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What women want. Gender-based norms and cognition in STEM occupational choices

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Abstract

This research investigates why some women like STEM occupations more than others. We show that this phenomenon is rooted in historical kin-based norms and specific aspects of cognition, perceptions, and aspirations enforced by the normative demands of ancestral societies. Using a sub-population of second-generation immigrants from the European Social Survey (ESS), we find that intensive kinship ties, supported by strong cousin-marriage preferences, co-residence of extended families, and community endogamy, which resulted in the enforcement of stricter social norms and greater conformity while discouraging individualism, independence, and analytical thinking, had a persistent negative impact on women's current STEM occupation choices. In addition to the individual-level analysis, we also document that kinship intensity reduces the proportion of women in STEM across countries, thereby widening the documented gender gaps. Furthermore, we show that the causal link between norms, cognition, and occupation is both direct and indirect, passing through contemporary cultural traits. At the same time, ancestral kin does not significantly affect men's occupational choices, while it increases the likelihood of having a gender-biased opinion about the role of women in the labour market. The results are robust to a rich set of potential confounding factors at the country of origin level and a battery of sensitivity checks.

Keywords: Kin-based institutions, gender-based norms, analytic cognition, STEM.

JEL Classification: D03, J16, N30

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Declarations

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1 Introduction

Despite the fact that female labour force participation has significantly increased in the past century and legislation for equal opportunities for women and men has been put in place in most developed countries, women continue to be under-represented in many sectors, in particular in the fields of science, technology, engineering, and mathematics (STEM). Recent statistics indicate that in 2023, women represent only 28% of the STEM workforce globally. Specifically, women made up 18% of the STEM workforce in the United States, 17% in the European Union, 16% in Japan, and 14% in India. Furthermore, women continue to face vertical discrimination within firms ("glass ceiling"), resulting in their under-representation in decision-making roles compared to men. The existing challenges, therefore, are not limited to whether women enter the labour force but also to the specific profession they select.

Although extensive literature exists on the potential determinants of women's labour force participation (Alesina and Giuliano, 2010; Alesina et al., 2013; Alesina et al., 2015, among others), fewer economic studies have rigorously investigated the causal mechanisms underlying women's preferences for STEM occupations. This is a critical issue since gender disparities in STEM may significantly contribute to the gender wage gap, as most of the STEM jobs pay higher salaries than non-STEM ones (Beede et al., 2011; Kahn and Ginther, 2017; Jiang, 2021). Furthermore, reducing the gender gap in STEM occupations is acknowledged as pivotal in advancing general equity as well as in unlocking the full potential of the STEM workforce, which will represent an increasing share of the overall labour force in the coming decades.

The reason why some women like STEM more than others lie in a variety of factors. First, besides standard economic considerations, such as access to education and work-life balance, the preferences for STEM may be significantly shaped by specific cognitive attributes and interests. Attitudes toward scientific subjects, along with analytical thinking and problem-solving, are qualities that can encourage participation in STEM fields. These attitudes are also shaped by what society as a whole "thinks" about women's role in economic and

social life. Gender-based norms according to which STEM is "blue" and the rest is "pink" associate STEM occupations with masculine qualities, leading to stereotypes that can push away girls and women from pursuing STEM (Thébaud and Charles, 2018). Furthermore, culturally embedded norms may intersect with some specific cognitive aspects, which further complicates the puzzle. More precisely, the evolution of individualistic and less embedded cultures was accompanied by looser norms and restrictions and enhanced analytic rather than holistic thinking (Hofstede et al., 2010; Schulz et al., 2019). Accordingly, therefore, women with more individualistic cultural backgrounds might have better analytical skills than those originating from more collectivistic and embedded cultures. Indeed, this actually seems to be the case (Ehrl and de Assis Alves, 2024). The interplay between norms and cognition, therefore, may be crucial in explaining why some women engage more in STEM while others opt for less technology-intensive occupations.

Although economists and sociologists widely agree that informal institutions may significantly influence individual preferences and choices, including those for STEM, a relatively few rigorous empirical papers exist to support this claim. Some literature finds that social gender norms affect parents' expectations of girls' academic knowledge in mathematics and science relative to that of boys (Rodríguez-Planas and Nollenberger, 2018), which may represent a reliable factor influencing women's educational choices. Others, however, show that even with a STEM college degree, women are more likely to opt out of STEM occupations than their male counterparts, which cannot be attributed to gender differences in ability or family-related reasons but rather to discrimination in the labour market and stereotyping (Jiang, 2021).

Isolating the impact of social norms internalised in individuals' beliefs and choices is particularly challenging when data are collected through surveys, as they are inherently endogenous to personal experiences and economic incentives. To address this issue, some literature relied on historical proxies of gender-based norms. Alesina et al. (2013), Alesina et al. (2015) and Duranton et al. (2009), for instance, employ ancestral use of plough and the spread of distinct family types proposed by Todd (1985) to explain the rate of female

labour force participation, political involvement, and entrepreneurship in contemporaneous societies. The authors show that more capital-intensive agricultural technology reliant on ploughing, which tended to favour men in farming tasks, has persisted up to modern times, making women with these particular cultural backgrounds significantly less likely to participate in the labour market or other social activities. The prevalent family type, on the other hand, partly reflected the division of gender-based roles. Communitarian or stem families with stronger family ties reinforced rigid norms regarding women's roles in society compared to more flexible nuclear family structures.

While previous studies focused more on determinants of women's labour market participation, in this research we want to understand why some women choose STEM-related occupations while others, similar in all aspects except their cultural background, don't. More precisely, we identify historical mechanisms that contributed to the emergence and persistence of specific norms and cognitive aspects that, transmitted from one generation to another, continue to exert significant influence on women's occupational preferences. We rely on a novel set of characteristics of kinship structures in the Middle Ages introduced by Schulz et al. (2019) that covers several aspects of ancestral kinship simultaneously, pertaining more closely to cultural practices and organisational aspects of societies driven by rules and norms. The reason why these measures are particularly suited for the purposes of our analysis is twofold. First, intensive kin-based societies were characterised by dense networks and strong within-group interdependence and cooperation. Deep cultural evolution in these societies led to the emergence of distinct psychological traits needed to support the collectivist demands enforcing conformity, obedience, favouritism, respect, loyalty to one's group, and holistic perception of relationships. At the same time, they were discouraging individualism, independence, and analytical thinking (Schulz et al., 2019; Varnum et al., 2010). Second, strong kin reinforced family bonds and led to stricter gender-based norms and division of roles. The interplay between kin-related psychological traits and stricter norms determined the perceptions and aspirations of each single member of society, with a clear gender-based divide.

Our empirical analysis proceeds in two steps. We first explore the association between the share of women in STEM jobs (as well as the relative gender gap) and the ancestral proxies for kin-based norms across countries. As a second step, we estimate a set of individual-level regressions on the sub-sample of female second-generation immigrants to isolate a direct effect of historical kinship of individual ancestors' country of origin on the probability of choosing a STEM professional career. In line with our expectations, we find that countries with more intensive historical kin-based institutions tend to have lower proportions of females in STEM, net of the other geo-climatic historical conditions, agricultural technology, political and economic characteristics, and religious composition. The individual-level analysis, on the other hand, reveals that women whose parents were born in countries with tighter norms and where the normative demands of intensive kinship in the past incentivised greater conformity, obedience, and holistic cognition are less interested in pursuing careers in scientific and technical fields. To complement the analysis, we further show that the effect of historical kin-based norms and cognition has been assimilated into contemporary cultural (or psychological) attributes inherited by individuals from their parents by means of a two-stage empirical model. More precisely, we predict part of contemporary individualism, embeddedness, and the strength of tradition and family ties determined by historical kin-based institutions and use it as a proxy for intergenerationally transmitted gender norms and cognition. The results clearly indicate that women with more individualistic and less embedded cultural backgrounds founded on less intensive ancestral kinship legacies, looser family ties, and a higher predisposition to analytical thinking are, on average, more inclined to pursue STEM occupations.

The novelty of this research is threefold. To the best of our knowledge, this is the first study that explores the causal relationship between kin-based social norms and individual preferences for STEM occupations. This is an important contribution since the existing literature focuses on the effects of norms on labour market participation (Alesina et al., 2013), or math and science test scores (Rodríguez-Planas and Nollenberger, 2018), yielding very important conclusions which, however, do not necessarily imply higher STEM partici-

pation rates (Jiang, 2021). Second, historical measures considered in this research represent an important source of novelty given their ability to capture simultaneously different dimensions of historical institutions together with cognitive aspects that influenced individual perceptions, expectations, and aspirations. Third, we show that the effect of historically determined norms is both direct and indirect, passing through contemporary psychological traits concerning gender roles, the intensity of family ties, and cognition. Our results add to the existing body of research highlighting the importance of attitudes in predicting economic choices and outcomes, shedding light on how deeply ingrained cultural characteristics can shape economic development processes in both home and host countries.

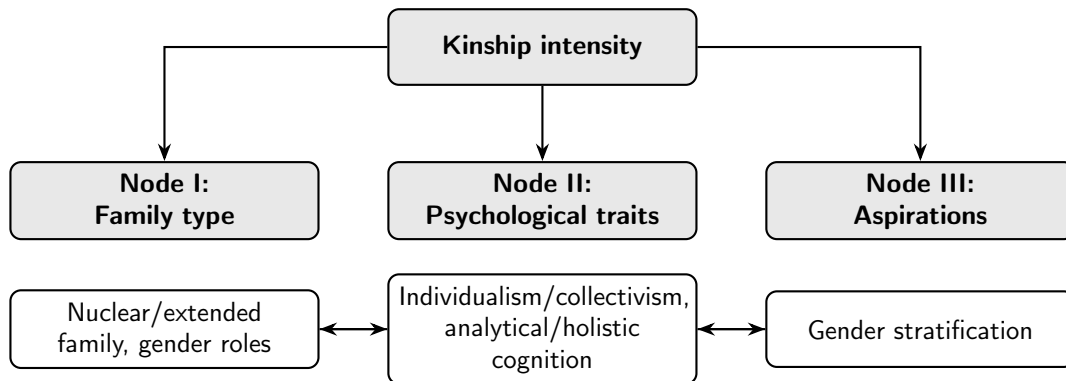
The rest of the paper is organised as follows. Section 2 presents our conceptual framework and mechanisms linking historical kin-based institutions to individuals' preferences for STEM. Section 3 describes ancestral proxies of kin-based institutions, while Section 4 presents the data and variables utilised in this study. Section 5 explains our identification and empirical strategy, followed by Section 6, which presents the main results. Finally, Section 7 concludes.

2 Kin-based institutions, norms and psychological outcomes

The predominant family type and other pre-modern institutions were influenced by ecological, climatic, and geographic conditions that dictated the kind of settlement, primary economic activity, and the extension of kin ties. Hunter-gatherers, for instance, tended to live in nuclear families or small bands, while sedentary agricultural societies mostly showed complex village communities and extended families (Hofstede et al., 2010). Lower resources (both human and economic) and ecological risks in predominantly hunter-based communities favoured extensive kin ties, while more intensive agricultural societies relied on dense and interdependent networks with a strong sense of in-group loyalty, discipline, respect of hierarchy, and adherence to societal rules and norms. Deep cultural evolution led to the emergence of distinct psychological traits needed to support the organisational needs

of diverse societies, with hunter-gatherer communities being predominantly egalitarian and flexible, enforcing individualistic and indulgent ways of thinking, as opposed to intensive kin-based institutions, which were favouring collectivism and holistic modes of reasoning. These traits in turn determined the perceptions and aspirations of each single member of the society, with a clear gender-based divide in several domains of every-day life. Figure 1 shows the mechanism linking kin-based institutions to psychological and organisational outcomes and norms. The discussion below will describe in detail each node of these interconnected processes separately.

Figure 1: Conceptual framework linking kinship intensity, societal institutions, and individual cognition and attitudes



Node I: Kinship ties, family structure and gender norms

The organization of pre-modern societies relied primarily on kin-based institutions. The extension of kin ties determined the degree of the within and between groups' interdependence and predominant family structure. Intensive kin-based institutions were characterized by dense and interdependent social networks with strong in-group loyalty and conformity and close kin marriages. Looser and extensive kin ties, on the other hand, translated into narrower networks and lower within and between group interdependency (Schulz et al., 2019).

Social networks threaded together by kinship institutions have enforced rules and norms individuals were supposed to adhere to in order to support the organizational needs of the

community. Intense kinship favoured tight networks supported by traditional, co-residing extended family structures. In these strongly interdependent contexts, men were typically seen as the primary breadwinners and decision-makers, while women were responsible for domestic duties and care-giving. The tight division of roles led to a hierarchical family structure where men held greater authority and power within the household, while women held limited autonomy and decision-making power (Castles, 1995; Esping-Andersen, 1999; Ferrera, 1996). Less intense kinship, on the other hand, favoured narrower and less interdependent social ties and a smaller, nuclear households and weak family ties. These societies tended to foster an egalitarian gender role where men and women participate equally in employment and housework.

Node II: Kinship ties and psychological traits

Enduring family structures and cultural-evolutionary processes emerging from pre-modern kinship have contributed to the emergence and persistence of several psychological patterns, attitudes, and beliefs, such as individualism, conformity, impersonal trust and fairness, and analytical thinking (Enke, 2019; Gelfand et al., 2011; Henrich, 2020; Schulz et al., 2019). The normative demands of intense kin-based institutions required conformity, obedience, and loyalty to one's group, discouraging, at the same time, individualism, independence, and analytical thinking. Less intense kinship, on the other hand, favoured a lower interpersonal embeddedness and lower need for strict rules and discipline, which resulted in higher independence, individualism, and creativity (Varnum et al., 2010). The fact that social orientation (individualism versus collectivism) is also related to the way of thinking (analytic versus holistic) is well documented in the literature. Markus and Kitayama (1991); Nisbett et al. (2001, 2008) and Varnum et al. (2010) discuss how different conceptions of individuality influence cognition and motivation, with Western cultures being more independent and motivated to explore their intrinsic interests compared to Asian societies that limit individualism and personal autonomy and reward holistic cognition. Moreover, Schulz et al. (2019) show that individuals whose parents originate from countries with less intensive kinship show

greater individualism-independence, less conformity-obedience, and more impersonal trust and fairness. Additionally, Ehrl and de Assis Alves (2024) document that higher individualism is associated with a significant increase in analytical skills as measured by PISA scores in science and mathematics, where women with stronger individualistic cultural backgrounds score significantly higher than their similar counterparts originating from more collectivistic societies. Along similar lines, Rodríguez-Planas and Nollenberger (2018) find that the performance of second-generation immigrant women is shaped by overall attitudes regarding women's political empowerment and economic opportunity in the country of ancestry and that these norms affect parents' expectations on girls' academic knowledge relative to that of boys.

Node III: Kinship ties, division of labour and aspirations

Contemporary societal attributes and psychological patterns, ranging from individualism to conformity and analytical thinking, therefore, have been influenced by enduring family structures and deep cultural-evolutionary processes. All these factors may have reinforced the common belief that women should not tie their achievements, attitudes, and aspirations to prospective life opportunities that were reserved for men. This latter aspect, indeed, is at the heart of the so-called "gender-stratification hypothesis" (Baker and Jones, 1993). As a consequence, women tend to prioritize values such as helping others, contributing to society, and giving back to their communities, in contrast to males, who often prioritize values such as earning a high income (Lyson, 1984; Eccles, 1987; Dicke et al., 2019, Thébaud and Charles, 2018). This is consistent with the higher representation of females in human services occupations.¹ Conversely, males are more inclined to value working with tools and machines, earning a high income, and pursuing careers in traditional male-dominated fields (Su et al., 2009; Wang and Degol, 2013). The fact that women tend to prioritize certain occupations, however, does not necessarily mean that they have different perceptions regarding their abilities toward more technical or scientific fields, rather, it is a product of

¹See, for instance: <https://ilostat.ilo.org/where-women-work-female-dominated-occupations-and-sectors/>

parental (and societal in general) expectations influenced by social gender norms. Indeed, Rodríguez-Planas and Nollenberger (2018) show that girls hold similar beliefs about their abilities irrespective of culture, but those having parents originating from less gender-unequal countries simply have lower preferences to do maths or science. This evidence suggests that biases in women’s preferences can lead them to opt for gender-conforming occupations as a result of the parental influence on their learning cognitive skills.

The above mechanisms, therefore, suggest that social networks and family organizations threaded together by kinship institutions have shaped individuals’ attitudes, perceptions, and ways of thinking according to normative demands and enforced several norms of conduct. Culturally embedded gender norms on the one side and analytic versus holistic cognition on the other generated a persistent effect on gender-based division of roles and aspirations. Since preferences for STEM are shaped by personality traits such as problem-solving and analytical thinking, attitudes towards prospective life opportunities, and social norms influencing parental expectations of women’s roles in society, women with more intensive historical kinship backgrounds may demonstrate lower interest in pursuing a STEM career. These mechanisms will underpin our main hypothesis discussed in Section 5.2.

3 Proxies of kin-based institutions

Most of the existing proxies of social norms refer to family organization, as one of the main kin-based structures. Some studies measure the strength of family ties by looking at survey questions that elicit beliefs on the importance of the family in an individual’s life, the duties and responsibilities of parents and children, and the love and respect for one’s own parents, among other factors (Alesina and Giuliano, 2010, Alesina et al., 2015). Eliciting this kind of self-reported information from survey data may give rise to issues related to endogeneity with respect to individual experiences and economic incentives. To overcome these concerns, attempts have been made to exploit some exogenous historical information

capturing various aspects of societal organization, including a set of rules and norms governing individuals' behaviour. For instance, Duranton et al. (2009), Alesina et al. (2015), and Galasso and Profeta (2018) used medieval-age family structures from Todd (1985) to explain differences in current economic outcomes. The Todd's classification of familial bonds goes along two dimensions, *i.e.*, the vertical relationship between parents and children, which is either "liberal" or "authoritarian," and the horizontal one capturing the predominant inheritance rule ("egalitarian" or "nonegalitarian").² This yields four possible types of family organization: the absolute nuclear family (liberal vertical relationship; nonegalitarian horizontal relationship), the egalitarian nuclear family (liberal; egalitarian), the stem family (authoritarian; nonegalitarian), and the communitarian family (authoritarian; egalitarian). Stem and communitarian families are characterised by more intensive family bonds and gender norms compared to other family types. Individuals whose ancestors come from cultures with strong familial bonds tend to be less geographically mobile and often earn lower wages. They are more likely to experience unemployment and generally favour stricter labour market regulations (Alesina et al., 2015). Moreover, individuals with intense family ties tend to hold more conservative views regarding women's societal roles, exhibit greater resistance to social changes and new ideas, and generally display reduced levels of trust (Alesina and Giuliano, 2010).

Other measures focused on rules and norms and their direct implications for the gender-based division of labour, without explicitly relying on family ties. Alesina et al. (2013) found that differences in gender-based norms have their origins in the form of agriculture traditionally practices in the pre-industrial period, namely a more labour intensive shifting cultivation, which required the use of handheld tools like the hoe and the digging stick, and a more capital intensive plough cultivation. Agricultural systems reliant on ploughing tended to favour men in farming tasks, while women specialized in domestic activities. This unequal

²The vertical relationship between parents and children is "liberal" when children become independent from their parents at an early age and leave their parental home as soon as they get married, while it is "authoritarian" if children continue to depend on their parents in adulthood and still live with them after marrying. The horizontal relationship between siblings is "egalitarian" when siblings receive an equal share of family wealth after their parents' death or "nonegalitarian" when parents favour one offspring at the expense of the others and transmit family wealth only to one child.

distribution of gender roles in the past had a persistent effect on the gender-based division of labour and continues to have significant implications for women’s economic outcomes, such as female labour force participation, involvement in politics, and engagement in entrepreneurial activities in contemporary societies.

The approach adopted in this paper complements the analysis in Alesina et al. (2013) and those relying on Todd (1985) but, at the same time, presents an important element of novelty. As mentioned in the Introduction, we exploit a unique set of historical measures of kin-based institutions introduced by Schulz et al. (2019) that covers several aspects of ancestral kinship ties simultaneously, pertaining more closely to cultural practices and organizational aspects of societies driven by rules and norms. In addition, the proposed measures capture how individuals’ cognition adapted to the normative demands and values of predominant social networks, determining their perceptions, expectations, and aspirations. This latter aspect is particularly relevant for the purposes of our analysis since it represents one of the key factors shaping individual preferences for STEM.

The main historical variable used in our analysis is the Kinship Intensity Index (KII, henceforth), which represents a comprehensive measure of various elements common to intensive kin-based institutions. More precisely, the index comprises five sub-indicators that capture key dimensions of kin-based organizations, namely the prevalence of cousin marriage preference, polygamy, co-residence of extended families, lineage organisation, and community organisation:

- (i) **Cousin marriage preference/prevalence.** Marriages between close kin have a significant impact on the compactness of social networks and family bonds (grounded in both genetic relatedness and shared socialisation). Across diverse societies, cultural norms emerge that either endorse or prohibit specific kin marriages. The increased prevalence of cousin marriage impedes the development of broad connections between families and clans that were previously unconnected or distant. Instead, it fosters the establishment of additional family ties and amplifies genetic relatedness among families and households that were already interconnected.

- (ii) **Polygamy.** Polygamy fosters kinship intensity through two main channels. First, fewer men reproduce, which affects the genetic group relatedness (reproductive skew). Second, polygamous marriage favours the formation of a common extended household: a larger number of genetically related individuals living together increases the strength of social and family bonds.
- (iii) **Co-residence of extended families.** Extended families are households in which multiple generations co-reside or live in close proximity. For instance, grandparents, their adult children, and grandchildren may inhabit a single residence. This structure contrasts with the nuclear family model, which consists exclusively of parents and their children. Such multi-generational living arrangements often facilitate the strengthening of interpersonal ties among family members.
- (iv) **Lineage organisation.** Lineage refers to ancestry, with two primary types. In unilineal descent, ancestry is traced through a single lineage, either the maternal or paternal line. Individuals, hence, are assigned to one specific family line, with a clear reference to familial relationships and obligations. For instance, in cases of family disputes, members know precisely which side of the family they are expected to support. In contrast, bilateral descent traces ancestry through both maternal and paternal lines, meaning individuals inherit connections to a unique set of relatives from each parent's family (with the exception of siblings, who share the same set). Unlike uni-lineal descent, this system promotes balanced connections to both sides of the family, generally resulting in less intense bonds.
- (v) **Community Organisation.** This indicator captures how extended families or clans arrange their living spaces. When family members live together in a specific area of a settlement, they interact less with outsiders and more with each other, making within-group ties stronger. Moreover, community organisation also relates to marriage patterns, specifically whether people marry within their own community (endogamy). When communities practice endogamy, they become more tightly connected because

they do not bring in new members from other villages through marriage. Both patterns (living close together and marrying within the community) help to maintain strong interdependencies.

It is important to note that KII is conceptually different from the other historical proxies used in the literature. While plough proved to be a reliable proxy for women’s participation in the labour market, the set of measures embraced in KII may be more suitable to explain particular occupational and/or educational choices rather than merely pointing to women’s willingness to work or stay at home. As already mentioned, what makes kinship measures appropriate for capturing women’s preferences toward STEM occupations lies in their linkage with some specific psychological traits related to individualism and analytical thinking, which tend to prioritize personal goals, self-expression, and individual achievements over adhering to group norms (Hofstede et al., 2010; Schulz et al., 2019). These cognitive attributes promote autonomy and independence, which may make women more inclined to pursue non-traditional fields as they are encouraged to follow their own paths and interests rather than conform to societal expectations about gendered career choices. At the same time, the kinship index considers multiple aspects of kin-based institutions and not only the predominant family type (which is only one of the five dimensions of the index). We will turn to this point in the next section.

4 Data and variables

This section provides a description of data sources and variables used in the empirical analysis. We first describe the country-level variables used in both the cross-sectional and individual-level analyses. The second part of the section reports the main dependent and explanatory variables used in the analysis at the individual level.

4.1 Country-level Data

Labour market indicators

The estimation of the cross-country relationship between historical kinship intensity and women’s current employment in STEM relies on labour market statistics extracted from International Labour Organization (ILO) databases.³ The data provides information on labour force participation by gender and age, with a specific section on STEM professions, including employment trends, educational attainment, wages, and youth employment in STEM. We include different indicators, such as the percentage of women employed in STEM sectors relative to the total STEM workforce and the relative gender gap, calculated as the difference between the proportions of males and females employed in these sectors. In order to account for the prevalence of STEM occupations in the economy (both for men and women), we consider the share of female and male STEM employment within the total female and male labour force.

Kinship measures and contemporary cultural traits

The information on five sub-indicators of KII comes from the Ethnographic Atlas (EA), provided by the Database of Places, Language, Culture, and Environment (D-Place). The EA database is ethnicity-based and includes 1291 pre-industrial ethnic groups. It contains information regarding whether a specific ethnicity favours cousin marriage and, if so, which type is preferred. Cousin marriage preference is represented as a continuous variable ranging from 0 to 3, where higher values indicate a stronger preference. Concerning polygamy, EA classifies societies into three categories: monogamy, occasional or limited polygyny, and common polygyny.⁴ Schulz et al. (2019) develop a continuous indicator ranging from 0 (representing monogamy) to 2 (indicating common polygyny/polygamy). The co-residence of extended families is captured by two different variables. The first one concerns domestic organization, while the other relates to marital residence. The extended family sub-indicator is obtained as the average value of the domestic organization and marital residence. The higher the value, the greater the intensity of family ties. Finally, Schulz et al. (2019) propose

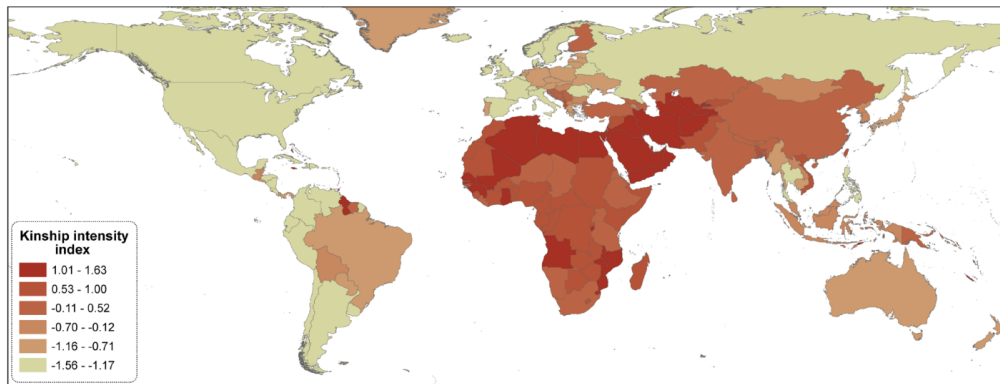
³See: <https://ilostat.ilo.org/blog/where-women-work-female-dominated-occupations-and-sectors>

⁴Polygyny refers to the most common form of polygamy, entailing the marriage of a man with several women.

two continuous variables for lineage and community organization, ranging between 0 and 1. Lower values of lineage organization denote bilateral descent, while higher values refer to other forms of descent rules (including duolateral, quasi-lineage, and ambilineal descent). Community organisation integrates two aspects (localization and community endogamy), taking value 1 if localized clans are present and/or if community endogamy is evident. If both are absent, the variable takes the value 0. A community organization value of 0 denotes communities lacking localized groups and displaying no inclination towards local endogamy.

Based on these indicators, the authors compute two standardised kinship indices: one at the ethnicity level and another at the country level. For the purposes of our analysis, we make use of KII at the country-level, which represents the population-weighted index of ethno-linguistic groups residing within the country. Figure 2 shows the distribution of kinship intensity across countries. Higher values of the index correspond to more intense kinship norms.

Figure 2: Kinship Intensity Index (KII) across countries

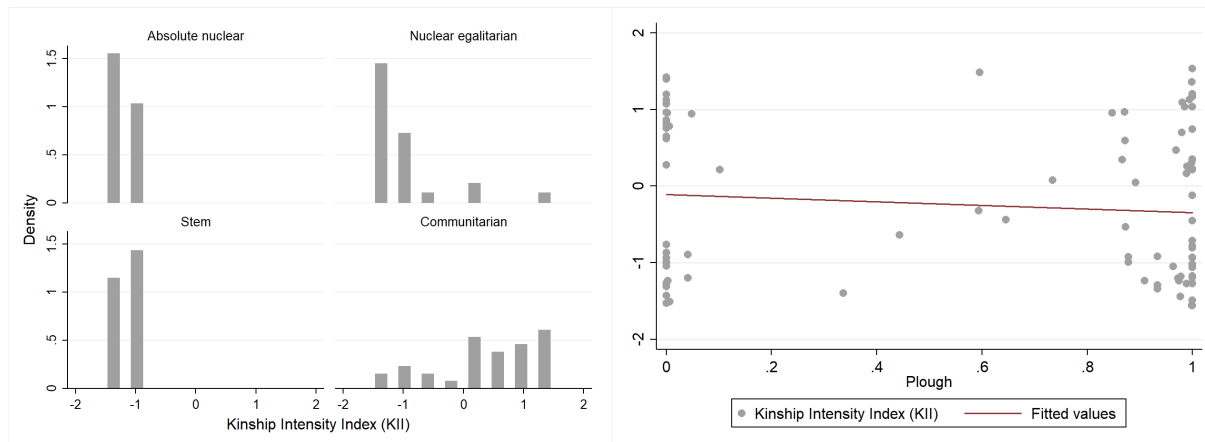


Source: Schulz et al., 2019.

As already stressed in the previous section, the kinship intensity index captures multiple aspects of pre-modern kin-based institutions, which makes the index conceptually different from the other historical proxies of gender-based norms. Figure 3 shows that for each type of familial structure from Todd (1985), there are multiple values of KII, which represent a

valuable source of cross-cultural variability. The correlation between KII and the measure of plough from Alesina et al. (2013), on the other hand, is almost null (-0.1) confirming the fact that these two measures capture different aspects of historical institutions. We will turn to this point in Section 6.2.

Figure 3: Kinship Intensity Index (KII) versus family types from Todd (1985, 1990) and historical plough from Alesina et al. (2013)



Source: Alesina et al. (2013); Schulz et al. (2019); Todd (1985, 1990).

Regarding cultural traits that may serve as a bridge between historical attributes and individuals' contemporary choices, we consider a set of indicators originating from different sources. The first indicator, namely the degree of individualism, is taken from Hofstede et al. (2010). Individualism measures the extent to which individuals prioritize their own interests over the interests of the group. This indicator, hence, reflects the importance of independence, with higher scores indicating societies where personal freedom, autonomy, and self-expression are highly esteemed, as opposed to cultures where group harmony, interdependence, and loyalty to the community are prioritized. As already stressed in Section 2, a preference for individualism is significantly associated with weaker social norms and a more analytical cognition.⁵

The second set of indicators originates from the World Values Survey (WVS) and includes

⁵For more info on these indicators, see Hofstede et al. (2010).

tradition and family. Tradition captures the importance individuals attach to traditional values, customs, or religion, while the strength of family ties relies on three variables that gauge beliefs regarding the significance of family in respondents' lives, the obligations and duties of parents and children, and the affection and respect for one's parents. Societies characterized by intense family ties tend to have more traditional beliefs about the role of women in society and are more reluctant to changes in society and innovation (Alesina and Giuliano, 2010; Schwartz, 2006). The last psychological outcome considered is embeddedness from Schwartz (2006) according to which more embedded cultures prioritize the preservation of the status quo and exercise restraint against actions that could disrupt the traditional order.

Among additional controls in country-level regressions, we consider a set of geographical characteristics, including agricultural suitability, absolute latitude, mean distance to waterways, average terrain ruggedness (Schulz et al., 2019) and a set of historical economic indicators from Alesina et al. (2013), namely political hierarchies, economic complexity, and the use of plough in agriculture. Regarding contemporary socio-economic controls, we include the GDP per capita, the religion composition (Schulz et al., 2019) and exposure to a socialist/communist regime before 1992 (Galor and Özak, 2016).

4.2 Individual-level Data

The individual-level analysis relies on data from the European Social Survey (ESS, henceforth), a biennial cross-country survey covering a large set of European countries (plus Israel) since 2002.⁶ The survey includes nationally representative samples of individuals aged 15 or older living in private households, irrespective of nationality, citizenship, or language. It gathers data on beliefs, attitudes, behavioural patterns, and a rich set of socio-economic characteristics. Respondents include natives (and third-plus generation immigrants) as well as first- and second-generation immigrants. Moreover, given the structure of ESS data, we

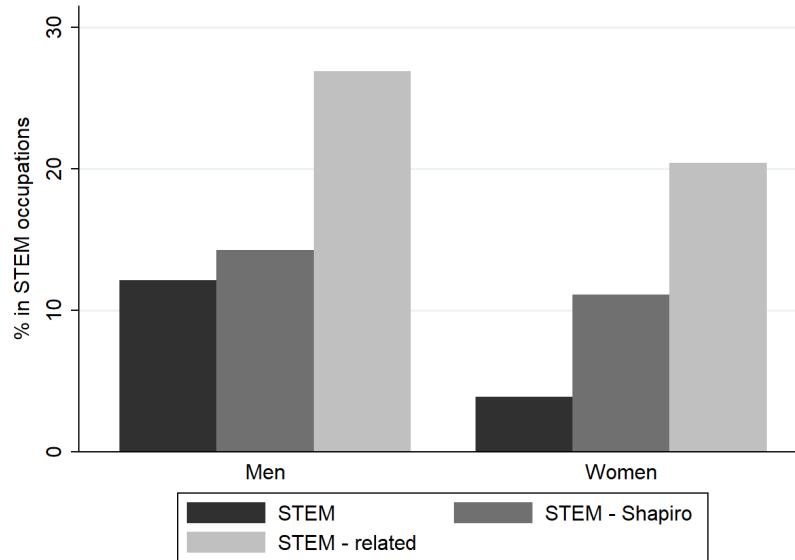
⁶The ESS survey selects new sample members each round (cross-sectional sampling) and does not contain a longitudinal component.

are able to link the information on parental characteristics to each respondent, such as the parents' country of birth, type of occupation, and educational attainment. In what follows we provide a more detailed description of the core variables used in the analysis.

Occupational variables

We consider three different definitions of STEM occupations. The main categorization follows the International Labour Organization (ILO) and Jergins (2023) and considers individuals working in science (including physical, life, and the social sciences), engineering, and math or technology-intensive occupations ("STEM"). The second, broader definition also includes those working in architecture or health occupations ("STEM-related"). Finally, we consider another classification proposed by Shapiro et al. (2015) that aligns with Jergins (2023) but includes two more subcategories, namely health professionals and health associate professionals ("STEM-Shapiro"). Figure 4 shows the distribution of different STEM classifications by gender. About 20% of females are employed in STEM-related fields, against 27% of males. The largest gender gap is observed with Jergins's classification, where only 4% of women are employed in STEM occupations, against approximately 12% of males. The narrowest gap relates to the STEM-Shapiro classification, with 11% of women compared to 14% of men following STEM professional careers. This is not surprising given that this classification extends to essential healthcare roles such as nurses and healthcare assistants, where women often represent the majority.

Figure 4: Alternative definitions of STEM occupations, by gender (%).



Source: ESS, rounds 2-10

Other Individual-level Controls

Regarding individual-level characteristics, we consider a rich set of demographic and socio-economic information regarding both respondents and their parents. Among the demographic characteristics of respondents, we include age, quadratic age, gender, marital status, and number of children. Marital status contains the following categories: married or in a civil partnership, single, separated, divorced, and widowed. We take the first relationship status (married) as a reference category. We also control for the respondents' self-assessed health (SAH), which is a binary variable with a value of 1 if individuals declare that their health is very good or good and 0 otherwise. The importance of religion and political involvement is used to control for other non-economic determinants of occupational choices (in addition to those potentially captured by ancestral controls regarding family ties and gender roles). As regards religion, we include a dummy indicator to capture the intensity of religious feelings. The degree of political interest is measured by individual responses to the following question: "How interested would you say you are in politics? Are you very

interested, quite interested, hardly interested, or not interested at all?". We dichotomise responses into a binary variable, which has a value of 1 if the respondent is very interested or quite interested and 0 otherwise. As for the socio-economic characteristics of parents, we control for parental education and the type of last occupation (white or blue-collar). We also include a binary variable capturing whether one of the parents was absent during the respondent's childhood or adolescence. Table A.1 in the Appendix reports descriptive statistics for the individual-level sample.

5 Identification and empirical strategy

5.1 Identification

Our primary objective is to isolate the effect of historically determined and culturally embedded norms and cognition on the likelihood of women sorting into STEM occupations, net of the other individual and country-specific factors. The identification of culture, in general, raises two major concerns. First, given the fact that traditional estimation approaches fail to separate the effect of selected dimensions of culture from the other country-specific factors such as economic and institutional arrangements, the identification of specific traits should compare individuals born and raised in the same economic and institutional environments but whose cultural values are potentially different. This strategy underlies the so-called "epidemiological approach" (Giuliano, 2007, Fernández, 2011, Galor and Özak, 2016, Galor et al., 2020, Bernhofer et al., 2023, Kovacic and Orso, 2023) and focuses on native individuals with one or both foreign-born parents (*i.e.*, second-generation immigrants). In other words, female second-generation immigrants who are identical in all aspects except for their cultural backgrounds should have different propensities to opt for STEM professional careers.⁷ Considering second-generation immigrants, therefore, allows us to exploit the exogenous variation

⁷Generally, the epidemiological approach relies on the following assumptions: i) cultural values and beliefs are vertically transmitted from parents to children, ii) cultural heritage is long-lasting, meaning that it affects individual's beliefs, emotions, and choices throughout their lives, iii) cultural values systematically vary across individuals having different cultural backgrounds, and iv) despite the heterogeneity in their cultural backgrounds, individuals living in the same country (or region) face identical economic and institutional arrangements.

in parental cultural backgrounds while keeping the other country-specific factors invariant. Second, in order to account for potentially omitted geographical, social, and institutional characteristics related to individuals' ancestors that may have influenced the formation and transmission of these specific traits across generations, we include a large set of geographical and historical controls for the parental country of origin, such as agricultural suitability, absolute latitude, mean distance to waterways, and average terrain ruggedness. Moreover, we also control for GDP per capita and human capital at the parental country of origin level, along with a set of confounding individual demographic and socio-economic characteristics.

Our final sample includes 7135 women older than 25, residing in 28 countries, and interviewed in eight consecutive rounds carried out every two years, starting from 2004 (round 2) to 2018 (round 9).⁸ Moreover, we include 59 countries of origin for foreign-born mothers and 80 countries of origin for foreign-born fathers.⁹

5.2 Empirical Strategy

Our main hypotheses derive from the mechanisms depicted in Figure 1. More precisely, we assume that historical kin-based institutions reflect the importance of norms and gender-based division of roles, together with some specific psychological aspects of the individuals' cognition that may be particularly relevant in the context of STEM occupations. Under the assumption of persistence of these traits across generations, the historical attributes of the individuals' ancestries may still have an influence on their preferences and aspirations. Accordingly, we empirically validate the following hypotheses:

Hypothesis 1 *Historical kin-based institutions and gender gap in STEM*

Countries with more intensive ancestral kin-based norms and institutions have, on average, lower shares of women in STEM jobs and a higher gender gap in STEM occupations compared to others.

⁸Round 1 is not included in the analysis since it does not contain information on the parents of the respondents.

⁹Countries with less than 100 second-generation immigrants and parental origins with less than 20 observations are excluded from the analysis.

Hypothesis 2 *Historical kin-based institutions and women’s preferences for STEM*
Second-generation immigrant women whose parents originate from countries with more intensive ancestral kin-based norms and institutions are, on average, less likely to sort into STEM professions.

Hypothesis 3 *Historical kin-based institutions, contemporary cultural values and women’s preferences for STEM*

The effect of ancestral kin-based institutions is indirect and passes through parental contemporary cultural traits closely related to the intensity of family ties, gender roles, and the prevalence of specific cognitive aspects.

To validate Hypothesis 1, we first regress the proportion of women employed in STEM professions and the relative gender gap at the country level on ancestral characteristics related to kinship institutions, controlling for a battery of historical and contemporary socio-economic characteristics:

$$STEM_c = c_1 + \alpha_1 KIN_c + \lambda_1 \mathbf{X}_c + \beta_1 \mathbf{A}_c + \omega_1 \mathbf{Z}_c + \epsilon_c, \quad (1)$$

where $STEM_c$ is the share of women employed in STEM jobs (on the total STEM workforce) or the relative gender gap (calculated as the difference between the proportion of males and females employed in these sectors) in the country c ; KIN_c is a vector of kinship intensity norms (kinship index, preference for cousin marriage, polygamy, extended family, lineage organisation, community organisation). $\{X_c\}$ includes a set of geographical historical characteristics (agricultural suitability, absolute latitude, mean distance to waterways, and average terrain ruggedness), and $\{A_c\}$ represents a set of ancestral characteristics related to traditional plough (use of plough, political hierarchies, and economic complexity) from Alesina et al. (2013). Finally, $\{Z_c\}$ is a vector of contemporary socio-economic controls (i.e., share of (fe)male STEM on total (fe)male labour force, GDP per capita, religion, and exposure to a socialist/communist regime before 1992).

As a second step, we estimate a set of regressions at the individual level in order to isolate a direct and independent effect of historical kinship institutions on the probability of women’s sorting into STEM professional careers (Hypothesis 2):

$$STEM_{i,cr} = c_1 + \alpha_1 KIN_{i,cp} + \lambda_1 \mathbf{X}_{i,cr} + \omega_1 \mathbf{Z}_{i,cr} + \epsilon_{i,cr}, \quad (2)$$

where $STEM_{i,cr}$ is a dummy indicator with value 1 whether a respondent i residing in country c declares to have a STEM job, and 0 otherwise, while $KIN_{i,cp}$ is a vector of kinship intensity norms associated with the respondent parents’ country of origin (cp). $\{X_{i,cr}\}$ includes a full set of individual characteristics, and $Z_{i,cr}$ is a vector of parental socio-economic controls (education and type of occupation of both parents). Robust standard errors are clustered at the parental country of origin level.

Finally, to show that historical proxies for family ties and cognitive traits affect occupational choices through their impact on the inherited component of parental culture, the third block of models follows a two-stage estimation approach. In the first stage, we estimate the following regression:

$$TRAIT_{cp} = c_2 + \alpha_2 KIN_{cp} + \lambda_2 \mathbf{X}_{cp} + \epsilon_{cp}, \quad (3)$$

where $TRAIT_{cp}$ are a set of standardised variables capturing psychological outcomes at the parental country of origin level (cp). KIN_{cp} includes the kinship intensity index and its sub-components, and $\{X_{cp}\}$ includes historical geographical controls at the parental country of origin. In line with Schulz et al. (2019), a positive effect of KIN_{cp} would indicate the presence of stronger family ties in contemporary cultures, which translates into more intensive gender norms and a more pronounced analytical cognition.

At a second step, we take the predicted values of cultural values, \widehat{TRAIT} , and estimate the following equation:

$$STEM_{i,cr} = c_3 + \alpha_3 \widehat{TRAIT}_{i,cp} + \lambda_3 \mathbf{X}_{i,cr} + \omega_3 \mathbf{Z}_{i,cr} + \epsilon_{i,cr}. \quad (4)$$

A negative coefficient of *TRAIT* would indicate that part of contemporary cultures reflecting historical kin-based norms reduces the likelihood of women sorting into STEM occupations. As in equation (1), we cluster the robust standard errors at the country of residence and the parental country of origin level. Moreover, since contemporary cultural traits predicted by historical factors originate from a different distribution, in all model specifications we bootstrapped standard errors in order to obtain correct estimates.

6 Results

6.1 Historical kinship and STEM: cross-country analysis

In Tables 1 and 2 we regress the share of women in STEM on ancestral proxies, controlling for a set of geographic characteristics, such as agricultural suitability, absolute latitude, mean distance to waterways, and average terrain ruggedness. According to Schulz et al. (2019), these are important factors associated with economic development, colonial expansion, and productivity. In addition, we include the share of males and females employed in STEM fields out of the total male and female workforce in order to account for the overall spread of STEM occupations in the economy. Furthermore, to account for other contemporary socio-economic factors that may affect women’s employment in STEM, we gradually extend the set of controls by including the natural log of real GDP per capita measured in 2000 and its square to allow for a U-shaped relationship between economic development and female labour force participation (Alesina et al., 2013; Goldin, 1995). Moreover, following Alesina et al. (2013), we consider two historical proxies for political and economic complexity as well as the presence of traditional plough use in agriculture. As shown by the authors, these factors provide valuable insights into the development and persistence of gender roles across societies. More complex political and economic structures often correlate with more pronounced gender divisions due to labour specialization and hierarchical systems. As explained in Section 2, these historical patterns have shown notable persistence, continuing to shape modern gender attitudes and female participation in the workforce. Finally, we control for the

religious composition of the country as well as for the exposure to a socialist or communist political regime prior to 1992. Regarding religion, Schulz et al. (2019) find that the spread of Catholicism significantly reduced the effect of kinship institutions on different psychological contemporary attributes. Socialist and communist political systems, on the other hand, were generally characterized by higher female participation rates in STEM fields. Indeed, the existing research finds substantial differences between women in former socialist and western capitalist countries. For instance, Lippmann and Senik (2018) analysed academic grades in mathematics using the former division of Germany as a natural experiment to isolate the historical effects of capitalist versus state socialist education while controlling for differences in economic conditions and teaching styles. The authors find that girls in Eastern Germany outperform their peers in the western part in terms of math test scores, are less anxious and more confident about their aptitude in math, and result more competitive when compared to their western counterparts.¹⁰

The results suggest that countries with more intense historical kinship norms tend to have lower proportions of women in STEM, even after controlling for the effects of geography, unobserved continental heterogeneity, and the size of STEM fields within the country (Table 1). Among the components of the kinship index, preferences for cousin marriages, predominant extended family, and lineage organization are among the most significant predictors of lower shares of females in STEM fields. Controlling for additional economic and social variables does not significantly alter the results (Table 2). However, the inclusion of the natural log of a country’s real per capita GDP and the indicator for historical economic complexity (Columns 1 and 2) reduces the magnitude of the effect of historical kinship structures. This relationship further shrinks when we control for the religious composition of the country and for the characteristics of political systems prior to 1992 (Columns 3 and 4) but remains statistically significant. In line with our expectations, countries that experienced

¹⁰This, however, is not isolated evidence. According to Eurostat, for instance, the European Union’s top five most gender-balanced tech workforce in 2022 were in former socialist countries: Bulgaria, Estonia, Lithuania, Latvia, and Poland. These countries also register the highest female shares of graduates from STEM. In addition, when comparing the percent of women in the overall labour force employed in science and technology with the European Union’s average, post-socialist societies tend to perform better. For more info, see <https://ec.europa.eu/eurostat/web/products-eurostat-news/w/DDN-20230602-1>.

socialist or communist regimes register significantly higher prevalence of women in STEM.

A similar picture emerges when we focus on the gender gap in STEM (Tables A.2 and A.3 in the Appendix). Countries characterised by a higher historical kinship index tend to have a larger gender gap in STEM occupations. This result is robust to the inclusion of the set of socio-economic contemporary variables.

Table 1: Historical kin-based norms and the share of females in STEM occupations: country-level estimates

	Share fem. in STEM	Share fem. in STEM	Share fem. in STEM	Share fem. in STEM	Share fem. in STEM	Share fem. in STEM
KII	-0.055*** (0.020)					
Cousin preference		-0.045*** (0.015)				
Polygamy			-0.031 (0.022)			
Extended				-0.098** (0.041)		
Lineage					-0.101*** (0.034)	
Clan						-0.062 (0.040)
Other controls:						
<i>Continent FE</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Historical geo-controls</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>F & M in STEM</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>N. Observations</i>	50	50	50	50	50	50

Notes: The table shows the correlations between the ancestral characteristics and the share of women in STEM at the country level. The method of estimation is OLS. Robust standard errors clustered at the country level are reported in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 2: Ancestral characteristics and the share of females in STEM occupations: country-level estimates with additional controls

	Share fem. in STEM	Share fem. in STEM	Share fem. in STEM	Share fem. in STEM
Kinship index	-0.042** (0.018)	-0.042** (0.019)	-0.032* (0.019)	-0.039** (0.018)
GDP (log, 2000)	0.027 (0.081)	0.043 (0.084)	0.015 (0.079)	0.051 (0.077)
GDP (log, sqr, 2000)	-0.003 (0.005)	-0.004 (0.006)	-0.002 (0.006)	-0.004 (0.005)
Traditional plough use		0.043 (0.045)	0.032 (0.046)	0.025 (0.042)
Political hierarchies		-0.008 (0.015)	-0.017 (0.015)	-0.015 (0.013)
Economic complexity		0.004 (0.019)	0.010 (0.014)	0.015 (0.013)
Catholic (% , 2000)			-0.082 (0.057)	-0.077 (0.062)
Protestant, (% , 2000)			-0.050 (0.092)	0.020 (0.097)
Muslims,(% , 2000)			-0.138** (0.053)	-0.108** (0.049)
Orthodox Christ., (% , 2000)			-0.089 (0.099)	-0.192** (0.091)
Socialism (before 1992, d)				0.084* (0.046)
Other controls:				
<i>Continent FE</i>	Yes	Yes	Yes	Yes
<i>Historical geo-controls</i>	Yes	Yes	Yes	Yes
<i>F & M in STEM</i>	Yes	Yes	Yes	Yes
<i>N. Observations</i>	50	50	50	50

Notes: The table shows the correlation between the ancestral characteristics and the share of women in STEM at the country level. The method of estimation is OLS. Robust standard errors clustered at the country level are reported in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

6.2 Historical kinship, norms and STEM: individual-level analysis

Tables 3 and 4 report the results of the direct effects of historical kinship institutions on STEM occupational choices for a sub-sample of second-generation immigrants. In Table 3, we focus on our main STEM categorization, while Table 4 examines the two alternative classifications, namely a broader measure of STEM and another categorization based on Shapiro et al. (2015). We consider native individuals with either one or both foreign-born parents. Tables 5 and 6 show the results for alternative definitions of second-generation immigrants.

Column 1 in Table 3 includes the kinship index, while columns 2 through 6 consider each component of the index separately. Overall, female respondents with at least one parent originating from countries characterized by more intensive historical kin-based norms are less inclined to pursue a career in STEM fields. The estimated effect of the kinship index is negative and statistically significant at the five percent level. Notably, among the five sub-dimensions of KII, preference for cousin marriage and co-residence of extended family show stronger associations with the probability of opting for a STEM occupation. These findings are in line with Hypothesis 2 indicating that strong family ties and tighter norms on the one side and specific aspects of cognition induced by normative demands of intensive kinship in the past on the other make women less interested in pursuing careers in scientific and technical fields. Strong association between STEM and cousin marriages is particularly relevant since lower rates of close-kin mating are strongly related to the individualistic, independent, and analytic cognitive dimensions (Schulz et al., 2019). Moreover, the preference for cousin marriage has been significantly shaped by other formal historical institutions, such as the exposure to the mediaeval Western Church, which transformed European kinship structures during the Middle Ages by limiting the practices related to close-kin marriages. As shown by Schulz et al. (2019), this transformation was one of the key factors behind a shift towards the so-called Western, Educated, Industrialized, Rich, and Democratic ("WEIRD") psychology.

The results for the other two categorizations of STEM are similar (Table 4). The first two columns refer to STEM-related jobs ("STEM-r"), and the final two include Shapiro et al. (2015) classification ("STEM-S"). For the sake of space and clarity, we only report coefficients for the overall kinship index and the cousin marriage sub-dimension. Kinship intensity continues to be a reliable predictor, with a stronger effect compared to the one obtained for our main STEM classification. Compared to STEM-related fields, the effect of the kinship index is somewhat reduced for Shapiro's categorization. This is not surprising considering that the classification includes essential healthcare roles, such as nurses and healthcare assistants, where women are often overrepresented. Concerning preferences for cousin marriage, their impact remains negative and statistically significant, which is in line

with the main specification in Table 3.

Table 3: Kinship intensity and STEM occupational choices. Female second-generation immigrants with either one or both foreign-born parents.

	STEM	STEM	STEM	STEM	STEM	STEM
Kinship index	-0.008** (0.004)					
Cousin preference		-0.006** (0.003)				
Polygamy			-0.004 (0.005)			
Extended Fam				-0.023** (0.009)		
Lineage					-0.010 (0.008)	
Clan						-0.013* (0.007)
Age	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)	0.002 (0.002)
Low Educ.	-0.015 (0.010)	-0.015 (0.010)	-0.015 (0.010)	-0.016 (0.010)	-0.015 (0.010)	-0.015 (0.010)
High Educ.	0.029*** (0.005)	0.030*** (0.005)	0.030*** (0.005)	0.030*** (0.005)	0.030*** (0.005)	0.030*** (0.005)
Urban	0.007 (0.006)	0.007 (0.006)	0.006 (0.006)	0.007 (0.006)	0.007 (0.006)	0.006 (0.006)
Atheism	0.008 (0.005)	0.008 (0.005)	0.009* (0.005)	0.009* (0.005)	0.008* (0.005)	0.009* (0.005)
Other controls:						
<i>Individual controls</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Parental controls</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Country of residence</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Round & Cohort</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>N. Observations</i>	7135	7135	7135	7135	7135	7135

Notes: The table shows the direct effect of the main proxies for kin-based norms on the probability of opting for a STEM job. All specifications include country of residence, year (survey round), and cohort of birth controls. Additional individual characteristics (not reported for the sake of space) include marital status, household size, good overall health, parental education, and occupation. The method of estimation is Logit. The reported coefficients are marginal effects. Robust standard errors clustered at the country of residence and the parental country of origin level are reported in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Kinship Intensity, STEM-related and Shapiro STEM classifications. Female Second Generation Immigrants with either or both parents born abroad

	STEM-r	STEM-r	STEM-S	STEM-S
Kinship index	-0.017** (0.008)		-0.012* (0.007)	
Cousin preference		-0.016** (0.008)		-0.012** (0.006)
Age	-0.000 (0.004)	-0.000 (0.004)	0.001 (0.003)	0.001 (0.003)
Low Educ.	-0.170*** (0.020)	-0.170*** (0.020)	-0.123*** (0.018)	-0.123*** (0.018)
High Educ.	0.153*** (0.010)	0.153*** (0.010)	0.055*** (0.008)	0.055*** (0.008)
Urban	0.021* (0.012)	0.021* (0.012)	0.018* (0.011)	0.018* (0.011)
Atheism	0.018 (0.011)	0.017 (0.011)	0.000 (0.009)	-0.000 (0.009)
Other controls:				
<i>Individual controls</i>	Yes	Yes	Yes	Yes
<i>Parental controls</i>	Yes	Yes	Yes	Yes
<i>Country of residence</i>	Yes	Yes	Yes	Yes
<i>Round & Cohort</i>	Yes	Yes	Yes	Yes
<i>N. Observations</i>	7173	7173	7173	7173

Notes: The table shows the direct effect of the main proxies for kin-based norms on the probability of opting for a STEM job (two additional classifications). Models 1 and 2 refer to STEM-related jobs (STEM-r), while Models 3 and 4 refer to Shapiro STEM classification (STEM-S). All specifications include country of residence, year (survey round), and cohort of birth controls. Additional individual characteristics (not reported for the sake of space) include marital status, household size, good overall health, parental education, and occupation. The method of estimation is Logit. The reported coefficients are marginal effects. Robust standard errors clustered at the country of residence and the parental country of origin level are reported in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

In addition to the results in Tables 3 and Table 4, in Table 5 we consider alternative definitions of second-generation immigrants, *i.e.*, female second-generation immigrants whose mother is born abroad (and whose father is either native or foreign-born) and those whose father is born abroad (and whose mother is either native or foreign-born). Columns 1 and 2 identify a woman's ancestry by her mother's country of origin, while columns 3 and 4 use the father's country of birth. Interestingly, we find that ancestral traits linked to the mother's country of origin significantly account for the likelihood of choosing a STEM profession,

whereas this is not observed for historical traits associated with the father’s country of origin.

Table 5: Kinship Intensity and STEM jobs. Alternative definitions of second-generation immigrants: foreign-born mother (FBm) and foreign-born father (FBf).

	STEM	STEM	STEM	STEM
Kinship intensity (FBm)	-0.013*** (0.004)			
Cousin preference (FBm)		-0.010*** (0.003)		
Kinship index (FBf)			-0.007 (0.005)	
Cousin preference (FBf)				-0.005 (0.004)
Age	0.001 (0.002)	0.001 (0.002)	0.002 (0.002)	0.002 (0.002)
Low Educ.	-0.004 (0.011)	-0.004 (0.011)	-0.020* (0.012)	-0.020* (0.012)
High Educ.	0.025*** (0.007)	0.025*** (0.007)	0.030*** (0.006)	0.030*** (0.006)
Urban	0.004 (0.008)	0.004 (0.008)	0.011 (0.007)	0.011 (0.007)
Atheism	0.003 (0.007)	0.003 (0.007)	0.011** (0.005)	0.011** (0.005)
Other controls:				
<i>Individual’s controls</i>	Yes	Yes	Yes	Yes
<i>Parental controls</i>	Yes	Yes	Yes	Yes
<i>Country of residence</i>	Yes	Yes	Yes	Yes
<i>Round & Cohort</i>	Yes	Yes	Yes	Yes
<i>N. Observations</i>	4595	4595	4891	4891

Notes: The table shows the direct effect of the main proxies for kin-based norms on the probability of opting for STEM jobs. All specifications include country of residence, year (survey round), and cohort of birth controls. Additional individual characteristics (not reported for the sake of space) include marital status, household size, good overall health, parental education, and occupation. The method of estimation is Logit. The reported coefficients are marginal effects. Robust standard errors clustered at the country of residence and the parental country of origin level are reported in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Similarly, when we consider the subsample of female second-generation immigrants with both foreign-born parents (Table A.4, in the appendix), the maternal cultural heritage exerts

a relatively stronger effect on women’s occupational choices. This evidence is in line with the established empirical findings regarding the intergenerational transmission of attitudes and behaviours, underscoring the significance of the maternal role in shaping the identity of their offspring (Fernández et al., 2004; Cipriani et al., 2013; Dohmen et al., 2011; Farré and Vella, 2013; Bernhofer et al., 2023).

Besides the relevant aspects of historical kin-based norms, there may be some potentially omitted geographical, institutional, and cultural characteristics related to individuals’ ancestors that may have co-determined the formation and transmission of preferences and attitudes across generations. To address this concern, we consider a set of geographical characteristics of the parental country of origin, such as absolute latitude, terrain roughness, distance to the coast or navigable rivers, as well as caloric suitability country variables. In addition, in order to account for potentially omitted aspects related to unobserved human capital and development, we include the logarithm of GDP per capita (measured in 1913) and human capital (measured as the percentage of the population 16-64 with completed tertiary education). As demonstrated in Ashraf and Galor (2011), these characteristics could have exerted a lasting impact on contemporary development, indirectly influencing occupational decisions.

Table 6 shows the main results. In Panel A we consider the subset of female second-generation immigrants with either one or both foreign-born parents, while Panel B relies on the subset of individuals with foreign-born mothers. The inclusion of geographic and economic aspects of the individuals parents’ countries of origin in columns 1-3 does not significantly alter the results. The effects of historical kin-based norms remain stronger for individuals with foreign-born mothers, which is in line with evidence reported in Table 5. Columns 4 and 5 add additional controls for individuals who were aged 16 or older during the historical period in which their current countries of residence were characterized by socialist/communist political systems (column 4), as well as whether their parents originate from a country with a socialist/communist political background (column 5).¹¹ The characteris-

¹¹The reference period is 1945-1990. Individuals born between 1929 and 1974 were aged 16 or older during the reference period. Post-socialist countries in our dataset are the following: Bulgaria, Czech Republic,

tics of the political systems in which individuals have grown up may significantly shape the attitudes and professional success of women. Indeed, the existing research finds substantial differences between women in former socialist and western capitalist countries, as previously discussed in the country-level results section (Section 6.1).

The results show that women raised in the socialist or communist political systems are, on average, 2.2% more likely to sort into STEM occupations. The reasons for which post-socialist societies perform better are twofold. First, state investments in STEM education and training for women were much higher and were put in place well before Western capitalist societies. Second, family responsibilities that traditionally forced women out of the labour force were less binding because the state had socialized many of the domestic tasks carried out by women in Western capitalist countries, such as intensive public childcare, public cafeterias and laundries, as well as an extensive network of services aimed at offering formal care for older and impaired individuals. These gender-equal policies influenced the work values of women and shaped the conception of gender roles (Campa and Serafinelli, 2018; Lippmann and Senik, 2018; Lippmann et al., 2020). The effect of historical kinship institutions, on the other hand, remains unaltered, providing additional evidence for the robustness of our previous findings. Similarly, the effects remain robust even when we control for the socialist or communist backgrounds of individuals' parents, which, however, do not significantly differ from zero.

Finally, in order to compare the performance of kinship measures with the other two historical proxies for gender-based division of labour and predominant family types, in Table A.5 (in the appendix) we re-estimate our main models with Todd's historical indicators of strong family ties (stem and communitarian families) and proxies for agricultural technology (ploughing cultivation versus shifting cultivation systems) from Alesina et al., 2013.

Estonia, Croatia, Hungary, Lithuania, Latvia, Poland, Russia, Slovakia, Slovenia, and Ukraine. Three countries were excluded due to a very low number of second-generation immigrants (Albania, Montenegro, and Romania).

Table 6: Kinship Intensity and Historical Economic and Geographical Controls. Female second-generation immigrants with either one or both foreign-born parents (Panel A) and with foreign-born mothers (Panel B).

Panel A: Either or both	STEM	STEM	STEM	STEM	STEM
Kinship index	-0.009*	-0.005	-0.007*	-0.008**	-0.008**
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)
Ruggedness	-0.000				
	(0.003)				
Distance waterways	-0.004				
	(0.006)				
Caloric suitability	-0.000				
	(0.000)				
Absolute Latitude	0.000				
	(0.000)				
GDP per capita (1913)		0.000			
		(0.000)			
Human Capital (15-64)			-0.000		
			(0.002)		
Socialism (respondent)				0.022**	
				(0.011)	
Socialism (parents)					0.007
					(0.006)
<i>N. of obs.</i>	7134	5948	6444	7135	7135
Panel B: Foreign-born mother	STEM	STEM	STEM	STEM	STEM
Kinship index	-0.017***	-0.014***	-0.017***	-0.013***	-0.012***
	(0.004)	(0.005)	(0.005)	(0.004)	(0.004)
Ruggedness	-0.001				
	(0.003)				
Distance waterways	-2.518				
	(1.877)				
Caloric suitability	-0.000				
	(0.000)				
Absolute Latitude	-0.000*				
	(0.000)				
GDP per capita (1913)		-0.000			
		(0.000)			
Human capital (15-64)			-0.002		
			(0.002)		
Socialism (respondent)				0.020*	
				(0.011)	
Socialism (mother)					0.005
					(0.008)
<i>N. of obs.</i>	4572	3551	3855	4595	4595
<i>Individual controls</i>	Yes	Yes	Yes	Yes	Yes
<i>Parental controls</i>	Yes	Yes	Yes	Yes	Yes
<i>Country of residence</i>	Yes	Yes	Yes	Yes	Yes
<i>Round & Cohort</i>	Yes	Yes	Yes	Yes	Yes

Notes: The table shows the effects of kinship index on the probability of sorting into STEM occupations. All specifications include country of residence, year (survey round), and cohort of birth controls. Additional individual characteristics (not reported for the sake of space) include marital status, household size, good overall health, parental education, and occupation. The method of estimation is Logit. Robust standard errors clustered at the country of residence and the parental country of origin level are reported in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

As already discussed in Section 2, the two measures capture single specific aspects of women’s economic behaviour (labour market participation) and the predominant family type (communitarian and stem versus nuclear and egalitarian) and are conceptually different from KII, which covers multiple aspects of norms and cognition. The effects of plough and family are weaker in explaining differences in the preferences for STEM occupations across women with different cultural backgrounds. Communitarian and stem family types (as more traditional and interdependent than nuclear and egalitarian) significantly correlate only with broader definitions of STEM, while for the main specification they are not statistically different from zero.

6.3 Additional tests on male subsample

In addition to the above robustness check, we perform a set of additional tests on a male subsample of second-generation immigrants. We show that historical kin-based institutions do not exert considerable effect on males’ sorting into STEM, while they significantly increase the likelihood of male individuals having a gender-biased opinion about the role of women in society. The results from Table A.6 (in the Appendix) suggest that the effect of historical kinship on men’s career decisions is almost null. The marginally significant effect of the aggregate index can be attributed to the clan sub-dimension. This latter evidence probably does not capture the effect of gender roles; rather, it passes through some other cultural trait that makes male individuals less prone to sorting into STEM professions. Indeed, the historical presence of clan organizations counts much less for women compared to men (Table 3). At the same time, however, more intensive kin-based norms positively influence the likelihood of men having biased attitudes regarding who should have the priority to work when jobs are scarce. Men originating from cultures with more pronounced gender roles are significantly more likely to report that men should have priority over women in the labour market. Intensive kin-based norms, however, positively influence, at least to some extent, also the likelihood of women holding biased views on employment priorities, although the effect is much weaker compared to that of men (Table A.7, in the Appendix). This is

particularly the case for women with cultural backgrounds characterized by extended families as opposed to nuclear ones, while this difference among men is not statistically significant.

6.4 Indirect effects of historical kinship

In this section, we show that the effect of historical kinship institutions on women’s occupational choices passes through cultural traits inherited by individuals from their parents. We proceed in two steps. First, we replicate the main findings from Schulz et al. (2019) to demonstrate that the ancestral tightness of kin-based norms significantly correlates with some contemporary cultural traits closely related to the importance attached to family ties, gender roles, and analytic cognition. Second, we take the predicted values from this set of regressions and use them as a proxy for the historically determined and intergenerationally transmitted kin-based norms in models estimating the probability of women sorting into STEM occupations. In all model specifications, we control for the country’s geographic characteristics, agricultural suitability, absolute latitude, mean distance to waterways, and average terrain ruggedness.

Table 7 shows the results. The kinship intensity index and the presence of cousin-marriage preferences are associated with lower individualism and stronger embeddedness, traditions, and family bonds in contemporary cultures. This result suggests that societies that have been exposed to more intensive kin-based institutions in the past are characterized by lower degrees of individualism and independence, stronger individuals’ commitment to stable social relationships and the existing social order, and more pronounced social norms and traditions.

According to Hypothesis 3, women with ancestral origins characterized by stronger kin-based norms and, hence, lower individualism, stronger embeddedness, and more pronounced family ties and traditions should be less likely to sort into STEM occupations, *ceteris paribus*. In Table 8, we regress the respondents’ occupation (STEM) on the predicted values of each of the above-reported cultural traits together with the full set of individual-specific and parental characteristics.

Table 7: Cultural traits and historical proxies for kinship institutions

	Individ.	Tradition	Embedd.	Fam. ties	Individ.	Tradition	Embedd.	Fam. ties
Kinship index	-0.185** (0.086)	0.321*** (0.120)	0.586*** (0.084)	0.220** (0.087)				
Cousin preference					-0.155* (0.086)	0.454*** (0.127)	0.553*** (0.140)	0.341*** (0.091)
Ruggedness	-0.122 (0.083)	-0.064 (0.121)	-0.038 (0.078)	0.116 (0.085)	-0.116 (0.085)	-0.013 (0.127)	-0.017 (0.087)	0.149* (0.083)
Distance waterways	-0.375 (0.276)	0.098 (0.188)	0.489*** (0.171)	0.135 (0.215)	-0.415 (0.261)	0.387** (0.190)	0.685*** (0.141)	0.273 (0.197)
Caloric suitability	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000** (0.000)	0.000 (0.000)
Absolute latitude	0.037*** (0.004)	0.004 (0.007)	-0.031*** (0.005)	-0.045*** (0.005)	0.038*** (0.004)	-0.000 (0.007)	-0.038*** (0.005)	-0.046*** (0.004)
<i>N. of obs</i>	74	61	60	65	74	61	60	65
<i>R squared</i>	0.530	0.109	0.714	0.614	0.520	0.180	0.637	0.641

Notes: The table shows the association between historical proxies for kin-based norms and contemporary psychological (cultural) traits. The method of estimation is OLS. Robust standard errors clustered at the country level are reported in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

The results are in line with our expectations. Women originating from more individualistic cultures are, on average, more likely to be employed in STEM. At the same time, cultural backgrounds characterised by more pronounced embeddedness, tradition, and stronger family bonds are less likely to see their female members sort into STEM occupations.¹²

It is interesting to note that the effect of the predicted individualism, embeddedness, and family ties is very similar (in some cases even identical) to the direct effects of the kinship index on the probability of sorting into STEM occupations (Table 3). This result goes in line with the evidence in Table 7. Indeed, the goodness of fit of models regressing individualism, embeddedness, and family bonds on the kinship index is considerably higher than that of tradition (0.53, 0.71, and 0.61, respectively). A similar picture emerges when considering the sub-dimension for the prevalence of cousin marriages. Finally, the results for alternative specifications of STEM (Table A.8, in the Appendix) suggest that the effect of historical kin-based norms is reflected especially by individualism and embeddedness, while cousin marriage preference is captured also by tradition.

¹²Restricting the sample to second-generation immigrants with a foreign-born mother does not change the results. In most cases, though, the effects of culture become even stronger. We don't report these results for the sake of space and clarity. They are available upon request.

Table 8: Predicted cultural traits and STEM occupational choices. Female second-generation immigrants with either one or both foreign-born parents.

	STEM	STEM	STEM	STEM	STEM	STEM	STEM	STEM
Individualism (pred, KII)	0.012*** (0.004)							
Tradition (pred, KII)		-0.026** (0.011)						
Embeddedness (pred, KII)			-0.009*** (0.002)					
Family bonds (pred, KII)				-0.010*** (0.003)				
Individualism (pred, CP)					0.011*** (0.004)			
Tradition (pred, CP)						-0.019** (0.008)		
Embeddedness (pred, CP)							-0.008*** (0.003)	
Family bonds (pred, CP)								-0.009*** (0.003)
<i>N. of observations</i>	7156	7156	7156	7156	7156	7156	7156	7156
<i>Individual controls</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Parental controls</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Country of residence</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Round & Cohort</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table shows the marginal effects of the predicted psychological (cultural) traits on the probability of sorting into STEM occupations. The method of estimation is Logit. "Pred, KII" stands for predicted with the kinship intensity index (KII), "Pred, CP" stands for predicted with the cousin preference component (CP) of KII. All specifications include country of residence, year (survey round), and cohort of birth controls. Additional individual characteristics (not reported for the sake of space) include marital status, household size, good overall health, parental education, and occupation. Bootstrapped standard errors clustered at the country of residence and the parental country of origin level are reported in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

7 Conclusions

In this study, we investigate the effects of the interplay between gender norms and cognition in shaping women's attitudes towards STEM occupations. More precisely, we explore the origins of these traits founded in historical kin-based institutions and show that cultural backgrounds characterised by more intensive and interdependent kin favoured the emergence and persistence of norms and attitudes closely related to holistic cognition and gender-based division of roles and aspirations. Higher individualism embedded in weaker historical kin, on the other hand, is related to looser norms and stronger analytic cognition.

We test these conjectures both at the country level and on the subset of second-generation migrants. The results suggest that countries with stronger historical kinship structures tend to have lower proportions of females in the overall STEM workforce. The individual-level analysis further confirms that women whose parents originate from countries characterised by strong historical kin-based norms are significantly less likely to choose a STEM professional career. This may be due to the fact that stronger individualism combined with looser gender-based norms and stronger analytical cognition makes the choice for STEM less gender-biased. Indeed, our results confirm that the effect of historical kin passes through contemporary cultural traits related to individualism, embeddedness, and the strength of family bonds.

The contribution of this research is twofold. First, we exploit a novel set of exogenous historical measures that simultaneously capture several aspects of ancestral informal institutions beyond the predominant family type. These measures are different from the other proxies for gender norms employed by the literature since they are more suitable to explain "what" women choose instead of merely whether they participate in the labour market or not. Second, historical attributes linked to kin-based norms are closely related to individuals' cognition, where more emphasis on analytical as opposed to holistic thinking has been internalised into psychological processes that ultimately make some women more prone to pursue STEM than others.

The findings in this paper may have relevant policy implications. The implementation of education programs to challenge traditional gender stereotypes and the promotion of gender equality in STEM fields from an early age may depend on the context and specific target group. The design of policies should take into account the specificities of women's cultural backgrounds, especially in terms of their intrinsic resilience to changes regarding their role in the economic and social life, which, as shown by this research, can have deep historical roots. This latter aspect may significantly impact the efficiency of policies since the persistent effect of culturally embedded motivations and beliefs may render any "one size fits all" solution only partially efficient. This becomes particularly relevant for the immigrant population (both first- and second-generation) whose diverse cultural backgrounds and underlying preferences

may translate into different degrees of "resilience" to anti-stereotype policies and programs.

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A Appendix

Table A.1: Summary statistics

Variable	Mean	Std. Dev.	Min	Max	Obs
Kinship Index	-.642	.875	-1.526	1.548	11602
Cousin Preference	.507	.953	0	3	11602
Poligamy	-.773	.618	-1.107	1.425	11602
Extended Fam	.424	.311	.002	.996	11602
Lineage	.26	.405	0	1	11602
Clan	.305	.332	0	1	11602
High Edu (parents)	.261	.439	0	1	9507
White Coll. (parents)	.652	.476	0	1	11549
Absent Parent	.138	.345	0	1	11549
Age	49.964	15.741	22	98	12906
Age Squared	2744.191	1654.764	484	9604	12906
Low Edu	.17	.375	0	1	10420
Medium Edu	.563	.496	0	1	10420
High Edu	.267	.442	0	1	10420
Urban	.746	.435	0	1	12866
Atheism	.248	.432	0	1	12017
Good Health	.596	.491	0	1	12906
N. Children	.899	1.194	0	10	12906
Married	1.943	1.187	1	4	12035
Politics	.438	.496	0	1	12017

Table A.2: Ancestral characteristics and the gender gap in STEM occupations: country-level estimates with historical and contemporary controls (I)

	Gender gap	Gender gap	Gender gap	Gender gap	Gender gap	Gender gap
Kinship index	0.111*** (0.040)					
Cousin preference		0.089*** (0.029)				
Polygamy			0.062 (0.043)			
Extended				0.195** (0.083)		
Lineage					0.202*** (0.068)	
Clan						0.125 (0.080)
Fem-STEM/Fem LF	-3.693*** (0.951)	-4.269*** (0.948)	-2.970** (1.172)	-3.246*** (1.036)	-3.200*** (1.067)	-3.563*** (1.176)
Male-STEM/Male LF	2.114* (1.066)	2.571** (1.148)	1.500 (0.992)	1.781* (0.952)	2.012* (1.038)	1.865** (0.914)
Other controls:						
<i>Continent FE</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Historical geo-controls</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>N. Observations</i>	54	54	54	54	54	54

Notes: The table shows the correlation between the ancestral characteristics and the female share of women in STEM jobs at the country level, controlling for a set of historical and contemporary variables. OLS estimates are reported with robust standard errors. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3: Ancestral characteristics and the gender gap in STEM occupations: country-level estimates with historical and contemporary controls (II)

	Gender gap	Gender gap	Gender gap	Gender gap
Kinship index	0.083** (0.035)	0.083** (0.039)	0.064* (0.037)	0.078** (0.037)
Fem-STEM/Fem LF	-3.464*** (1.060)	-3.119** (1.227)	-4.028*** (1.212)	-4.207*** (1.174)
Male-STEM/Male LF	1.173 (1.571)	0.861 (1.652)	2.253 (1.585)	1.998 (1.544)
GDP (log, 2000)	-0.055 (0.162)	-0.085 (0.169)	-0.030 (0.159)	-0.101 (0.153)
GDP (log, sqr, 2000)	0.006 (0.011)	0.009 (0.012)	0.005 (0.011)	0.009 (0.010)
Traditional plough use		-0.085 (0.090)	-0.064 (0.092)	-0.051 (0.084)
Political hierarchies		0.016 (0.031)	0.033 (0.029)	0.030 (0.026)
Economic complexity		-0.008 (0.038)	-0.020 (0.028)	-0.030 (0.026)
Catholic (% , 2000)			0.164 (0.114)	0.153 (0.124)
Protestant, (% , 2000)			0.099 (0.184)	-0.040 (0.194)
Muslims,(% , 2000)			0.276** (0.106)	0.216** (0.098)
Orthodox Christ., (% , 2000)			0.177 (0.198)	0.385** (0.182)
Socialism (before 1992, d)				-0.168* (0.092)
Other controls:				
<i>Continent FE</i>	Yes	Yes	Yes	Yes
<i>Historical geo-controls</i>	Yes	Yes	Yes	Yes
<i>N. Observations</i>	50	50	50	50

Notes: The table shows the correlation between the ancestral characteristics and the female share of women in STEM jobs at the country level, controlling for a set of historical and contemporary variables. OLS estimates are reported with robust standard errors. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.4: Kinship Intensity and STEM jobs. Female Second Generation Immigrants: both foreign-born parents.

	STEM	STEM	STEM	STEM
Kinship intensity (mother)	-0.019*** (0.006)			
Cousin preference (mother)		-0.013*** (0.004)		
Kinship intensity (father))			-0.014** (0.005)	
Cousin preference (father)				-0.010** (0.005)
Age	0.002 (0.003)	0.002 (0.003)	0.002 (0.003)	0.002 (0.003)
Low Educ.	-0.001 (0.013)	-0.001 (0.013)	-0.001 (0.013)	-0.001 (0.013)
High Educ.	0.019 (0.011)	0.020* (0.011)	0.018 (0.011)	0.019* (0.011)
Urban	0.010 (0.012)	0.009 (0.012)	0.007 (0.011)	0.007 (0.011)
Atheism	0.007 (0.010)	0.008 (0.010)	0.005 (0.010)	0.005 (0.010)
Other controls:				
<i>Individual's controls</i>	Yes	Yes	Yes	Yes
<i>Parental's controls</i>	Yes	Yes	Yes	Yes
<i>Country of residence</i>	Yes	Yes	Yes	Yes
<i>Round & Year of birth</i>	Yes	Yes	Yes	Yes
<i>N. Observations</i>	2294	2294	2287	2287

Notes: The table shows the direct effect of the main proxies for family ties and gender roles on the probability of opting for a STEM job. All specifications include country of residence, year (survey round), and cohort of birth controls. Additional individual characteristics (not reported for the sake of space) include marital status, household size, good overall health, parental education and occupation. The method of estimation is Logit. The reported coefficients are marginal effects. Robust standard errors clustered at the country or residence and the parental country of origin level are reported in parenthesis. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5: Kinship intensity and STEM occupational choices. Female second-generation immigrants with either one or both foreign-born parents.

	STEM	STEM-r	STEM-S	STEM	STEM-r	STEM-S
Plough	-0.023** (0.011)	0.015 (0.028)	-0.004 (0.019)			
Communitarian				-0.017* (0.009)	-0.035* (0.021)	-0.037** (0.016)
Stem				-0.011 (0.008)	-0.042** (0.020)	-0.035** (0.014)
Age	0.003 (0.002)	0.001 (0.004)	0.003 (0.004)	0.002 (0.002)	-0.001 (0.004)	0.002 (0.004)
Low Education	-0.014 (0.010)	-0.174*** (0.024)	-0.131*** (0.019)	-0.016 (0.010)	-0.167*** (0.023)	-0.127*** (0.019)
High Education	0.029*** (0.005)	0.161*** (0.010)	0.060*** (0.009)	0.027*** (0.005)	0.156*** (0.010)	0.055*** (0.009)
Urban	0.007 (0.006)	0.012 (0.013)	0.014 (0.012)	0.005 (0.007)	0.013 (0.014)	0.017 (0.013)
Atheist	0.007 (0.005)	0.036*** (0.013)	0.006 (0.010)	0.006 (0.006)	0.030** (0.013)	0.005 (0.010)
Other controls:						
<i>Individual controls</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Parental controls</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Country of residence</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Geographic</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Round & Cohort</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>N. Observations</i>	5466	5531	5531	5128	5235	5235

Notes: The table shows the direct effect of the main proxies for family ties and gender roles on the probability of opting for a STEM job. All specifications include country of residence, year (survey round), and cohort of birth controls. Additional individual characteristics (not reported for the sake of space) include marital status, household size, good overall health, parental education and occupation. The method of estimation is Logit. The reported coefficients are marginal effects. Robust standard errors clustered at the country or residence and the parental country of origin level are reported in parenthesis. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.6: Kinship intensity, STEM occupational choices, and rights to have a job when they are scarce. Male second-generation immigrants with either one or both foreign-born parents.

	STEM	STEM	STEM	STEM	STEM	STEM
Kinship index	-0.012*					
	(0.007)					
Cousin preference		-0.005				
		(0.006)				
Polygamy			-0.014			
			(0.010)			
Extended Fam.				-0.020		
				(0.014)		
Lineage					-0.019	
					(0.014)	
Clan						-0.030**
						(0.014)
<i>N. Observations</i>	5767	5767	5767	5767	5767	5767
	Rights	Rights	Rights	Rights	Rights	Rights
Kinship index	0.029**					
	(0.012)					
Cousin preference		0.023**				
		(0.011)				
Polygamy			0.042***			
			(0.014)			
Extended Fam.				0.011		
				(0.038)		
Lineage					0.038	
					(0.024)	
Clan						0.076***
						(0.027)
<i>N. Observations</i>	2569	2569	2569	2569	2569	2569
Other controls:						
<i>Individual controls</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Parental controls</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Country of residence</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Round & Cohort</i>	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table shows the direct effect of the main proxies for family ties and gender roles on the probability of opting for a STEM job, and to agree with the statement that men should have more right to job than women when jobs are scarce ("Rights"). All specifications include country of residence, year (survey round), and cohort of birth controls. Additional individual characteristics (not reported for the sake of space) include marital status, household size, good overall health, parental education and occupation. The method of estimation is Logit. The reported coefficients are marginal effects. Robust standard errors clustered at the country or residence and the parental country of origin level are reported in parenthesis. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. 52

Table A.7: Kinship intensity, and rights to have a job when they are scarce. Female second-generation immigrants with either one or both foreign-born parents.

	Rights	Rights	Rights	Rights	Rights	Rights
Kinship index	0.022*					
	(0.011)					
Cousin preference		0.013				
		(0.010)				
Polygamy			0.027**			
			(0.012)			
Extended Fam.				0.057*		
				(0.034)		
Lineage					0.036	
					(0.024)	
Clan						0.018
						(0.024)
<i>N. Observations</i>	3286	3286	3286	3286	3286	3286
Other controls:						
<i>Individual controls</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Parental controls</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Country of residence</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Round & Cohort</i>	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table shows the direct effect of the main proxies for family ties and gender roles on the probability of agreeing with the statement that men should have more right to job than women when jobs are scarce ("Rights"). All specifications include country of residence, year (survey round), and cohort of birth controls. Additional individual characteristics (not reported for the sake of space) include marital status, household size, good overall health, parental education and occupation. The method of estimation is Logit. The reported coefficients are marginal effects. Robust standard errors clustered at the country or residence and the parental country of origin level are reported in parenthesis. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.8: Predicted cultural traits and STEM occupational choices. Female second-generation immigrants with either one or both foreign-born parents. Alternative classifications of STEM.

	STEM-r	STEM-r	STEM-r	STEM-r	STEM-S	STEM-S	STEM-S	STEM-S
Individualism (pred, KII)	0.027* (0.014)				0.016* (0.009)			
Tradition (pred, KII)		-0.048 (0.032)				-0.039 (0.025)		
Embeddedness (pred, KII)			-0.022** (0.009)				-0.014** (0.006)	
Family bonds (pred, KII)				-0.021* (0.012)				-0.012 (0.008)
<i>N. of obs</i>	7195	7195	7195	7195	7195	7195	7195	7195
	STEM-r	STEM-r	STEM-r	STEM-r	STEM-S	STEM-S	STEM-S	STEM-S
Individualism (pred, CP)	0.026* (0.014)				0.015* (0.009)			
Tradition (pred, CP)		-0.042** (0.021)				-0.037** (0.014)		
Embeddedness (pred, CP)			-0.021** (0.009)				-0.014** (0.006)	
Family bonds (pred, CP)				-0.019* (0.011)				-0.012* (0.007)
<i>N. of obs</i>	7195	7195	7195	7195	7195	7195	7195	7195
<i>Individual controls</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Parental controls</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Country of residence</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Round & Cohort</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The table shows the marginal effects of the predicted psychological (cultural) traits on the probability of sorting into STEM occupations. All specifications include country of residence, year (survey round), and cohort of birth controls. Additional individual characteristics (not reported for the sake of space) include marital status, household size, good overall health, parental education, and occupation. The method of estimation is Logit. Bootstrapped standard errors clustered at the country or residence and the parental country of origin level are reported in parenthesis. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.