according to their ATC.**



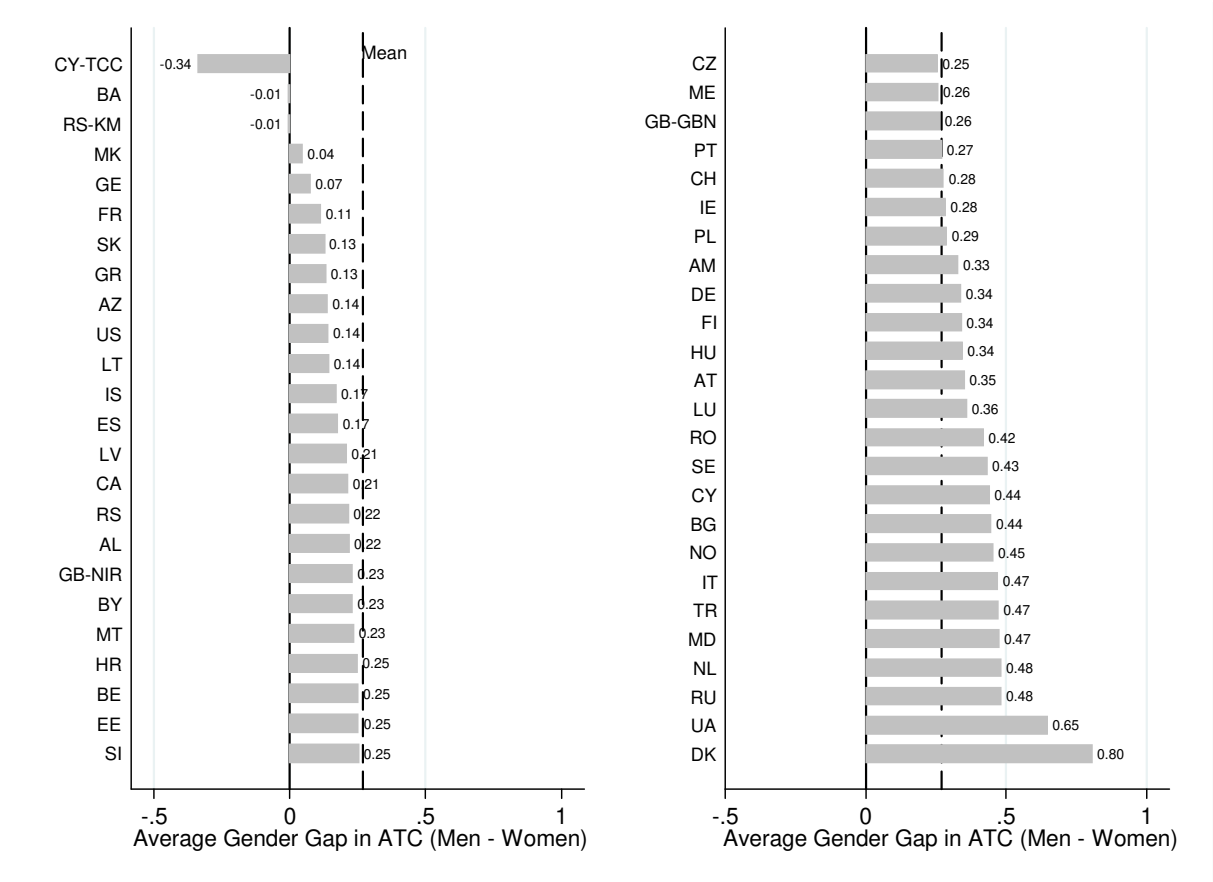
Note: Attitude toward competition (ATC) is measured through the question: “How would you place your views on this scale (from 1 to 10)? 1) competition is harmful, it brings out the worst in people; 10) competition is good. It stimulates people to work hard and develop new ideas”. The distribution covers 48 nations and three European Value Survey waves (1990-1993, 1999-2001 and 2008-2010). See Appendix A1 for more details.

**Figure 3. Average ATC according to the EVS wave.**



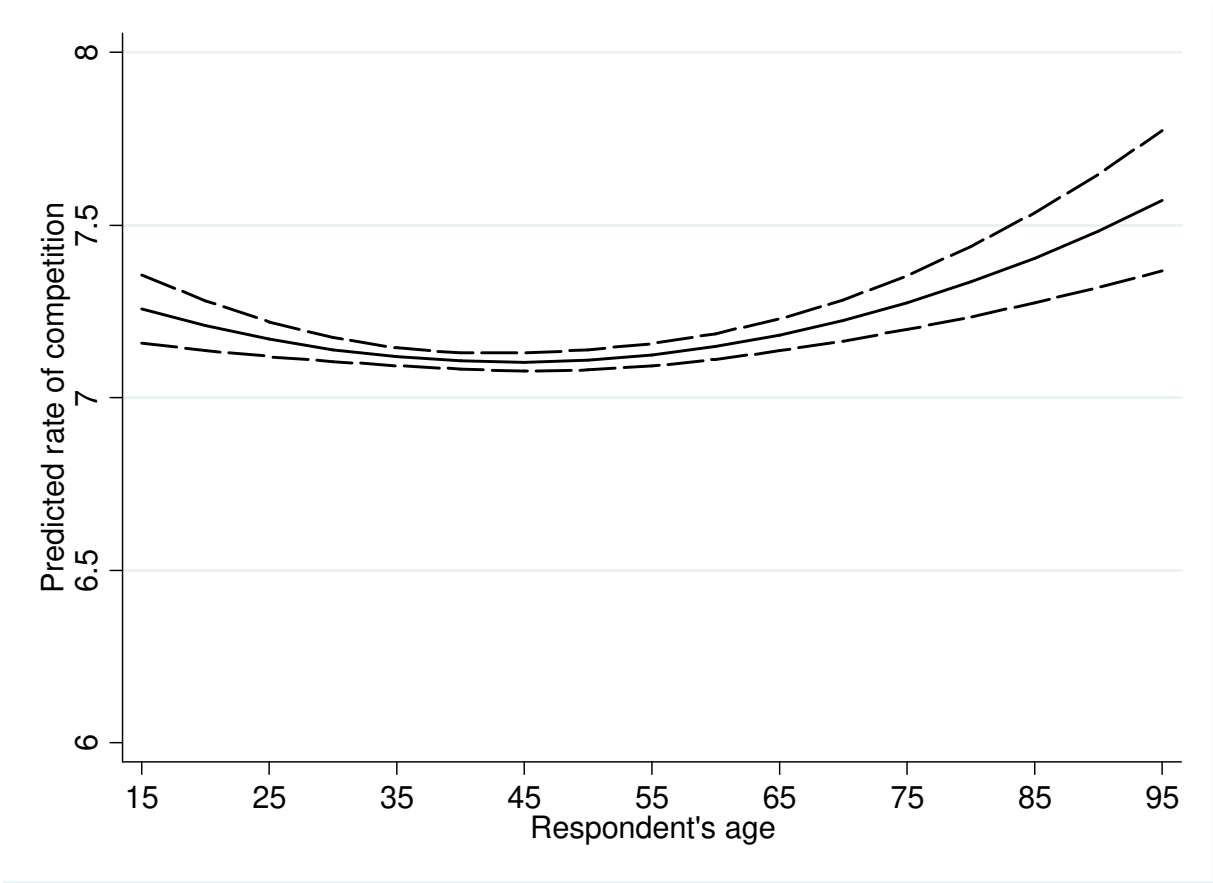
Note: Attitude toward competition (ATC) is measured through the question: “How would you place your views on this scale (from 1 to 10)? 1) competition is harmful, it brings out the worst in people; 10) competition is good. It stimulates people to work hard and develop new ideas”. The measure covers 48 nations. See Appendix A1 for more details.

**Figure 4. Average gender gap in ATC by country.**



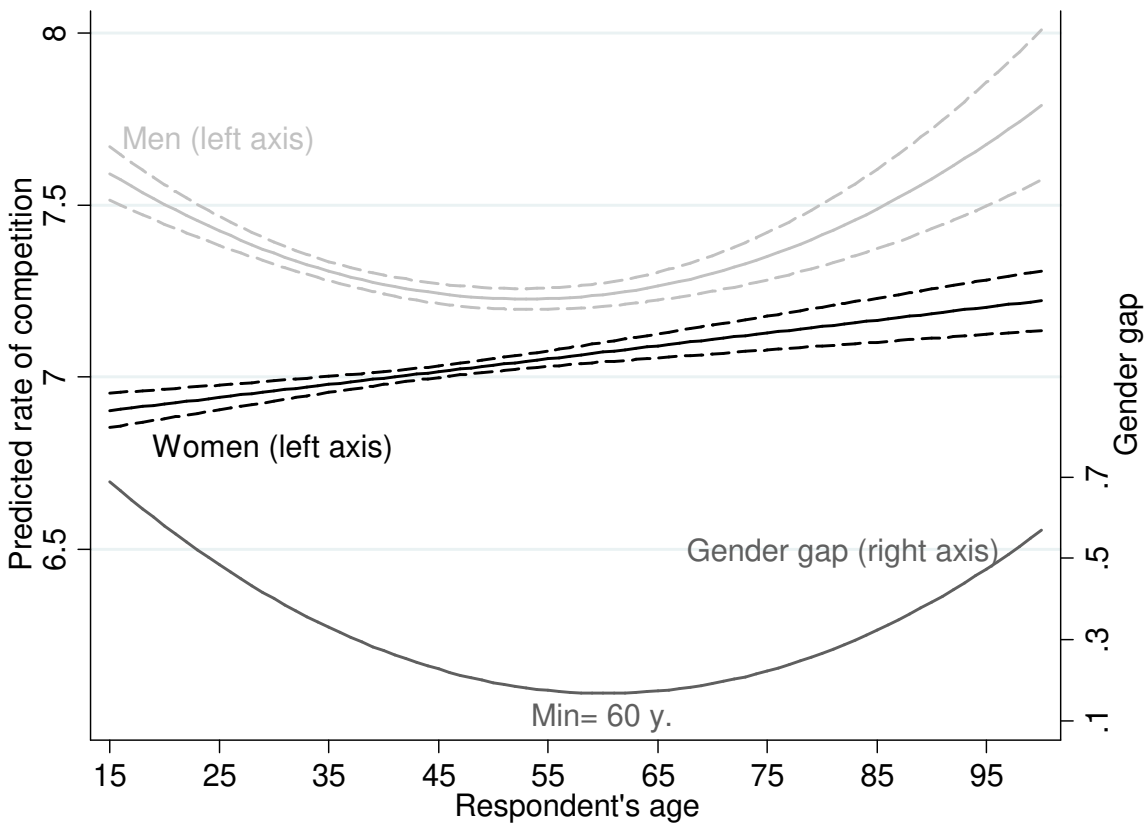
Notes: Attitude toward competition (ATC) is measured through the question: “How would you place your views on this scale (from 1 to 10)? 1) competition is harmful, it brings out the worst in people; 10) competition is good. It stimulates people to work hard and develop new ideas”. To calculate the gender gap, we compute the spread between the average value for men and the average value for women by nation. The dash lines represent the average difference between men and women regardless the respondents’ nations. The distribution covers three European Value Survey (1990-1993, 1999-2001 and 2008-2010). See Appendix A1 for more details.

**Figure 5. Nonlinear impact of age on Attitude Toward Competition (ATC).**



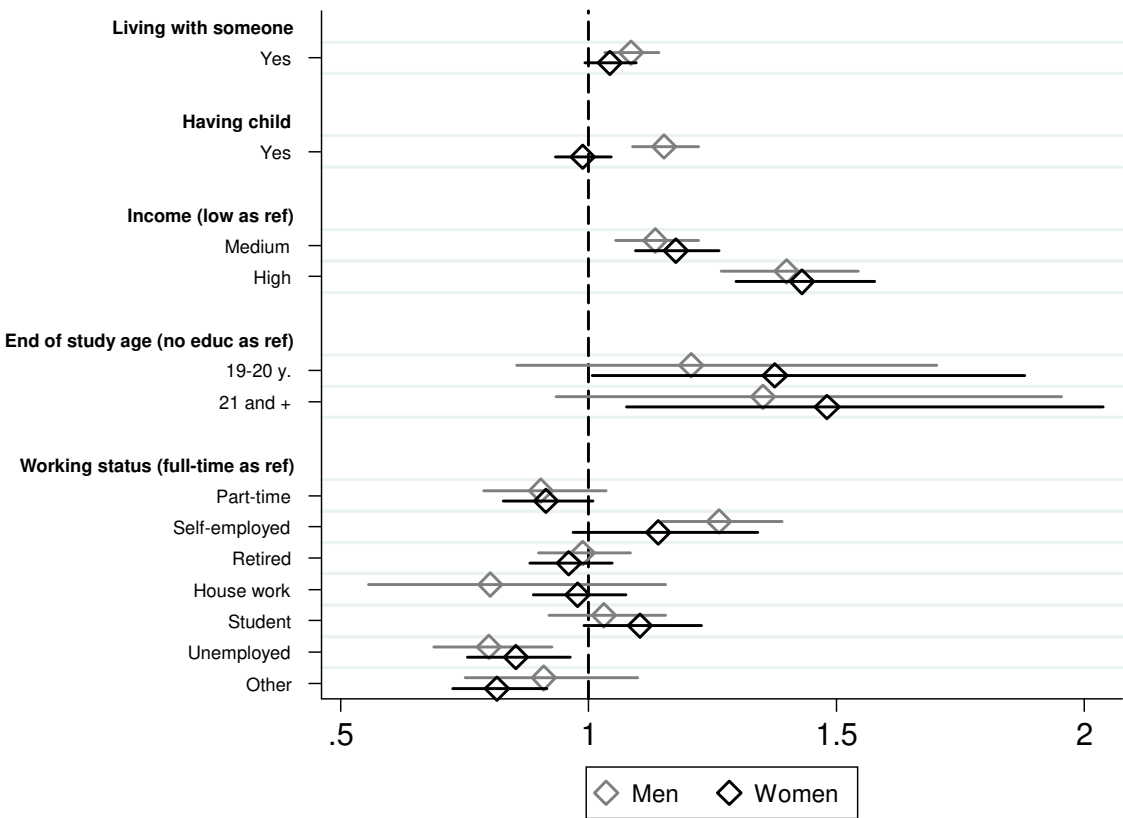
Notes: Attitude toward competition (ATC) is measured through the question: “How would you place your views on this scale (from 1 to 10)? 1) competition is harmful, it brings out the worst in people; 10) competition is good. It stimulates people to work hard and develop new ideas”. The predicted rates come from the quadratic model presented in Table 1 (third column), all other variables taking their average value. The solid line indicates the prediction and the dash ones the 95% confidence intervals.

**Figure 6. Gendered impact of age on the ATC and gender gap over age.**



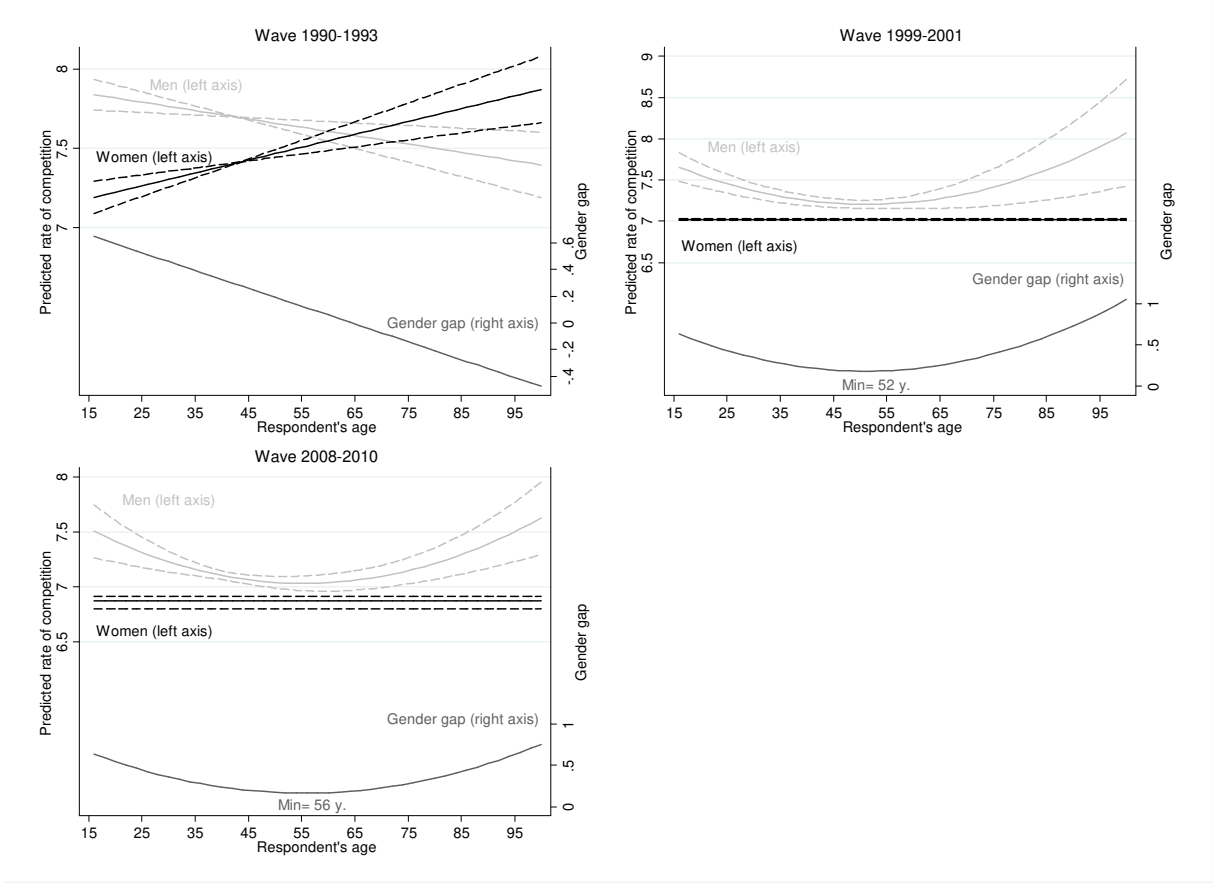
Notes: Attitude toward competition (ATC) is measured through the question: “How would you place your views on this scale (from 1 to 10)? 1) competition is harmful, it brings out the worst in people; 10) competition is good. It stimulates people to work hard and develop new ideas”. The predicted rates come from two models presented in Table 2 and detailed in Table A5.1 in Appendix A5: the quadratic model for men and the linear one for women, all other variables taking their average value. The solid line indicates the prediction and the dash ones the 95% confidence intervals. The gender gap is the spread between predicted ATC for men and women for each age.

**Figure 7. Other factors of ATC according to respondent gender.**



Notes: Attitude toward competition (ATC) is measured through the question: “How would you place your views on this scale (from 1 to 10)? 1) competition is harmful, it brings out the worst in people; 10) competition is good. It stimulates people to work hard and develop new ideas”. The estimated coefficients are produced by the quadratic model for men and linear model for women, the entire outcomes are displayed in Table A5.1 of Section A5 of the Appendix. The lines around the diamond indicate the 95% confidence intervals.

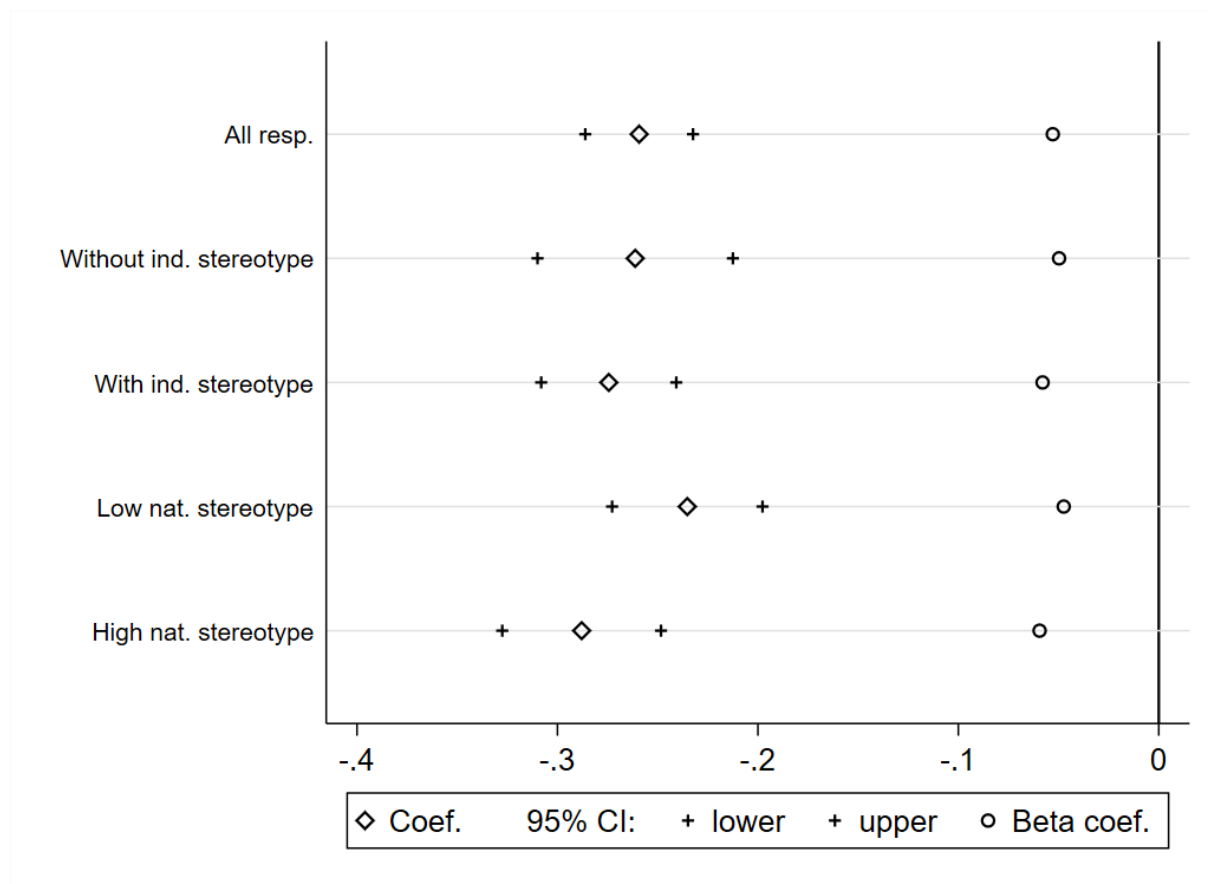
**Figure 8. Gendered impact of age on the ATC and gender gap over age according to the EVS wave.**



Notes: Attitude toward competition (ATC) is measured through the question: “How would you place your views on this scale (from 1 to 10)? 1) competition is harmful, it brings out the worst in people; 10) competition is good. It stimulates people to work hard and develop new ideas”. The predicted rates come from two models presented in Section A7 of the Appendix: the quadratic model for men and the linear one for women, all other variables taking their average value. The solid line indicates the prediction and the dash ones the 95% confidence intervals. The gender gap is the spread between predicted ATC for men and women for each age. We only keep in the studied sample the respondents living in the nations involved in the three EVS waves (1990-1993, 1999-2001 and 2008-2010).

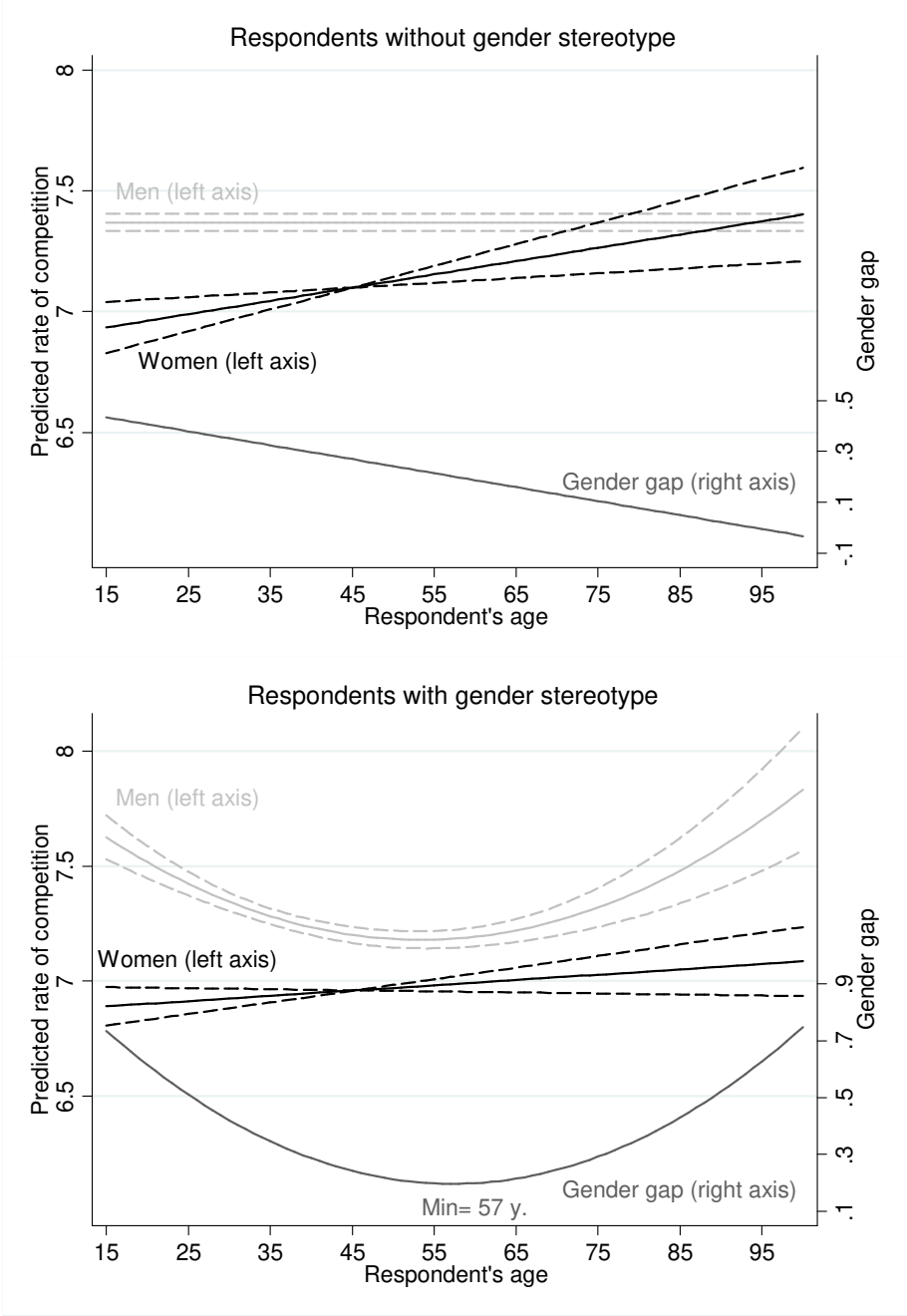


**Figure 9. Comparisons of the gender gap in ATC according to sub-samples defined by gender stereotype.**



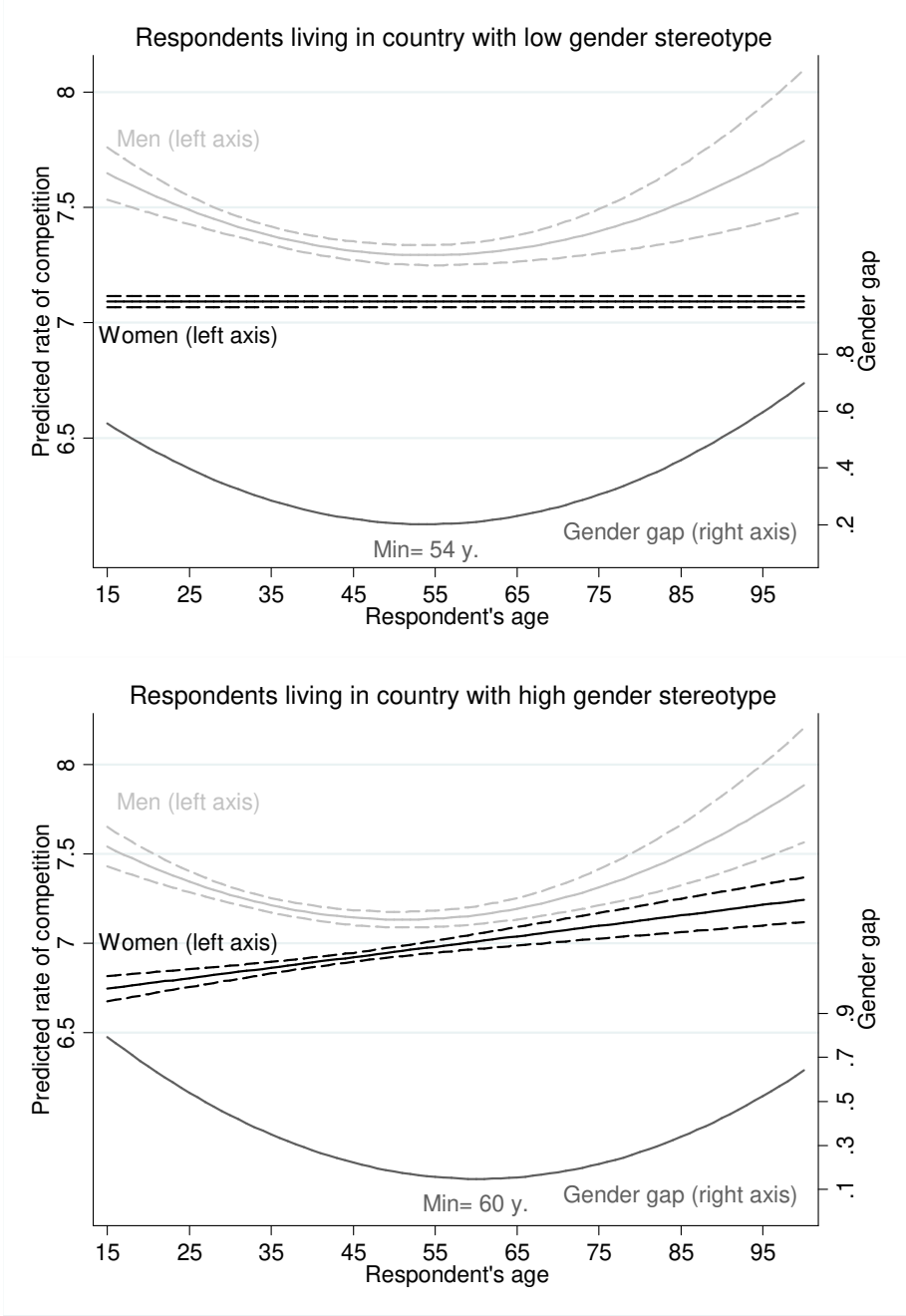
Notes: “Ind” stands for individual and “nat” does for national. Attitude toward competition (ATC) is measured through the question: “How would you place your views on this scale (from 1 to 10)? 1) competition is harmful, it brings out the worst in people; 10) competition is good. It stimulates people to work hard and develop new ideas”. Gender stereotype is measured through the question: “For the statement ‘Both the husband and wife should contribute to household income’, can you tell me how much you agree?”, with four items of answer: “agree strongly”, “agree”, “disagree” and “disagree strongly”. Is considered as an individual with gender stereotype a respondent who does not answer “agree strongly” to the question. Is considered as living in a country with a collective gender stereotype a respondent for whom the average national answer is lower than the average of the entire sample. Coefficients of the gender respondent variable are estimated with OLS method and the quadratic functional form for age. All respondents give the estimated coefficient for the entire sample (see Table 1), then we split the sample into two subsamples according to the stereotypes (individual or national). For details, see Section A9 of the Appendix. The beta coefficient is the estimated standardized coefficient. The diamond indicates the estimated coefficient and the crosses the lower and upper values of the 95% confidence interval.

**Figure 10. Gendered impact of age on the ATC and gender gap over age according to individual gender stereotype.**



Notes: Attitude toward competition (ATC) is measured through the question: “How would you place your views on this scale (from 1 to 10)? 1) competition is harmful, it brings out the worst in people; 10) competition is good. It stimulates people to work hard and develop new ideas”. Gender stereotype is measured through the question: “For the statement ‘Both the husband and wife should contribute to household income’, can you tell me how much you agree?”, with four items of answer: “agree strongly”, “agree”, “disagree” and “disagree strongly”. Is considered as an individual with gender stereotype a respondent who does not answer “agree strongly” to the question. The predicted rates come from four models presented in Section A9 of the Appendix: the quadratic model for men if it is significant and the linear one for women, all other variables taking their average value. The solid line indicates the prediction and the dash ones the 95% confidence intervals. The gender gap is the spread between predicted ATC for men and women for each age.

**Figure 11. Gendered impact of age on the competition rate and gender gap over age according to collective gender stereotypes.**



Notes: Attitude toward competition (ATC) is measured through the question: “How would you place your views on this scale (from 1 to 10)? 1) competition is harmful, it brings out the worst in people; 10) competition is good. It stimulates people to work hard and develop new ideas”. Gender stereotype is measured through the question: “For the statement ‘Both the husband and wife should contribute to household income’, can you tell me how much you agree?”, with four items of answer: “agree strongly”, “agree”, “disagree” and “disagree strongly”. Is considered as living in a country with a collective gender stereotype a respondent for whom the average national answer is lower than the average of the entire sample. The predicted rates come from four models presented in Section A9 of the Appendix: the quadratic model for men if it is significant and the linear one for women if it is significant, all other variables taking their average value. The solid line indicates the prediction and the dash ones the 95% confidence intervals. The gender gap is the spread between predicted ATC for men and women for each age.