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What drives women out of management? The joint role of testosterone and culture☆

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ABSTRACT

Exploiting variation across communities in indices correlated with women emancipation, we show that in regions where women are less emancipated the average 2D4D Digit Ratio is lower than that of men compared to regions with higher indices, a finding that is consistent with the existence of gender related obstacles into management.

This finding can explain why: (a) fewer women than men are managers; (b) the proportion of women among managers is higher in countries with higher women emancipation; (c) women managers show more masculine traits. Once women enter management, they are equally able than man.

1. Introduction

Management around the globe is a very masculine occupation. In virtually all developed countries the share of women among managers is limited. For instance, the EU Annual Activity Report for 2007 shows that in Austria around 70% for existing enterprizes are managed by men, and women are largely under represented in leading roles in Austrian enterprizes: only in 16% of the companies with more than 50 employees the CEO is a woman. Similar figures prevail in all European countries. In the USA, the fraction of women holding an executive officer position in the *Fortune 500* companies were 13.5% in 2009; the fraction holding corporate board seats were 15.2% in 2008 (Soares et al., 2009).[1]

What explains women failure to become managers? One possibility is that women as a group, have less "managerial ability". In Lucas' (1978) model, people self-select into management on the basis of their skill to manage inputs; if managerial ability is gender-related, then it could explain the smaller fraction of women in managerial positions. Alternatively, women may have different preferences that matter for occupational choice. Management entails more risk taking than working as an employee for a fixed salary; hence more risk tolerant people should self select into management

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[1] The list of CEO women in the first 1000 Fortune companies is available at http://www.catalyst.org/publication/322/women-ceos-of-the-fortune-1000.

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(Kihlstrom and Laffont, 1979). One strand of literature shows that indeed women differ from men in a number of traits that are relevant for occupational choice. Concerning preferences, a robust finding of both field and experimental studies is that in representative samples women are less willing to take risks than men.[2] Regarding attitudes, recent evidence shows that women seem to be less comfortable with competitive pressure and thus less willing than men to engage in competitive interactions such as bargaining (Babcock and Laschever (2003)), tournaments (Gneezy and Rustichini, 2003, 2004a, 2004b; Niederle and Vesterlund, 2007) and auctions (Chen et al (2009)). The role of feedback and competition in ranking is known to be important in organizations (Kuhnen and Tymula, 2011). Interestingly, this literature shows that while men performance seems to be enhanced by increased competition, women performance either responds less or is even hampered (Gneezy and Rustichini, 2004b; see Price, C., 2011, for an application to managerial competition). Because of this women may self select into jobs that are sheltered from competitive pressures.

In summary, this first theory is that women differ in abilities or attitudes. A very different explanation is that women, even those endowed with an intrinsic ability to engage in managerial activities, are discouraged from doing so because culturally-driven norms and beliefs restrict women freedom of occupational choice and inhibit them from choosing what are considered masculine jobs. For instance, given the importance that women play in the reproduction of the specie, norms may have developed that recommend women should not engage in occupations that absorb a lot of time and energy - managerial and managerial jobs being certainly of this type. If so, only those with extraordinary intrinsic ability will self-select into management since not doing so would be too large a fee to pay to obey the social norm. But that would imply that very few do so.

The most serious problem in distinguishing these theories (and in studying the role of social norms in the process of occupational choice) is that it is hard to obtain a measure of intrinsic managerial ability that is independent of previous choices of the individual or that is not the reflection of gender related cultural norms. For instance, differences in risk aversion between the two genders as measured in experiments may reflect differences in initial endowments or lifetime wealth due for example to differences in expected bequests between males and females. Similarly, differences in the way men and women react to competition may not be due to an intrinsic dislike of competition among women but to the prevalence of culturally determined roles. This is suggested for instance by Gneezy et al. (2006) who compare selection into competitive environments in a patriarchal and in a matriarchal society and find that while in the first men choose the competitive environment twice as often as women, in the matriarchal society the opposite is true. Similarly, Dreber et al. (2009) find that contrary to what has been observed among Israeli children by Gneezy and Rustichini (2004b), there is no gender difference in reaction to competition among Swede boys and girls. Whatever the task, boys and girls compete equally, a result that may reflect the fact that Sweden scores high on gender equality measures (Guiso and Paiella, 2008).

To distinguish the two theories and shed light on the nature vs nurture alternative in this context we propose using a biological marker - exposure to testosterone in womb as reflected in the second to fourth digit ratio - as a measure of managerial traits, being them skills or preferences, and combine it with variation in beliefs about men/women parity in areas where people are located. This allows to explore whether women potentially endowed with intrinsic managerial ability actually succeed in becoming managers or rather whether they have to give up because they face stronger barriers than men.

The digit ratio is considered a reliable marker of the exposure to testosterone in the fetal period, with a lower ratio index associated with a higher level of androgens. Second, such exposure is considered to have an organizing effect of the brain during that period, shaping in a permanent way future individual behavior. There is considerable evidence supporting both hypotheses (see Manning, 2002, for a review).

We start by illustrating two links that are key to our analysis: the link between the digit ratio, testosterone at birth and gender and the link between testosterone and managerial traits (Section 2). In Section 3 we describe our main data source - a survey of Italian managers for which information on the digit ratio was collected; this section establishes basic features of the data, most notably that contrary to representative samples in our selected one women have a lower digit ratio. Section 4 lays down a conceptual framework about gender occupation selection when both intrinsic managerial ability and gender differences in emancipation are allowed for and obtains a number of testable predictions; the latter are confronted with the data in Section 5. Section 6 concludes.

2. Digit ratio, gender and managerial traits

Our argument is based on two links: the first in the link between gender and testosterone; the second the link between testosterone and managers traits. We examine them in turn.

2.1. Gender, digit ratio and testosterone

A large literature has established that in representative samples women have a higher digit ratio than man. The difference is significant, and estimated at around 0.04 (Cohen effect size 0.62). This finding is ancient (Baker, 1888), and has been

[2] Many papers find significant difference between genders in risk taking. In experimental setting (Holt and Laury, 2002, Hartog et al., 2002, Powell and Ansic, 1997, Fehr-Duda et al., 2006 and Levin et al., 1988); using field data and surveys, Dohmen et al. (2005), Guiso and Paiella, 2009, Kimball et al., 2007 among others. For a survey of the experimental evidence see Croson and Gneezy (2009).

Table 1
DR and High School grade, Optimism and Willingness to Work. Columns 1 and 2 for High School grade, (1 for male individuals); columns 3 and 4 for Optimism (3 for male individuals), columns 5 and 6 for Willingness to Work (5 for male individuals). The coefficients reported are standardized (β coefficients).

	HS Gr.		Opt.		Will. work	
	Men beta/p	Women beta/p	Men beta/p	Women beta/p	Men beta/p	Women beta/p
Digit ratio: right hand	−0.060	−0.134**	−0.038	−0.074	−0.081*	−0.016
	(0.266)	(0.035)	(0.264)	(0.128)	(0.056)	(0.792)
Age of manager	0.003	0.008	0.016	−0.079	0.049	0.054
	(0.962)	(0.911)	(0.707)	(0.222)	(0.287)	(0.454)
Education of manager	0.195***	0.117*	0.082**	−0.020	−0.026	0.018
	(0.000)	(0.050)	(0.022)	(0.710)	(0.522)	(0.782)
Height entr.	−0.029	0.053	0.001	0.070	0.022	0.067
	(0.504)	(0.391)	(0.979)	(0.193)	(0.599)	(0.221)
First born manager	0.035	0.052	0.002	−0.005	0.048	0.045
	(0.437)	(0.406)	(0.962)	(0.921)	(0.223)	(0.402)
Firm age	−0.017	0.007	0.008	−0.009	−0.065*	−0.061
	(0.686)	(0.918)	(0.858)	(0.871)	(0.095)	(0.128)
Years in control	0.049	−0.017	0.043	0.111	0.025	0.124**
	(0.341)	(0.805)	(0.350)	(0.141)	(0.618)	(0.027)
r2	0.074	0.119	0.037	0.093	0.056	0.111
N	541	294	768	399	667	335

confirmed by recent systematic studies (Manning John et al., 1998). The relevant literature, possible explanations of the difference, and implications are discussed in detail in Manning (2002). A possible explanation of the gender difference in the digit ratio has been proposed based on the differential effect of testosterone (facilitating the growth of the fourth digit) and estrogen (for the growth of the second digit).

The fundamental fact that we use here is *not* that there is a gender difference in managerial ability (or any ability) across genders which should be documented by the difference in the digit ratio. Instead, we rely on large existing evidence on two findings. The first is the one we have just recalled that the distribution of the ratio is different in a particular direction in the two genders belonging to a given population. The second is that, *within* each gender, a number of skills and personality traits are correlated with the digit ratio, and managerial ability in particular is negatively correlated with the ratio. These findings, most notably the first, hold in randomly selected samples. Our sample of self-selected managers may differ substantially in this respect, and this difference is what we plan to use to separate the two explanations of the gender difference in participation in managerial activity, one based on difference in ability and the other on social selection.

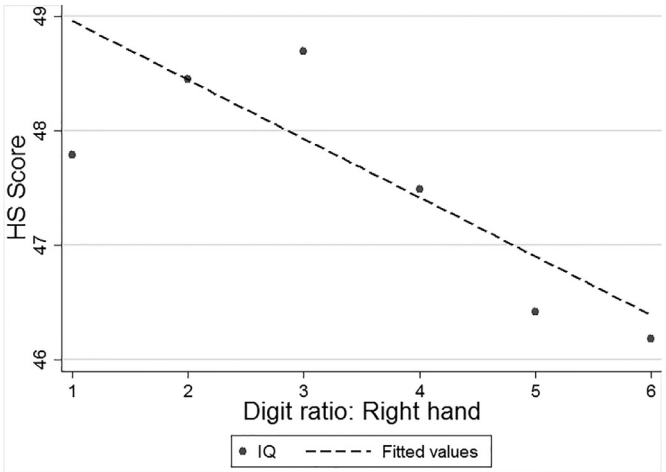
2.2. Digit ratio, testosterone and managerial traits

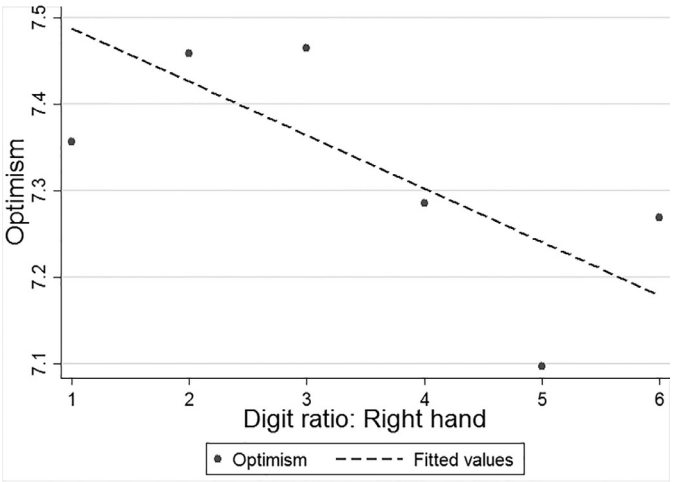
Exposure to testosterone in pre-natal period, as marked by the digit ratio, has been shown to be linked to several personalty characteristics, attitudes and skills. The traits that are interesting for us are preferences for risk, and managerial ability in Lucas (1978) sense - i.e. ability to manage a larger and presumably more complex set of inputs. A lower digit ratio has been found to be associated with higher earnings and better ability to remain in a competitive job in the City of London (Coates et al., 2009). Sapienza et al. (2009) find an effect of digit ratio on career choice. The reason for such correlation is still being investigated. Two possible explanations are natural: one is that the effect is through risk taking, the other is that digit ratio is correlated with higher ability. There is some evidence that more risky behavior is associated with a lower digit ratio: for example, Schwerdtfeger et al. (2010) have reported a higher rate of traffic violations in male frequent car drivers. Apicella et al. (2008) document a correlation between current testosterone and risk taking in a financial decision task; they find no correlation with digit ratio). The second is that digit ratio affects ability.

To document this link, in Fig. 1 we plot three measures of ability available in our survey: cognitive skills, optimism and willingness to work that are potentially relevant for manager's success.

An approximate measure of cognitive skills is the grade obtained at the end of the high school (typically at age 18, the equivalent of grade 12 in the USA): this measure should be considered approximate because it is know that it reflects also non-cognitive skills (see for instance Bertrand and Pan, 2013). The measure of optimism is the answer on a scale between 0 and 10 to a question determining expectation on future good and bad outcomes; willingness to work effort is measured by the number of hours the manager said he was willing to work before feeling the desire to change activity. We construct a categorical variable between 1 and 6 for the digit ratio and for each digit ratio category we compute the mean value of these measures of ability and then plot them. As the figure shows, individuals with higher testosterone at birth (lower digit ratio) have higher ability according to these measures. Table 1 runs controlled regressions, this time separately for men and women.

Though this leads unavoidably to a loss of efficiency, the negative correlation between digit ratio and ability holds for both men and women for all measures; but it is stronger for women when ability is measured by IQ and optimism and





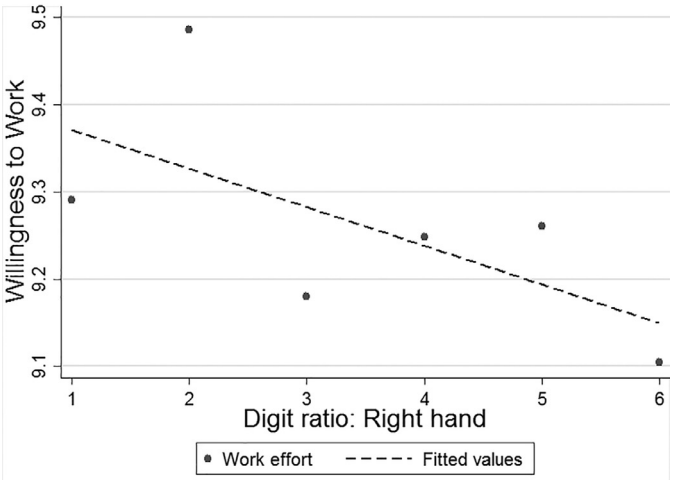


Fig. 1. DR and Cognitive skills, optimism and willingness to work. Data from a sample of 1430 managers, divided into six groups of equal size ($\sim$ 235 each group).

Table 2
Summary statistics. Mean, median and standard deviation (SD) for Age, Years in Control (of the firm), and Digit ratios.

	Male			Female			Sample		
variable	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
Panel A: Nr. of Employees									
All regions	33.65	20	42.14	27.69	20	35.59	31.63	20	40.12
North West	33.08	20	39.86	33.34	18	44.12	33.16	20	41.17
North East	39.02	20	50.59	30.76	20	40.81	36.17	20	47.58
Center	35.59	23	39.12	25.93	20	25.90	31.93	21	35.01
South	25.48	16	33.38	22.81	13	34.54	24.68	15	33.72
Panel B: Demographics									
Age	48.83	48	12.19	48.83	48	10.62	47.46	47	10.37
Years in Control	15.84	13	11.74	13.59	11	10.69	15.21	12	11.74
Panel C:									
Digit ratio, Right hand	1.002	1	0.052	0.999	0.999	0.051	1.001	1	0.052
Digit ratio, Left hand	1.002	1	0.049	0.995	0.997	0.049	0.998	0.999	0.049
variable	Mean								
Panel D: Women-headed firms									
Whole sample	0.34								
Sample reporting DR	0.35								

stronger for men when ability is measured by work effort. We take this evidence, as well as the strong negative correlation between firm size and digit ratio documented in Guiso and Rustichini (2017), as supportive of the idea that the digit ratio contains valuable information on managerial ability.

3. The survey and basic facts

3.1. The survey

Our main data set is a survey of managers or top CEOs conducted by ANIA ("Associazione Nazionale fra le Imprese Assicuratrici", or Italian National Association of Insurance Companies), on a sample of 2295 private Italian firms with a number of employees up to 250.[3] The survey, conducted between October 2008 and June 2009, consisted of two distinct questionnaires. The first collected general information on the firm, and was filled by the firm managers on a paper form. The second questionnaire collected information on the manager or the top CEO and, quite uniquely, it was filled in face to face interviews by a professional interviewer of a specialized company, using the CAPI (Computer Assisted Personal Interviewing) method. During the interview several broad groups of data were collected, including information on a number of traits, abilities and preferences of the manager; information on his own personal wealth holdings or those of his/her family; and several details on physical traits, family background and demographics, including gender, order of birth and siblings, height and pigmentation, among many others. Tables 2 and 3 present some summary statistics on the firms that were part of the survey. The share of women headed by firms is 34 the whole sample (Panel E)[4]

The Appendix describes the survey design in greater detail and provides a precise description of the variables used in this study. At the end of the personal interview, the interviewer asked each participant in the survey whether he or she was willing to have the length of the fingers measured. They were first informed that some recent research has established a link between choice of employment and success and some physical characteristics of a person. No mention was made of the direction of this link. If the participant accepted, the four measurements (second and fourth fingers of both hands) were collected with an electronic caliper, with small measurement error (0.02 mm). Each interviewer had his own tool; they were given a written protocol on how to execute the measurement and specifically trained for this task by the company. As part of the procedure they asked the subjects to keep the hand as straight as possible; fingers on the right were measured first, and then those on the left. The length measured was from the middle of the bottom crease at the base of the finger to its tip.

[3] One may be concerned that because the survey represents smaller firms (the average firm has about 32 employees) and most are family firms (85% are controlled by an individual within a family, see appendix) the dataset may not have enough power to answer investigate obstacles faced women, as individuals become managers in this sample by kinship. While this concern is legitimate it should not be overstated. First, though the average firm size is 32, there is substantial heterogeneity, with 10% of the firms in the sample with more than 70 employees and up to 249. Second, kinship may matter for some managers who inherit the firms from parents. But notice that: (a) there is evidence that in family firms parents managers have a preference for boys as successor just because they are boys (Bennedsen et al., 2007), which is consistent with our evidence of a women-averse cultural-driven bias even in family firms; (b) in 65% of the cases the father of the current manager was not a manager, implying that in all these cases the firm was not obtained by kinship; (c) in so far as in family businesses women can turn into management because of kinship, our estimates are a conservative estimates of the impact of the cultural bias.

[4] It is 35% in the sample of those participating in the measurement of the digit ratio.

Table 3
Summary statistics: Top Panel: Fraction of males in the sample in four regions. Bottom Panel: women emancipation index. The variable "Better executives" indicates the degree of agreement with the statement "On the whole, men make better business executives than women do". "PC" is the principal component of four variables describing women emancipation, averaged across regions.

variable	Mean		
Male, Sample	0.66		
Male, North West	0.68		
Male, North East	0.65		
Male, Center	0.62		
Male, South	0.70		
variable	Mean	Median	SD
Better executives	2.97	3.03	0.22
PC	−0.187	0.009	0.71

Table 4
Participation to Digit ratio measurement. The table reports the probit regressions. All regressions include dummies for regions and industrial sector: the estimated coefficients for these are not reported for simplicity. Robust standard errors.

	(1) b/p	(2) b/p	(3) b/p	(4) b/p
Male	−0.171**	−0.235***		
	(0.034)	(0.009)		
Age of manager	0.002	0.004	0.006	0.005
	(0.398)	(0.211)	(0.173)	(0.425)
Education of manager	0.027**	0.019	0.028**	−0.010
	(0.010)	(0.100)	(0.043)	(0.688)
Height entr.	0.010**	0.013**	0.019***	−0.006
	(0.019)	(0.011)	(0.001)	(0.494)
First born manager	0.001	0.075	−0.028	0.315***
	(0.989)	(0.233)	(0.717)	(0.005)
Firm age		−0.002	−0.001	−0.004
		(0.121)	(0.703)	(0.111)
Years in control		−0.002	−0.002	−0.006
		(0.570)	(0.578)	(0.310)
Age of interviewer		0.014***	0.014***	0.015**
		(0.000)	(0.004)	(0.033)
Height of interviewer		0.016***	0.015**	0.019*
		(0.004)	(0.030)	(0.055)
Male interviewer		−0.199	−0.181	−0.262
		(0.116)	(0.216)	(0.323)
log firm size: employment		0.025	0.001	0.091
		(0.458)	(0.976)	(0.129)
N	2246	1869	1242	624

3.2. The digit ratio

Out of 2295 managers interviewed, 1366 agreed to have the fingers length measured. The decision to participate in the measurement is correlated with various observable variables: it is lower among male managers and increasing with age and the height of the interviewed. Education instead has no predictive power as much as the age of the firm and the number of years the manager has been in control of the company (details are reported in Table 4).

This features may create a potential for selection bias. We account for this by including three controls for interviewer characteristics that empirically have predictive power on the willingness of the managers to let the interviewer measure his/her fingers. Specifically, we include gender, age and height of the interviewer. As Table 4, second column shows these variables have predictive power on the manager willingness to participate in the measurement. Since these characteristics belong to the interviewer there is no reason why they should be correlated with the residual in equations that model manager behavior that we will estimate latter; thus, they can be used as instruments to account for potential selection.[5] Running separate regressions for men and women (last two columns) shows that interviewer characteristics have a similar impact independent of gender.

[5] We have also used as an exclusion restriction a measure of affinity between the interviewer and the managers as reported by the interviewer at the end of the interview. Specifically, we have used the answers to the the question: "On a scale between 0 and 10 what do you think is your affinity with the person interviewed?" Results using this measure are very similar to those reported.

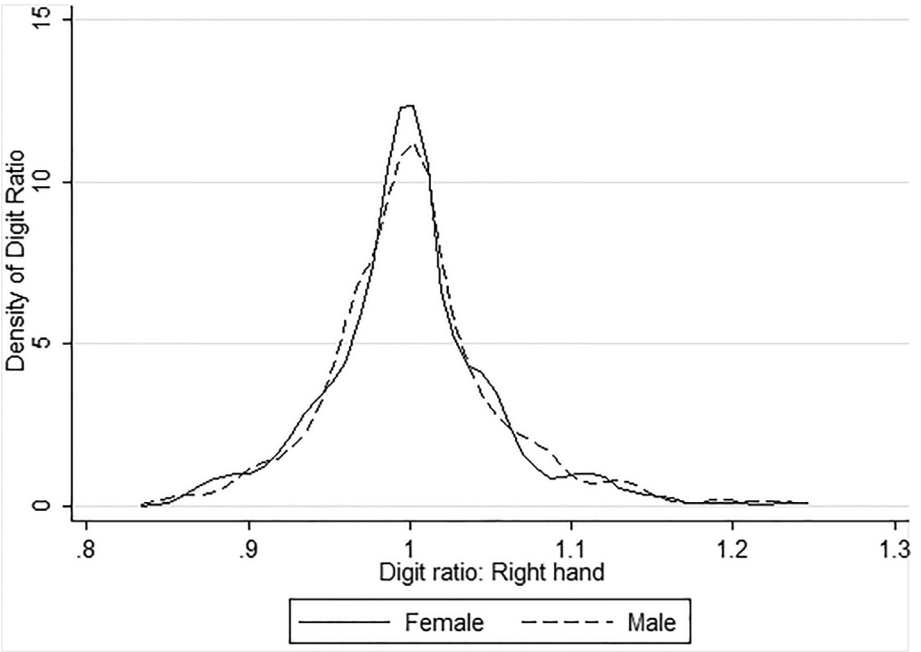


Fig. 2. Density of the Digit ratio in male and female subjects in the sample. $N = 469$ female managers, $N = 877$ male managers.

3.3. Gender difference in 2D:4D in the sample

For the sample of participants in measurement Fig. 2 shows the sample distribution of the digit ratio of the right hand (the one typically used in these studies; the distribution is similar of the left hand) for man and women.

In both cases the distribution is centered around 1 and is fairly symmetric, but departs from normality because it appears leptokurtic (Kurtosis 5.13). Most interestingly, the women's DR distribution has a slightly smaller mean - a finding that runs contrary to all previous evidence on gender differences in 2D:4D, as we recalled in Section 2.1. To highlight the differences in mean in Table 5 we run regressions of the digit ratio on a dummy for gender and various classical determinants such as the height of the individual and whether he/she was first born which have been found to correlate with the digit ratio.

The first two columns report results for the right hand and the last two for the left hand. As in previous studies we find that first born and taller managers have a significantly lower digit ratio (Barut et al., 2008) have similar finding on height; Manning (2002) has weaker evidence of this). Differently from all other studies we find that in our sample of managers, females have a *lower* digit ratio. Depending on whether we look at the right or left hand the difference ranges between 10 and 15% of the sample standard deviation in the digit ratio, and it is significantly different from zero in almost all specification reported in Table 5, including the one in the last column where estimates are adjusted for selection using a two step probit estimator. Since in representative samples females digit ratio exceeds men ratio by around 0.04, a more telling null hypothesis is that the female dummy in our regressions is equal to 0.04. This is always strongly rejected.

4. Model

4.1. Conceptual background

The implications for personality characteristics and ability of differences in digit ratio are still being established; so we have to be particularly careful in the assumptions we make on this point. In our companion paper (Guiso and Rustichini, 2017) we provide evidence that a lower digit ratio is associated with a higher level of managerial ability. This statement is true as long as the comparison concerns individuals of the same gender, and this is the assumption we make.

> **Assumption:** *Everything else being equal, the distribution of managerial ability of an individual A dominates (first order stochastic dominance) that of individual B of the same gender with higher digit ratio.*

This assumption says nothing, of course, about the comparison between two individuals of different gender. In particular a strong statement like the assumption that we just made without the condition that the individuals *A* and *B* are of the same gender is probably false, and we do not use it in the following. A weaker statement might be that the expected difference in ability between two individuals of the opposite gender with the same digit ratio is a constant independent of the digit ratio. For example, a statement that a men and a woman with digit ratio in the same percentile of the corresponding

Table 5
Determinants of Digit ratio. The regressions include 19 regional dummies, not reported for simplicity. Robust standard errors.

	DR Right		Heckman	DR Left		Heckman
	(1) b/p	(2) b/p	(3) b/p	(1) b/p	(2) b/p	(3) b/p
Main equation						
Female	−0.003	−0.008**	−0.010**	−0.008***	−0.016***	−0.017***
	(0.288)	(0.039)	(0.030)	(0.006)	(0.000)	(0.000)
Height entr.		−0.000**	−0.001**		−0.001***	−0.001***
		(0.048)	(0.027)		(0.003)	(0.002)
First born manager		−0.007**	−0.006**		−0.009***	−0.008***
		(0.023)	(0.040)		(0.002)	(0.003)
Selection Equation						
Female			0.198**			0.198**
			(0.013)			(0.013)
Height entr.			0.012**			0.012**
			(0.012)			(0.012)
First born manager			0.025			0.025
			(0.671)			(0.671)
Age of interviewer			0.013***			0.013***
			(0.000)			(0.000)
Height of interviewer			0.017***			0.017***
			(0.001)			(0.001)
Male interviewer			−0.223**			−0.223**
			(0.048)			(0.048)
Female * WE (pc)			−0.488**			−0.488**
			(0.012)			(0.012)
log firm size: empl.			0.011			0.011
			(0.708)			(0.708)
r2	0.043	0.050		0.029	0.043	
N	1313	1313	2129	1313	1313	2129
lambda			−0.014			−0.013
p	0.288	0.017	0.000	0.006	0.000	0.000

gender have the same ability seems appealing. There is however no evidence yet to support or reject such claim, so we do not assume this either. Consider now our finding that women in the sample of managers have a lower digit ratio than men in the same sample, contrary to the evidence in random samples. This fact alone may suggest that the barrier for women to enter a managerial career is higher than for men. The latter conclusion would indeed follow under the assumption that the distribution of ability for two individuals of opposite gender with digit ratios equal to, say, the corresponding median. Without this assumption, we have to introduce additional information to test our hypothesis: regional measures of women emancipation.

4.2. Measuring women emancipation

We obtain information on the degree of women emancipation by using differences in beliefs about the role of women in society across Italian regions. For this we rely on the 2005 wave of the *World Values Survey* and use data on responses to four questions. Subjects were asked to rate on a four levels scale the following different statements: (a) “Being a housewife is just as fulfilling as working for a pay”; (b) “On the whole, men make better political leaders than women do”; (c) “A university education is more important for a boy than for a girl”; (d) “On the whole, men make better business executives than women do”. Respondents could answer: “Strongly agree”, “Agree”, “Disagree”, “Strongly disagree”, which we code from 1 to 4. Each measure may be taken as increasing with beliefs that reflect women emancipation and gender parity. Fig. 3 shows the sample distribution of the four indicators and documents substantial heterogeneity in beliefs. Disagreement with the statements prevails but there are differences across statements.

The vast majority disagree that university is more important for a boy than for a girl; however a smaller fraction disagrees that men are better political leaders than women. Table 6 reports the correlation matrix between the four indicators: indicators are all positively correlated but with intensity varying between a minimum of 0.128 and a maximum of 0.62.

Out of the these variables we construct two indexes of women emancipation: the first is the score statement (d), reflecting the disagreement with the statement that men make better business executives than women. To construct the second we extract the first principal component of the four variables (correlation with the elementary indicators is shown in the last row of Table 6). We than take regional means of these two indexes and mach them with our managers data set by

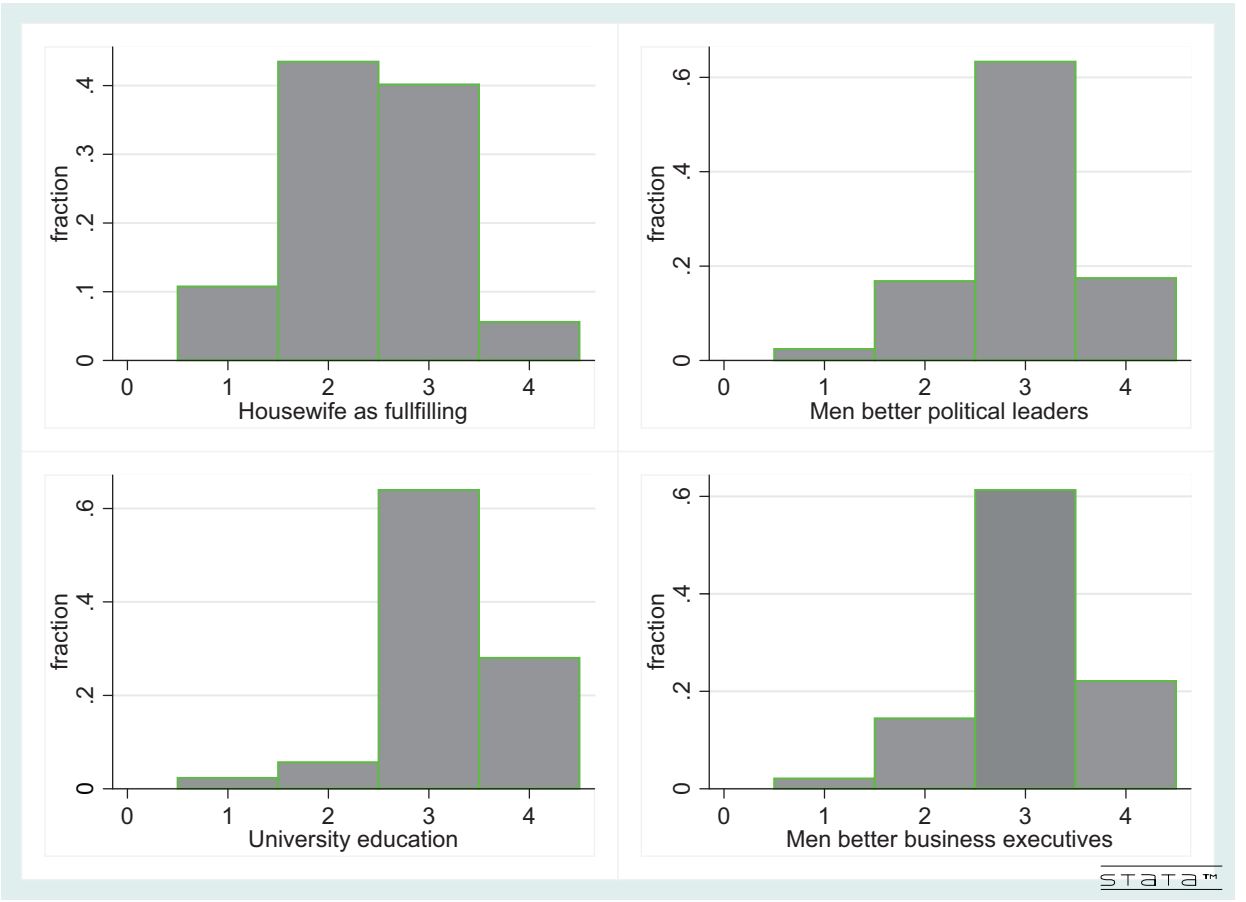


Fig. 3. Histograms of the answers to the questions: "Being a housewife is a just as fulfilling as working for a pay", "On the whole, men make better political leaders than women do", "A university education is more important for a boy than for a girl", "On the whole, men make better business executives than women do".

Table 6
Correlation among indices of women emancipation. Four variables report the degree of agreement with the statements: (Housewife) "Being a housewife is a just as fulfilling as working for a pay", (Political) "On the whole, men make better political leaders than women do", (University) "A university education is more important for a boy than for a girl", (Executives) "On the whole, men make better business executives than women do". PC is the principal component of the first four variables, averaged across regions. *p* value in parenthesis.

	Housewife	Political	University	Executives
Political	0.131	1		
	(0.0001)			
University	0.199	0.434	1	
	(0.0000)	(0.0000)		
Executives	0.166	0.619	0.499	1
	(0.0001)	(0.0000)	(0.0000)	
PC	0.356	0.812	0.767	0.850
	(0.0001)	(0.0000)	(0.0000)	

assigning to each manager in our sample the degree of women emancipation prevailing in his/her region of residence (20 regions in all). Table 2 shows summary statistics of the two measures.[6]

[6] We also constructed two analogous indicators: the first follows the procedure above but uses only women answers to the questions. The second was obtained by running a regression of the principal component measure or of the other indicator on demographic controls and a full set of regional dummies; the coefficients on these dummies were then taken as measures of women emancipation in the regions. The advantage of this procedure is that it accounts for observable differences in the composition of respondents across regions. Results are invariant to using these alternatives.

4.3. Model and implications

To capture formally the basic links between ability, emancipation and job selection and obtain some testable implications consider the following simple model. An agent i faces the choice of working as an employee and earning wage w or as a manager and earning profit Π_i. Each agent is endowed with a given ability A_i and each can produce output y_i using the diminishing returns technology $y_i = A_i L_i^{\alpha}$, where L_i is labor input - the only input in production. Ability in the population is distributed according to the cumulative $F_x(A)$ where $x \in \{M, W\}$ allows for the possibility that the distribution differs among men (M) and women (W).

We capture our basic assumption that women face stronger obstacles into management than men by assuming that there is a cost to enter management that depends on the degree of women emancipation $e = [0, 1]$ defined in the interval [0, 1] where 1 stands for full emancipation; for men $e = 1$. The monetary equivalent of this cost is a tax on profits at a rate $1 - e$. Optimal firm size and profits conditional on becoming an manager are

$$L_i^* = \left(\frac{\alpha A_i}{w}\right)^{\frac{1}{1-\alpha}}$$

and

$$\Pi_i^* = (1-\alpha)\alpha^{\frac{\alpha}{1-\alpha}} A_i^{\frac{1}{1-\alpha}} w^{-\frac{\alpha}{1-\alpha}};$$

thus agent i chooses to be a manager if

$$e\Pi_i^* = e(1-\alpha)\alpha^{\frac{\alpha}{1-\alpha}} A_i^{\frac{1}{1-\alpha}} w^{-\frac{\alpha}{1-\alpha}} \geqq w$$

or

$$A_i \geqq \frac{w}{me^{(1-\alpha)}} = \overline{A}(w, e)$$

where $m = \alpha^{\alpha}(1-\alpha)^{(1-\alpha)}$.

This set up allows to draw the following implications:

1. The threshold $\overline{A}(w, e)$ for becoming a manager is decreasing in the degree of emancipation,

$$\frac{\partial \overline{A}(w, e)}{\partial e} < 0.$$

Hence, the ratio of the density of women to men in management $\frac{1-F_W(\overline{A}(w,e))}{1-F_M(\overline{A}(w,1))}$ is higher in areas where emancipation is higher.

2. The average intrinsic ability of women managers is, everything else being equal, higher where the emancipation is lower, because the threshold is higher; this is clear since the expected ability as a function of the threshold $\overline{A}$

$$\frac{\int_{\overline{A}}^{\infty} A dF_W(A)}{1 - F_W(\overline{A})}$$

is increasing in the threshold.

3. Finally, the optimal firm size is

$$L_i^* = \left(\frac{\alpha A_i}{w}\right)^{\frac{1}{1-\alpha}}$$

which is increasing with ability and is unrelated to gender or emancipation. That is, once a woman makes it into management the translation of its intrinsic ability into firm outcomes is no different than that of men. This implication follows from the assumption that gender only affects the distribution of ability but not the technology that translates ability into output; and emancipation, being a tax on profits, only affects occupational decisions but not optimal firm size and thus the relation between intrinsic ability and firm output. Whether this is true or not is an empirical matter which is interesting to test.

4.4. Predictions

The three implications we have described in Section 4.3 can be formulated as follows in terms of correlations between the digit ratio as indirect measure of intrinsic ability, measures of women emancipation and our variables of interest.

First, the incidence of women among managers should be higher in regions where women emancipation is higher. We test this prediction with a regression of the fraction of women among the managers in the sample in each Italian region, on an index of women emancipation. The coefficient of the index should be positive. We test this prediction in Section 5.1.

Table 7
Fraction of female managers and women emancipation. The dependent variable is the fraction of female managers. The coefficients reported are standardized (β coefficients). Robust standard errors. The variable South is equal to one if the manager is operating in the South of Italy. p value in parenthesis; *** denotes significance a 1% level; ** at 5%, * at 10%.

	(1) beta/p	(2) beta/p	(3) beta/p	(4) beta/p
Women emancipation: PC	0.437*	0.438*		
	(0.054)	(0.058)		
Women emancipation: BE			0.472**	0.470**
			(0.036)	(0.040)
South		−0.126		−0.114
		(0.568)		(0.597)
R^2	0.191	0.207	0.223	0.236
N	20	20	20	20

The second prediction considers the effect on the female/male gap in the digit ratio, taken as indirect measure of managerial ability, of regional differences in beliefs about women ability (and any opinion that more generally they can represent). The prediction is that when an index of women emancipation is higher, the DR for women is higher, because access to a larger number of women into the managerial activity is possible and thus the distribution of women DR in that region becomes more similar to the one in a representative sample. Hence the female/male gap should tend to become more positive (or less negative). We test this prediction by regressing the digit ratio on several variables, a female dummy and an interaction between the female dummy variable and the index of women emancipation. This coefficient should be significant and positive. We test this prediction in Section 5.2.

The final prediction is that the relation between intrinsic ability and firm size does not depend on gender or on women emancipation: that is, once women enter management, they are equally able than man to translate their ability into outcomes for the firm; in particular the firm size. This prediction is tested in Section 5.3.

5. Results

5.1. Women emancipation and female management

We test the first prediction that the incidence of women among managers should be higher in regions where women emancipation is higher in Table 7. The dependent variable is the fraction of women managers in our sample in each of the 20 regions of Italy and is regressed on our indexes of women emancipation in the region.

The first column reports estimates using the principal component of the four elementary indicators of beliefs about women versus men roles and it shows a positive and significant correlation between the incidence of women managers and women emancipation. This result is unaffected if we add a South dummy and thus rely only on within area variation in women emancipation.

The other two columns, 3 and 4, show the results when we use the answers to statement “men make better business executives than women do”. In this case too the fraction of women managers is higher where the index of women emancipation is higher and is unaffected when adding a dummy for the South. Furthermore estimates using this indicator are even more precise, perhaps because it provides a more direct measure of the cultural obstacle women face in becoming managers.

The correlation with both variables is strong, and supports the prediction: a larger regional index of women emancipation is associated with a larger fraction of female managers among the subset of subjects for that region. The slope of the relation is large for the two indices. Using either one of two sets of estimates, moving from the region in the 10th percentile of emancipation index to the one in the 90th percentile is associated with a higher fraction of women managers of 14.4 percentage points - one half of the average share of women managers in the sample. The first prediction made no use of the digit ratio measurement. We now turn more specifically to the interaction between the value of the index of intrinsic ability and that of women emancipation. Of course there may be hidden variables affecting both women emancipation and fraction of women managers; so the results reported so far are best considered a correlation.

5.2. DR and female management

In Tables 8 and 9 we report the results of the regression with the interaction of the gender and women emancipation index on the digit ratio in the sample. We estimate the following equation:

$$DR_{iR} = a_0 + a_1 Female_{iR} + a_2 Female_{iR} \times e_R + f_R + Z_{iR}\beta + \epsilon_{iR} \quad (1)$$

Table 8
Digit ratio, right hand, gender and women emancipation. Columns 1 and 4 report OLS; Columns 2, 3, 5 and 6 the Heckman regressions. WE is Women emancipation index (BE). Standard errors are cluster adjusted at the regional level.

	OLS	Heckman		OLS	Heckman	
	(1)	(2)	(3)	(4)	(5)	(6)
	b/p	b/p	b/p	b/p	b/p	b/p
Main Equation						
Female	−0.008**	−0.013***	−0.015***	−0.190*	−0.271***	−0.273***
	(0.035)	(0.008)	(0.006)	(0.062)	(0.005)	(0.005)
Female * WE (pc)	0.022*	0.035***	0.037***			
	(0.096)	(0.005)	(0.004)			
Female * WE (BE)				0.060*	0.085***	0.085***
				(0.074)	(0.007)	(0.007)
Female * South			0.006			0.002
			(0.423)			(0.816)
Height entr.	−0.000*	−0.001***	−0.001***	−0.000**	−0.001***	−0.001***
	(0.052)	(0.009)	(0.009)	(0.049)	(0.008)	(0.008)
First born manager	−0.007**	−0.006*	−0.006*	−0.007**	−0.006*	−0.006*
	(0.023)	(0.056)	(0.058)	(0.025)	(0.061)	(0.061)
Selection Equation						
Female		0.198**	0.202**		3.313**	3.298**
		(0.013)	(0.021)		(0.035)	(0.036)
Female * WE (pc)		−0.488**	−0.491**			
		(0.012)	(0.013)			
Female * WE (BE)					−1.030**	−1.029**
					(0.045)	(0.046)
Female * South			−0.014			0.057
			(0.927)			(0.700)
Height entr.		0.012**	0.012**		0.012**	0.012**
		(0.012)	(0.012)		(0.011)	(0.011)
First born manager		0.025	0.025		0.024	0.024
		(0.671)	(0.672)		(0.687)	(0.683)
log firm size: empl.		0.011	0.011		0.010	0.010
		(0.708)	(0.707)		(0.736)	(0.735)
Age of interviewer		0.013***	0.013***		0.013***	0.013***
		(0.000)	(0.000)		(0.000)	(0.000)
Height of interviewer		0.017***	0.017***		0.018***	0.017***
		(0.001)	(0.001)		(0.001)	(0.001)
Male interviewer		−0.223**	−0.223**		−0.228**	−0.227**
		(0.048)	(0.047)		(0.043)	(0.044)
N	1313	2129	2129	1313	2129	2129
lambda		−0.043	−0.043		−0.044	−0.044
p		0.000	0.000		0.000	0.000

where DR_{iR} is the digit ratio of manager i located in region R; *Female* is dummy for gender (1 if manager is a woman, 0 otherwise) capturing systematic differences in *DR* between the two genders; e_R is the degree of women emancipation in region R, Z_{iR} is a vector of individual traits that have been found to correlate with the digit ratio and ϵ_{iR} a disturbance term.

In a representative sample one should expect $a_1 > 0$. In our selected sample, as we have already documented in Table 5, the opposite is true: women managers have a lower digit ratio than men managers: $a_1 < 0$. The key test of our explanation of this anomaly - that it reflects a higher ability requirement for women because of cultural prejudice - is offered by the third term, the interaction between the female dummy and the index of women emancipation in region R where the manager is based. If women emancipation lifts women obstacles to starting a firm, the digit ratio of women relatively to that of men should get closer to what is observed in a representative sample. Hence a_2 should be positive. There could be systematic differences across regions in the easiness of starting a firm (e.g. Guiso and Schivardi, 2011) independently of gender; these differences may arise because administrative costs may be higher in some areas, or because the minimum size required to set up a business differs across areas. These differences, if present, trigger different levels of minimum ability to become a manager and thus of the average level of our proxy for it, the digit ratio. The regional fixed effects f_R in (1) will capture all these channels of influence. Tables 8 and 9 show the result of the estimates.

Table 8 shows results using the digit ratio of the right hand; in column (1) the interaction between the male dummy and the principal component index of women emancipation is positive and statistically significant lending support to the model prediction. In column (2) we report estimates of the second-stage Heckman model that accounts for potential selection as not all managers were willing to participate in the finger's measurement. The exclusion restrictions for identifications are the three characteristics of the interviewer (age, gender and height) included in the first stage probit (reported in the bottom part of the table). The parameter estimate of the interaction between the female dummy and women emancipation has the same sign as in the first column but is somewhat larger and estimated with greater precisions. Column (3) adds

Table 9
Digit ratio, left hand, gender and women emancipation. Columns 1 and 4 report OLS; Columns 2,3, 5 and 6 the Heckman regressions. WE is Women emancipation index (BE). Standard errors are cluster adjusted at the regional level.

	OLS	Heckman		OLS	Heckman	
	(1)	(2)	(3)	(4)	(5)	(6)
	b/p	b/p	b/p	b/p	b/p	b/p
Main Equation						
Female	−0.016***	−0.020***	−0.023***	−0.185**	−0.258***	−0.266***
	(0.000)	(0.000)	(0.000)	(0.023)	(0.005)	(0.004)
Female * WE (pc)	0.019*	0.031***	0.034***			
	(0.074)	(0.010)	(0.006)			
Female * WE (BE)				0.056**	0.078***	0.080***
				(0.037)	(0.009)	(0.007)
Female * South			0.009			0.005
			(0.242)			(0.527)
Height entr.	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***	−0.001***
	(0.003)	(0.001)	(0.001)	(0.003)	(0.001)	(0.001)
First born manager	−0.009***	−0.009***	−0.008***	−0.009***	−0.008***	−0.008***
	(0.002)	(0.005)	(0.006)	(0.002)	(0.006)	(0.006)
Selection Equation						
Female		0.198**	0.202**		3.313**	3.292**
		(0.013)	(0.021)		(0.035)	(0.036)
Female * WE (pc)		−0.488**	−0.491**			
		(0.012)	(0.013)			
Female * WE (BE)					−1.030**	−1.027**
					(0.045)	(0.046)
Female * South			−0.014			0.057
			(0.927)			(0.701)
Height entr.		0.012**	0.012**		0.012**	0.012**
		(0.012)	(0.012)		(0.011)	(0.011)
First born manager		0.025	0.025		0.024	0.025
		(0.671)	(0.672)		(0.687)	(0.673)
log firm size: empl.		0.011	0.011		0.010	
		(0.708)	(0.707)		(0.736)	
Age of interviewer		0.013***	0.013***		0.013***	0.013***
		(0.000)	(0.000)		(0.000)	(0.000)
Height of interviewer		0.017***	0.017***		0.018***	0.017***
		(0.001)	(0.001)		(0.001)	(0.001)
Male interviewer		−0.223**	−0.223**		−0.228**	−0.226**
		(0.048)	(0.047)		(0.043)	(0.045)
N	1313	2129	2129	1313	2129	2129
lambda		−0.039	−0.038		−0.039	−0.040
p		0.000	0.000		0.000	0.000

to the specification also an interaction between the female dummy and a South dummy; even in this case results are unaffected suggesting that the women emancipation index in not capturing some geographical variable other than women emancipation that affects occupational choice differentially by gender. The last three columns show estimates similar to those presented in the first three, but using as measure of women emancipation people's views about whether male make better managers than women. In this case too the interaction between the female dummy and the index of emancipation is positive and significant in all specification and even more precisely estimated.

Table 9 reports results when we use the digit ratio of the left hand to measure intrinsic ability. Results are very similar to those reported in Table 8. In all cases the interaction between the female dummy and women emancipation is positive and significant, the effect is robust to selection and to adding an interaction between gender and the South dummy and to the measure of women emancipation.

In the least emancipated region (using the estimates in the third column of Table 8) the women/men difference in digit ratio is −0.102 - larger than the sample standard deviation in the digit ratio; in the most emancipated region the gender gap in digit ratio flips sign though it remains small (0.0048) compared to the difference in representative samples. Overall this evidence seems very much consistent with the idea that cultural beliefs that consider certain jobs as masculine - namely management - induce women to choose these jobs only when their talents far exceeds that necessary to induce the choice when such such norms are not binding and people are free to chose whatever occupation they like.

One issue with our findings is that the women's emancipation variable might also be capturing other feature of the environment that happen to be correlated with women emancipation- e.g. the quality of institutions or the level of education - and that may not be simply captured by the "South" dummy variable. While women emancipation is presumably correlated with other variables such as the quality of institutions and education, in so far these variables affect women relative cost of becoming managers through emancipation our analysis and interpretation are unaffected. The point may be more

worrying if these variables affect differentially men and women cost of setting up a business directly, for instance because gender-specific subsidies to management happen to be more generous to women in regions were women are more emancipated. Because subsidies to management have historically been used to foster development in the South, if such an effect is present it should be captured by the South dummy interacted with gender. As a farther check we have built a specific indicator of regional policies to foster women management. The indicator, described in detail in the appendix, sums scores assigned to each of the 20 Italian regions on seven domains, 5 related to specific subsidies policies and two to equal opportunities programs. We build two regional indicators, one using all seven domain-specific indexes and another using only the five related to subsidies. We find that these indicators are poorly correlated with the women emancipation index and results are unaffected when interact them with the gender dummy and add them as controls.[7]

Our estimates could be affected by geographical mobility: talented women facing discrimination in their region choose to move to a more women-friendly area. Obviously, if mobility costs are absent or very low gender-related local barriers to management could be undone by migrating. Still, we should observe a positive relation between the share on women managers and the degree of emancipation in a region and would even be steeper than if mobility was not allowed. In fact, talented women grown up in a low-women emancipation region would move and increase the share of women managers in high emancipation regions in addition to lowering it in low-emancipation regions (the only effect we would observe if mobility was not an option). On then other hand, migration would bias the correlation between the gender gap in the digit ratio and the degree of emancipation against us, since more talented women (low digit ratio) would be more willing to incur the mobility cost and leave to set their firm in a more emancipated region. We can test whether these concerns are relevant. Since we know where the manager was located before starting his activity (between age 15 and 18) and the current location of the firm, we can identify movers as those grown up in a region and working in another. If mobility is an issue we should find relatively large numbers and a higher frequency among women. We find that only 16.6% move and there is no difference between gender (among women the fraction is even slightly lower, 16.3%) suggesting this is unlikely to be an issue.

5.3. Digit ratio, size and gender

To test the last prediction - the relation between intrinsic ability and firm size does not depend on gender or on women emancipation - we run regressions of firm size on the digit ratio. We measure firm size in our sample using the number of employees. Besides including the digit ratio we also control for the age of the firm, a full set of industry dummies to account for differences in firm size across industries and a set of regional dummies to capture any difference across regions due to institutional features of various sorts (e.g. differences in legal enforcement, credit availability or firm subsidies) that may affect firm size. In addition we control for the age and education of the manager, the number of years he has been in control its height and whether he is first born. To check whether women are better or less able than men to translate their ability into outcomes once managers and whether this depends on emancipation we add to the specification interactions between: the digit ratio and a female dummy; the digit ratio and the index of women emancipation; these three variables (besides the female dummy directly; the direct effect of women emancipation being captured by the regional dummies). For each regression we compute two *F* tests: the *F* test for the null that all the terms involving the digit ratio are equal to zero; the *F* test for the null that only the interactions of the digit ratio with gender and emancipation are equal to zero. If ability matters for firm outcomes and matters independently of gender and emancipation we should reject the first null hypothesis but not the second.

Table 10 illustrates the results.

In all regressions we insert the Mill's ratio computed from a probit estimate of the probability of participating in the measurement of the digit length to account for selection, using interviewer characteristics as exclusion restrictions (see Table 4). As a measure of women emancipation we use the principal component indicator; results are unchanged using the other measure. The first column reports the regression with all the controls but no interaction terms between the digit ratio, gender and emancipation. It establishes that the digit ratio is negatively and significantly correlated with firm size (as in Guiso and Rustichini, 2017) - that is managers with higher exposure to prenatal testosterone run larger firms: one standard deviation decrease in the digit ratio is associated with a 7% increase in the average size of the firm. This finding supports our contention that the digit ratio captures intrinsic managerial ability. It is worth noticing that in this and subsequent specifications the direct effect of the female dummy is zero. That is there is no difference in the size of firms managed by male and female managers once we control for the digit ratio and for other observables. In our data gender per sè is uncorrelated with firm size.

The second column adds an interaction between the female dummy and the digit ratio. This interaction is small in size and not statistically significant. We reject the null hypothesis that all the terms involving the digit ratio are jointly equal to zero but obviously cannot reject that interaction term is zero (*F* test 2.42, *p*-value 0.07). This implies that once they choose to become managers men and women are equally good at translating their ability into firm outcomes.

The third column adds also an interaction between the digit ratio and women emancipation. Not surprising as we add interaction terms between the digit ratio and gender and emancipation the direct effect of the digit ratio looses some

[7] To save on space we do not report them but are available on request.

Table 10
Employment, gender and women emancipation. The coefficients reported are standardized (β coefficients). p value in parenthesis; *** denotes significance a 1% level; ** at 5%, * at 10%. Standard errors are cluster adjusted at the regional level.

	(1) beta/p	(2) beta/p	(3) beta/p	(4) beta/p
Digit ratio: right hand	−0.063**	−0.059	−0.054	−0.058
	(0.029)	(0.106)	(0.144)	(0.118)
Female	−0.068	0.029	0.084	0.040
	(0.141)	(0.959)	(0.880)	(0.941)
DR × Female		−0.097	−0.154	−0.113
		(0.863)	(0.781)	(0.834)
DR × Women Emanc.			0.707	0.796*
			(0.123)	(0.073)
DR × Female × WE				0.051
				(0.241)
Age of manager	−0.001	−0.000	−0.002	−0.003
	(0.982)	(0.989)	(0.962)	(0.921)
Education of manager	0.180***	0.179***	0.179***	0.180***
	(0.000)	(0.000)	(0.000)	(0.000)
Height entr.	−0.005	−0.006	−0.005	−0.004
	(0.908)	(0.903)	(0.917)	(0.927)
First born entr.	0.005	0.005	0.007	0.007
	(0.867)	(0.866)	(0.806)	(0.813)
Firm age	0.200***	0.200***	0.201***	0.199***
	(0.000)	(0.000)	(0.000)	(0.000)
Years in control	−0.013	−0.013	−0.012	−0.012
	(0.739)	(0.736)	(0.745)	(0.757)
Mill's ratios	0.097	0.098	0.097	0.098
	(0.264)	(0.259)	(0.266)	(0.260)
R^2	0.171	0.171	0.173	0.174
N	1098	1098	1098	1098

precision but its coefficient - and thus its effect on size - is fairly stable. Furthermore the joint hypothesis that all interaction terms are jointly equal to zero cannot be rejected (p-value=0.302) while we reject the null that all the terms involving the digit ratio are zero (p-value 0.0702). Finally the fourth column adds also a three-way interaction between the digit ratio, the female dummy and emancipation. The result is unchanged: the test of the null that all variables involving the digit ratio are equal to zero is rejected (p-value 0.078) while the test that all the interactions with the digit ratio are zero cannot be rejected (p-value 0.277). We read this evidence as consistent with gender and limited emancipation acting as a barrier for talented women to enter management; but once they cross the barrier neither gender nor emancipation affect women capacity to exploit their managerial talent.

6. Conclusions

The fact than women occupy a substantially smaller fraction of leadership positions in virtually all professions is an important policy issue. The fact is beyond dispute, in spite of modest improvements in recent years. Whether remedies are possible or desirable depends crucially on the reasons for the fact.

Two competing hypotheses have been proposed: one is that there is an intrinsic difference in managerial ability between men and women. In an extreme form, this hypothesis predicts that two individuals of the same intrinsic ability will have the same probability to access managerial activity, no matter what their sex is; but two individuals of different sex will have different ability. The second is that social norms, conventions, or simply direct discrimination affect the access of women to leadership positions. In an extreme form, this hypothesis predicts that two individuals of different sex will have on average the same intrinsic ability but different probability to access managerial activity.

The two explanations are not of course mutually exclusive. A research aimed at determining how much of truth there is in each will have eventually to use a direct measure of ability or some sufficiently precise approximation. Our paper is one step in this direction, in that it introduces one such proxy, the digit ratio. For reasons that we have discussed in Section 4.1, researchers do not have yet enough evidence to make inferences on the relative level of expected ability of two individuals of opposite sex on the basis of their digit ratios. This evidence may be obtained in the future, so this first step is a methodological advance.

In the meantime, we can however make correct inferences based on the comparisons of digit ratios of individuals of the same sex. This comparison allows us to test and reject the first, extreme hypothesis, that the gender gap in participation to leadership positions is entirely due to differences in intrinsic ability. In fact an implication of this theory is that there should be no effect of gender-related beliefs on the fraction of women managers. This result only requires evidence on the correlation between the fraction of women managers and beliefs. The use of our indirect measure of ability allows us to

prove that beliefs play an independent role (and do not simply reflect different regional values of intrinsic ability) and end up affecting the distribution of ability in the sample of individuals who become managers. In other words, our results show that the second explanation that social norms or discrimination affect the access of women to leadership positions is at least in part true.

Appendix

The ANIA survey

The ANIA Survey for Small Business Companies collects data on a sample of 2295 Italian firms and their top manager. The survey was conducted on a sample of small Italian firms, having up to a maximum of 250 employees, extracted from the total number of companies present in CERVED - a business information agency operating in Italy which collects companies balance sheet data. The survey was conducted between October 2008 and July 2009; the field study therefore covered the entire financial crisis. Compared to the initial target set at the completion of 2,300 interviews, the investigation closed with 2295 completed interviews. Participation in the survey entails the willingness to provide information on the use of insurance markets and details regarding the firm as well as the willingness of the top CEO/owner of the company to take part in a face to face interview with a professional interviewer. The first type of data was collected through a questionnaire filled out by each company, while the second type was obtained through an interview using the CAPI (Computer Assisted Personal Interviewing) method. Partly due to the difficulties that many firms have faced during the crisis, it proved to be more complex and difficult than usual to have the firm and the manager agree to participate in the survey. Moreover, the fact of directly interviewing the firm owner or CEO decreased the acceptance rate of the interviews, particularly for firms in the larger size categories and lengthened the time of the field study. Partly for this reason it was necessary to review the survey design in order to include a larger number of smaller firms (with less than 20 employees). This caused the sample to be more biased towards smaller firms than the population of businesses of up to 250 employees found in CERVED. In the final sample of 2295 firms, 98.5% are private, located in 59% of cases in north Italy, 19% in central Italy and 22% in the south and islands. In 85% of cases these are controlled by an individual within a family and a remaining 10% by a group of people without family ties.

Regional Subsidies Index (RSI)

We build the regional indicator of subsidies to women management combining information on several programs summarized in the study by IPI (2005) whose purpose was to compare the initiatives taken by the 20 Italian regions to foster women management using a standardized methodology. The study contains 20 chapters; one for each regions, describing in detail the various instruments in specific domain. Regional intervention in each domain is summarized in the last chapter of the study, the one we have used to build the indicator. Specifically, we assigned to each region a score over seven domains. The first two domains reflect whether a given region has on the funds made available by the national law 215/92 containing to sustain women-funded firms and start ups in two editions, 2004 and 2005; we assigned a score 1 if a region exploited this opportunity in each of the two years, and zero otherwise. The third indicator assigned a score 1 if the region topped up national funding to start a business by a women and 0 to whose that did not. The fourth indicator is set $=1$ if a region participated (0 if it did not) in a national program started in 2004 meant to disseminate information through specific campaigns to raise women awareness about women management programs at the European, national or regional level; the fifth indicator is set $=1$ if a region has mentoring program for women starting a business. The last two indicators measure regions engagement is two editions of an equal opportunity program (called EQUAL I and EQUAL II) consisting of specific initiatives at the regional level to promote women engagement in business using instruments other than monetary transfers. The indicator in each edition takes a value equal to the number of initiatives taken by the region (0 for regions not active). Our final indicator labeled RSI, is the sum of the scores in the seven sub-indexes. This score ranges between 0 and 9, with a mean 4.8 (sd 2.3).

Variables definitions

Here we provide a detailed description of the variables used in the paper whose definition is not obvious.

Affinity : assessment about the affinity with the interviewed managers provided by the interviewer on a scale between 0 (no affinity) and 10 (very high affinity).

Age of manager: in years

Education: Number of years of schooling of the manager

Firm age: Years since firm foundation

Firm size: Measured as number of employees

First born: Indicator equal to 1 if manager is the first born child

Height: Manager's height in centimeters

Male: Indicator equal to 1 if manager is a male

Women emancipation, principal component: First principal component using the four elementary beliefs illustrated in the text and then taking regional averages.

Women emancipation, single answer indicator: Values of the disagreement with the statement "Men make better executives than women do", averaged out across regions.

Years in control: Number of years since the manager has acquired the responsibility of the management of the firm.

Supplementary material

Supplementary material associated with this article can be found, in the online version, at 10.1016/j.euroecorev.2017.10.008.

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