FACULTY OF LAW, ECONOMICS AND FINANCE

Department of Economics and Management

Discussion Paper

2021-16

Economics

Department of Economics and Management
University of Luxembourg

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available online : https://wwwfr.uni.lu/recherche/fdef/dem/publications/discussion_papers

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Octobre, 2021

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The role of economic complexity on the formation of gender roles

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ABSTRACT

"He is a gentleman, and I am a gentleman's daughter. So far we are equal", Pride and Prejudice, 1813. Imagine if the Internet existed in 1813 when Jane Austen wrote the book. Would gender norms be comparable to the current ones? Boserup (1970) presented the novel thesis that cultural norms that assign different roles to men and women originate from the use of primitive agricultural technologies and evolve over time. Is such a mechanism still at play or was it a mechanism that worked only during the Malthusian era? Does the knowledge accumulation part of economic growth affect attitudes towards women? We examine this hypothesis relating revealed attitudes of up to 64,954 individuals coming from 59 countries with the level of their country's economic complexity. Our findings suggest the presence of U-shaped relationship between gender attitudes and economic complexity. At low levels of economic complexity, there is a negative relationship between female emancipation and the level of sophistication, suggesting that early stages of technological development are back-lashing gender roles. Beyond a threshold level of economic complexity this relationship is reversed, thus suggesting that further knowledge accumulation favours more egalitarian attitudes. Overall, our findings suggest that knowledge, encapsulated into technological advancement and the production of sophisticated goods, ultimately triggers a positive effect on female emancipation. Interestingly, we find that this mechanism applies primarily to attitudes related to the position of women within the households. When it concerns the change of attitudes related to the public position of women, this effect takes place only when the level of economic development is sufficiently high.

Introduction

Hidalgo and Hausmann argue that the differences across the economies worldwide go beyond differences in their GDP per capita. The countries have different networks of productive capabilities, i.e. inputs, institutions, technologies, knowledge and ideas that determine the "product space," i.e., the network representation of the products traded internationally.[1] Economic complexity is a concise measure of the knowledge accumulated in a population and reflected in the economic activities. The higher the economic complexity index (ECI), the higher the level of know-how in the country, and ultimately, the higher the sophistication of commodities produced and exported. ECI is a good predictor of economic growth, but it stresses technological sophistication and captures the productive capabilities of countries indirectly through the diversity and ubiquity of their exported products. In 2021, the United States has the highest GDP growth, but they only rank 4th concerning ECI. India is 7th for GDP growth but only 42nd for ECI ranking. China, the second-best for economic growth, ranks 18th for ECI. The economies of the United States, India and China, are so different in terms of economic complexity because they have very different sets of skills and knowledge ("person-bytes"), which, in turn, translate into very different sets of produced and exported goods.

Here we advance the hypothesis that economic complexity (ECI) is a fundamental driver for cultural change in general and attitudes towards women in particular. Knowledge accumulation expands an individuals' knowledge, choices and opportunities, thereby giving rise to new roles of female labor force and eventually demolishing traditional female role models. Our findings apply primarily to beliefs about gender roles within the household. Still, the implications of ECI on the public role of women are also at place, however a much higher level of sophistication is required.

This is the first study that hypothesizes about and quantifies the implications of economic complexity on attitudes towards women to the best of our knowledge. Interestingly, our findings suggest that this relationship is not linear. It takes a certain level of economic development for female emancipation to transit from the family into society.

Prior contributions have examined the historical emergence,[2–6] transmission,[7–9] persistence,[10] and change[11,12] of the cultural norms related to gender roles. It is argued that gender roles have emerged due to traditional agricultural practices as

the plough, favouring separation of roles between men and women only based on physical power. However, the long term effects of the use of plough are still traceable on cultural norms today because some of these norms show inertia and thus are transmitted from parents to their children, as shown in studies using migrants' self-reported attitudes.

Historically, gender roles are reflected in the division of labour by gender, with men participating in the labour market and women dedicated to child bearing. Female labour participation is closely related to economic growth[13,14] that drives greater demand for labour due to structural economic shifts[15] and reproductive technology advancement.[16] In turn, economic growth and technological advancement have certainly eased household labour and enhance paid labour. For instance, washing machines alone have eased the rigours of hand-washing clothes. However, economic growth has not freed women from being primarily responsible for housework, nor has it decreased their time doing housework. It is unclear if full-time housewives today spend more or less time on household duties as their grandmothers did back in the 60s. Accordingly, economic growth does impact female labour participation. But, it is unclear when and why it triggers cultural changes and shifts in gender roles.[11]

We push forward the hypothesis that it is knowledge accumulation, captured by the index of economic complexity, which impacts culture and attitudes. In addition, we argue that knowledge accumulation affects attitudes about gender roles in the family and society at a different pace. Female emancipation in the household is transferred in women's role in society, only when knowledge accumulation is high.

To test these hypotheses, we use a rich dataset documenting individual attitudes at the country level. More precisely, we explore the link between knowledge accumulation and individual-level data proxying cultural norms and attitudes. To measure attitudes towards gender roles, we use the integrated dataset of the European Values Study and the World Values Survey. This data set, which extends from 1981 to 2019, provides information about the demographic characteristics and the cultural attitudes of individuals residing in several countries worldwide. To capture a rich picture of attitudes towards women, we look into five major dimensions of norms that assign different roles to man and woman within the household. The first dimension is about the traditional norm that requires women to stay in the house and raise children. Relatedly, the second examines perceptions about female labour participation. The third is about marriage stability if women earn more than men, and the fourth regards how individuals perceive a role inversion with fathers looking after their children. Finally, the fifth is the perception of abortion when women are unmarried. Other related questions in the survey were disregarded because of a lack of answers. For illustration purposes, Figure 1 displays the relationship between ECI and the five gender attitudes, when taking averages at the country level for all waves. Interestingly, we observe a large heterogeneity across countries and across attitudes.

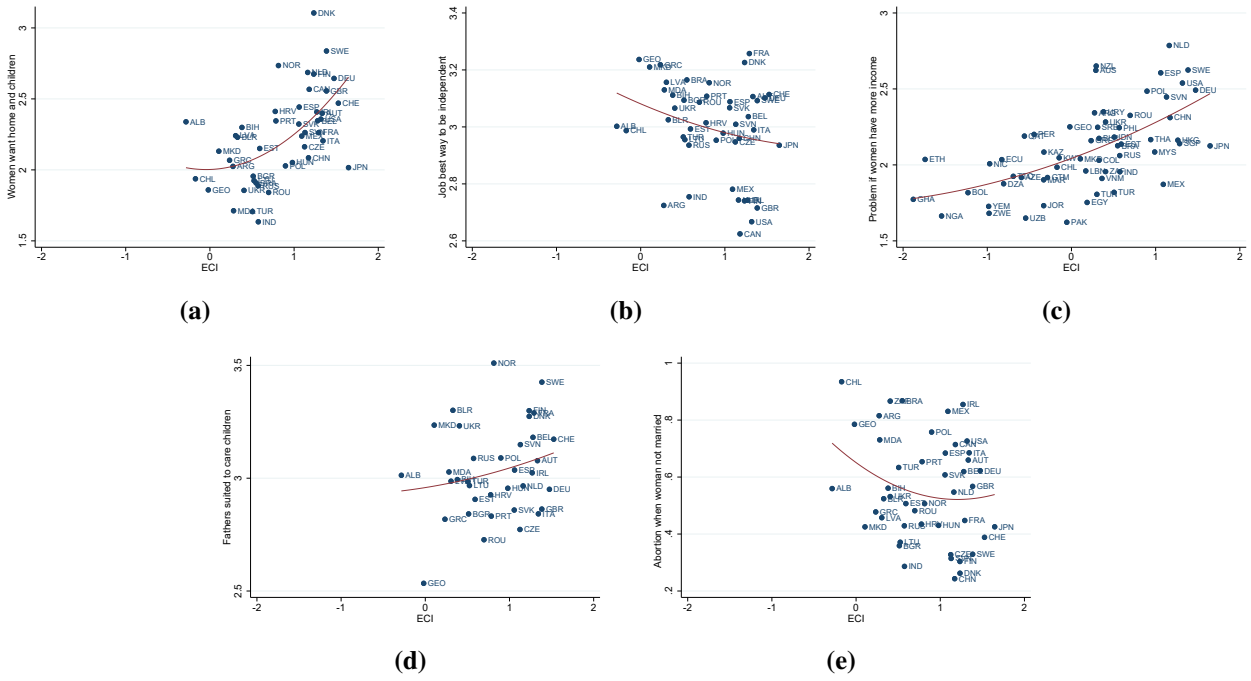

Figure 1. ECI vs **(a)** Women want a home and children **(b)** Job best way for women to be independent **(c)** Problem if women have more income **(d)** Fathers suited looking after children as mothers **(e)** Abortion when woman not married
(average values, all waves)

We measure knowledge accumulation using the improved ECI from the Observatory of Economic Complexity (OEC)

available at https://oec.world/en. The improved ECI condenses information and ideas. It quantifies the network representation of the relatedness and proximity between products traded internationally.[1,17] Higher ECI values are assigned to countries that export products located at the core of the "product space," i.e. products that require specialized skills and know-how such as electronics, machinery and chemicals, while for countries that export products located in the network's periphery, such as agricultural and textiles, the economic complexity methodology appoints lower values.

Our findings show that knowledge accumulation affects attitudes towards gender roles in the household non-linearly and follows a U-shaped function. When economic complexity and knowledge are limited, their further increase deteriorates female emancipation, back-lashing gender roles. However, when economic complexity is high, further knowledge accumulation favours more egalitarian attitudes for men and women. Interestingly, the impact of ECI on gender roles in society (women as leaders, women as business executives, women in politics) has a different pace. Economic complexity does affect gender roles in society but only when income per capita is relatively high. Differently said, knowledge accumulation impacts gender roles in the household, but it takes further knowledge accumulation for female emancipation to reach women's role in society.

Results

Table 1 presents our main results. For low levels of economic complexity, a higher ECI is associated with: (i) a higher likelihood to assign traditional roles of a housewife and child-bearer to women (column 1); (ii) an overall weaker attitude toward women independence through working (column 2); (iii) an increase of the belief that women shall not earn more than their husband (column 3); (iv) an overall decrease of the likelihood that fathers are considered fit to raise their children (column 4); (v) positive attitudes towards unmarried women with children (column 5). However, a level of economic complexity triggers a flip in attitudes–a *Turning Point*. Beyond this threshold of knowledge accumulation (see the values of the *Turning Point* in Table 1 for each dependent variable/column), a higher ECI is associated with a less traditional division of gender roles. In particular, in the range of ECI values above the *Turning Point*, additional knowledge accumulation, i.e., more economic complexity, results in an overall strengthening of attitudes that consider women not only as housewives but as equal participants in the labour market. Furthermore, the likelihood of finding attitudes that consider fathers suited to raise children than mothers increases and the same holds for the attitudes towards unmarried women with children. All levels of turning points in Table 1 are interior to the ECI values in our sample, which has an average of 0.382 and standard deviation of 0.773 (see Table 5).

Table 1. Benchmark Analysis: ECI and Attitudes Towards Women

	(1) Women want a home and children	(2) Job best way for women to be independent	(3) Problem if women have more income	(4) Fathers suited looking after children as mothers	(5) Abortion when woman not married
ECI	-0.435***	-0.771***	-1.842***	-3.704***	-2.329***
	(0.148)	(0.110)	(0.030)	(0.103)	(0.033)
ECI Squared	1.095***	0.415***	4.090***	1.443***	1.031***
	(0.065)	(0.053)	(0.067)	(0.044)	(0.022)
Turning Point	0.19	0.92	0.225	1.28	1.12
Observations	30,136	30,542	64,954	26,727	33,744
R-squared	0.188	0.049	0.098	0.077	0.187

Notes: (i) The dependent variables take values: 1-4 (Columns 1-4), 0-1 (Column 5). In all columns, lower values imply less favorable/more conservative attitudes towards women and higher values denote more favorable/modern attitudes towards women (see Table 5); (ii) All econometric specifications include individual and country controls (see in the text), country and wave/year fixed effects; (iii) Conley standard errors in parentheses; (iv) *p<.05; **p<.01; ***p<.001.

Interestingly, the attitudes in Columns 4 (Fathers as child carers) and 5 (Abortion if unmarried) require a much higher knowledge accumulation to reach the *Turning Point*. This finding is perfectly aligned with previous historical studies arguing that the caring male role is linked to a later phase of the revolution of family roles.[11] The first phase of the gender revolution is characterised by a strong rise in women's labor force participation while gender roles within the family remain unchanged. The second phase of the gender revolution starts with increasing involvement of men in the family chores, marking the transition towards more equal gender norms.

Table 2. ECI and Societal Female Emancipation

	(1) Men should have more right to a job than women	(2) Men make better political leaders than women do	(3) Men make better business executives than women do	(4) Women have the same rights as men.
ECI	-0.031	0.077	-0.133	-0.761
	(0.081)	(0.079)	(0.242)	(0.663)
ECI Squared	0.050	0.083	-0.077	-0.574
	(0.061)	(0.076)	(0.145)	(0.423)
Observations	252,217	208,590	118,274	116,976
R-squared	0.121	0.234	0.238	0.098

Notes: (i) The dependent variables in Columns 1-4 take values, 0-1 (Column 1), 1-4 (Columns 2 and 3), 1-10 (Column 4). In all columns, lower values imply less favorable/more conservative attitudes towards women and higher values denote more favorable/modern attitudes towards women (see Table 5); (ii) All econometric specifications include individual and country controls (see in the text), country and wave/year fixed effects; (iii) Conley standard errors in parentheses; (iv) *p<.05; **p<.01; ***p<.001.

Table 3. ECI and Societal Female Emancipation - High GDP per Capita Countries (Threshold 60.000$)

	(1) Men should have more right to a job than women	(2) Men make better political leaders than women do	(3) Men make better business executives than women do	(4) Women have the same rights as men.
ECI	-0.460***	-1.635***	-1.072***	-2.076***
	(0.027)	(0.029)	(0.020)	(0.018)
ECI Squared	0.180**	0.861***	0.514***	0.939***
	(0.019)	(0.016)	(0.017)	(0.015)
Turning Point	1.27	0.94	1.04	1.10
Observations	4,992	4,023	2,982	2,990
R-squared	0.157	0.510	0.336	0.213

Notes: (i) The dependent variables take values: 0-1 (Column 1), 1-4 (Columns 2 and 3), 1-10 (Column 4). In all columns, lower values imply less favorable/more conservative attitudes towards women and higher values denote more favorable/modern attitudes towards women (see Table 5); (ii) All econometric specifications include individual and country controls (see in the text), country and wave/year fixed effects; (iii) Conley standard errors in parentheses; (iv) *p<.05; **p<.01; ***p<.001.

Moreover, looking at our data, in 2010, countries belong to four groups. France, Germany, Switzerland, Japan, the USA are countries with an ECI that is beyond the *Turning Point* in all attitudes in Table 1, implying that in these countries further knowledge accumulation, undoubtedly improves the attitudes towards women in the household. In Spain, Denmark, Finland, Hong-Kong, Israel, among others, the level of ECI exceeds the *Turning Point* in columns 1, 2 and 3, but not yet that of column 4 and 5. Hence, additional ECI improvement is needed in these countries so that more knowledge translates into more open-minded attitudes about fathers as primary carers or about abortion if unmarried. However, other countries such as Argentina, Brazil, Egypt, Canada, Greece, India, Portugal, Turkey, have an ECI that exceeds the *Turning Point* only in Column 1 and 3. This means that in these countries, further knowledge accumulation causes temporary harm to the views on women independence (Column 2), in addition to the attitudes in Columns 4 and 5. Finally, a number of countries display an ECI level that is below any *Turning Point* in Table 1.

Last, we also explore whether ECI induces female emancipation in the societal role of women. Results are shown in Table

2. A higher level of ECI does not lead to more emancipated attitudes about the role of women in society. This is in line with sociological and historical studies arguing that the gender revolution occurs first in the role of the woman in the house and only after a gradual adaptation of the public sphere follows.[11] However, as shown in Table 3, if we concentrate on countries with a relatively high level of income, then, further accumulation of growth makes the economic complexity to return being relevant for female emancipation in societal roles. Taken all together, our findings suggest that knowledge accumulation first affects attitudes about gender roles in the household, and only after, with more knowledge accumulation, female emancipated attitudes transit into the role of the women in society.

Discussion

The central idea of this study is that knowledge accumulation ends up modernizing attitudes towards gender roles in the family first, and in the society next. It does so by ultimately moderating the traits that are perceived as desirable in women (Table 4). Cultural norms related to gender roles vary considerably across countries, as shown in Figure 1. Norms also evolve in time in response to changes in economic opportunities. However, attitudes towards women are driven by knowledge accumulation. This effect is strong and present, even when controlling for GDP per capita.

Our hypothesis that the amount of knowledge embedded in the productive structure of an economy has a long-lasting impact on the formation of cultural traits falls into the broader literature that explores the economic determinants of culture. However, we add a novel element, i.e. that of economic complexity. Why shall economic complexity affect gender roles? Our content is that at least two driving forces are in place and weighted differently in the decreasing and increasing part of the U-shaped relationship between ECI and gender attitudes. First and foremost, the use of advanced technologies corroborates the evidence that men and women are equally productive in the labour market. Thus, the division of labour within the family need not be the traditional one: fathers can raise children, and mothers can participate in the labour market. A second-order channel that complements the first is the *person byte effect*. Individuals who possess a high level of human capital to produce sophisticated products populate countries with high levels of economic complexity. Hence they are aware of the equal abilities of men and women to participate both in household and labour market activities. These citizens are then more prone to exhibit egalitarian gender attitudes. In the decreasing part of the U-shaped function, knowledge about abilities is limited and favours a backward vision of the innate aptitudes of men and women. In addition, the initial structural change from agriculture to the industry may initially favour men rather than women.

Table 4. Channels: The Impact of ECI on Appreciable Traits for Women

	(1)	(2)	(3)	(4)	(5)
			Traits in a woman:		
	wearing weil	good mother	good wife	religious	educated
ECI	9.456***	-0.531***	-0.506***	1.369***	-0.353***
	(0.190)	(0.032)	(0.042)	(0.196)	(0.048)
ECI Squared	4.523***	-0.248***	-0.267***	1.113***	-0.052
	(0.096)	(0.026)	(0.034)	(0.151)	(0.038)
Observations	12,572	15,169	15,163	15,153	15,145
R-squared	0.543	0.039	0.035	0.122	0.119

Notes: (i) The main explanatory variables take values from 1 (“Very important”) to 5 (“No important at all”); (ii) All econometric specifications include individual and country controls (see in the text), country and wave/year fixed effects; (iii) Conley standard errors in parentheses; (iv) *p<.05; **p<.01; ***p<.001.

In empirically establishing our mechanism, we use measures that implicitly capture perceptions of individuals about features in women that are considered appreciable. In particular, we examine the relationship between ECI and women traits such as being covered by a veil, being a good mother, being a good wife, being religious or being educated. As shown in Table 4, the effect of knowledge accumulation is very strong (linear term) and the rate of the effect is also increasing (quadratic term). The higher ECI, the higher the attractiveness of being educated, a good mother or good wife, but the lower the appeal of being religious or wearing a veil. The findings reveal that knowledge accumulation changes the appreciable traits for women, ultimately advancing egalitarian gender attitudes.

It is worth mentioning that as to the rest of the controls, interestingly, we find that globalisation modernises gender roles. However, the sign of the GDP per capita, is mostly negative. This is in line with previous seminal work by Goldin, 1995. GDP

growth shifts the locus of production from agriculture fields to factories. This switch has the effect of marginalising women for two reasons. First, the physical separation between home and workplace makes it more difficult to reconcile productive and reproductive tasks.[18] Second, since work in factories and industrial farms is generally considered unfit for married woman because working outside the house brings "stigma" on the family.[3] Importantly, our effects of knowledge accumulation persist despite controlling for the GDP per capita.

Despite bringing a novel key driver of culture towards gender roles, our research has some limitations that can be tackled in future research. Firstly, it would be interesting to enrich the types of attitudes related to gender norms and secondly, the use of longitudinal data would allow to mitigate individual heterogeneity.

Methods

The empirical analysis is designed to test our main and other related hypotheses. In the econometric specification, we associate each individual with his country's level of ECI. The ECI is our main explanatory variable and we hypothesize that it has a long-lasting effect on attitudes towards women as measured by the individuals' answers to a rich set of relevant questions in the European Values Study (EVS) and the World Values Survey (WVS). The EVS is one of the most comprehensive databases on the evolution of values. It's a long-running survey (every nine years since 1981) and covers the largest number of European countries. The 5th survey wave, launched in September 2017, concerns 38 European countries. The WVS consists of nationally representative surveys conducted in almost 100 countries which contain almost 90 percent of the world's population, using a common questionnaire. The WVS includes very poor to very rich countries, in all of the world's major cultural zones.

For the benchmark analysis (Table 1), we focus on the following five questions (in the parentheses we also report the code numbers of the answers i.e., the values of the respective variables adopted in our econometric specifications): Do you agree strongly (1), agree (2), disagree (3), or disagree strongly (4) with the statement: (i) *'A job is alright but what most women really want is a home and children'?*; (ii) *'Having a job is the best way for a woman to be an independent person'?*; (iii) *''If a woman earns more money than her husband, it's almost certain to cause problems'?*; (iv) *'Fathers are well suited for looking after children'?*; and (v) Do you disapprove (0) or approve (1) *'abortion when the woman is not married'?*

For the attitudes towards gender roles in the economy as a whole (Tables 2 and 3) we consider the questions: (i) Do you agree strongly (1), agree (2), disagree (3), or disagree strongly (4) with the statement *'When jobs are scarce, men should have more right to a job than women'?*; (ii) Do you agree strongly (1), agree (2), disagree (3), or disagree strongly (4) with the statement *'On the whole, men make better political leaders than women do'?*'; (iii) Do you agree strongly (1), agree (2), disagree (3), or disagree strongly (4) with the statement *'On the whole, men make better business executives than women do'?*'; (iv) Many things may be desirable, but not all of them are essential characteristics of democracy. Please tell for the following thing how essential you think it is as a characteristic of democracy. Use this scale where 1 means "not at all an essential characteristic of democracy" and 10 means it definitely is "an essential characteristic of democracy": *'Women have the same rights as men'*.

For measuring the perceptions of individuals about features in women that are considered appreciable we use the questions: In your opinion, is it very important (1), somewhat important (2), neither important or unimportant (3), little importance (4), no important at all (5) the following traits in a woman? (i) *'Wearing a veil in public places'*; (ii) *'Being a good mother'*; (iii) *'Being a good wife'*; (iv) *'Being religious'*; (v) *'Being educated'*. Summary statistics for all the variables are presented in Table 5.

The analysis is conducted using a multi-level model. We use the replies of the individuals on the above questions from the integrated version of the European Values Study and the World Values Survey (EWVS). Additionally, we capture a rich set of individual characteristics affecting attitudes towards women such as gender, age and age squared, the level of income as well as the level of education. However, restriction to the individual level leaves out important determinants such as the level of income and openness to trade. For this reason, we combine the individual data with country-level controls. We further control for country and survey round fixed effects, time varying country level controls that may also affect cultural attitudes such as income per capita and the net volume of trade. The latter measure is also quite important given the nature of the ECI. In our benchmark specification, the multilevel model estimates the following specification:

$$GenderNorms_{ict} = \alpha_0 + \alpha_1 ECI_{ct} + \alpha_2 ECI_{ct}^2 + \alpha_3 X_i + \alpha_4 C_c + \alpha_5 FE_c + \alpha_6 R_t + \varepsilon_{ict} \quad (1)$$

where, $GenderNorms_{ict}$ is an index of the attitudes towards gender roles (any of the four variables mentioned above) of individual i, residing in country c, who participated in the tth EWVS round. ECI_{ct} represents the level of ECI at the country level at time t (lagged values). To mitigate reverse causality issues, though this is more difficult in a multi-level model (and would operate via an anticipation effect), we associate each individual with past ECI values. We take into account the individual characteristics by applying the appropriate controls X_i such as age, age squared, gender, education and income level. C_c is the vector of additional country-level controls such as GDP per capita as a measure of development, and volume of trade as a proxy for openness. FE_c is a vector of country fixed effects that controls for all time invariant unobserved heterogeneity at

the country level. R_t is a vector of EWVS fixed effects aimed to capture round specific shocks that could affect individual responses. ε_{ict} is the error term. We estimate spatial heteroskedastic and autocorrelation consistent (HAC) standard errors in all our regressions.[19,20]

It is also essential to note that while our outcome variables are either binary or ordered variables, yet in our benchmark specifications we conduct ordinary least squares (OLS) regressions, that allows us to meaningfully introduce country and year fixed effects. This multilevel analysis shows that both cross-country controls as well as individual characteristics matter to define attitudes towards gender roles, yet economic complexity has a persistent effect on shaping them.

References

1. Hidalgo, C. A. & Hausmann, R. The building blocks of economic complexity. *Proc. national academy sciences* **106**, 10570–10575 (2009).
2. Almond, D. & Edlund, L. Son-biased sex ratios in the 2000 united states census. *Proc. Natl. Acad. Sci.* **105**, 5681–5682 (2008).
3. Boserup, E. *Woman's role in economic development* (London: George Allen Unwin, 1970).
4. Abrevaya, J. Are there missing girls in the united states? evidence from birth data. *Am. Econ. Journal: Appl. Econ.* **1**, 1–34 (2009).
5. Alesina, A., Giuliano, P. & Nunn, N. On the origins of gender roles: Women and the plough. *The quarterly journal economics* **128**, 469–530 (2013).
6. Hansen, C. W., Jensen, P. S. & Skovsgaard, C. V. Modern gender roles and agricultural history: the neolithic inheritance. *J. Econ. Growth* **20**, 365–404 (2015).
7. Fernández, R., Fogli, A. & Olivetti, C. Mothers and sons: Preference formation and female labor force dynamics. *The Q. J. Econ.* **119**, 1249–1299 (2004).
8. Fernandez, R. & Fogli, A. Culture: An empirical investigation of beliefs, work, and fertility. *Am. economic journal: Macroecon.* **1**, 146–77 (2009).
9. Blau, F. D., Kahn, L. M., Liu, A. Y.-H. & Papps, K. L. The transmission of women's fertility, human capital, and work orientation across immigrant generations. *J. Popul. Econ.* **26**, 405–435 (2013).
10. Grosjean, P. & Khattar, R. It's raining men! hallelujah? the long-run consequences of male-biased sex ratios. *The Rev. Econ. Stud.* **86**, 723–754 (2019).
11. Goldscheider, F., Bernhardt, E. & Lappegård, T. The gender revolution: A framework for understanding changing family and demographic behavior. *Popul. Dev. Rev.* **41**, 207–239, DOI: https://doi.org/10.1111/j.1728-4457.2015.00045.x (2015).
12. Fernández, R. Cultural change as learning: The evolution of female labor force participation over a century. *Am. Econ. Rev.* **103**, 472–500 (2013).
13. Doepke, M. & Tertilt, M. Women's Liberation: What's in It for Men?*. *The Q. J. Econ.* **124**, 1541–1591, DOI: 10.1162/qjec.2009.124.4.1541 (2009). https://academic.oup.com/qje/article-pdf/124/4/1541/5407296/124-4-1541.pdf.
14. Duflo, E. Women empowerment and economic development. *J. Econ. Lit.* **50**, 1051–79, DOI: 10.1257/jel.50.4.1051 (2012).
15. Goldin, C. *The U-Shaped Female Labor Force Function in Economic Development and Economic History*, 61–90 (University of Chicago Press, 1995).
16. Galor, O. & Weil, D. N. The Gender Gap, Fertility, and Growth. *Am. Econ. Rev.* **86**, 374–387 (1996).
17. Hidalgo, C. A., Klinger, B., Barabási, A.-L. & Hausmann, R. The product space conditions the development of nations. *Science* **317**, 482–487 (2007).
18. Benería, L. Reproduction, production and the sexual division of labour. *Camb. J. Econ.* **3**, 203–225 (1979).
19. Conley, T. G. Gmm estimation with cross sectional dependence. *J. econometrics* **92**, 1–45 (1999).
20. Conley, T. G. Spatial econometrics. In *Microeconometrics*, 303–313 (Springer, 2010).

Author contributions

Athanasios Lapatinas (AL), Anastasia Litina (AL) and Skerdilajda Zanaj (SZ) all contributed equally to the work and have supervised it jointly.

Data availability

The data that support the findings of this study are available from the corresponding author upon request.

Code availability

The code that supports the findings of this study is available from the corresponding author upon request.

Additional information

Table 5. Description of the variables and summary statistics.

Variable	Description	Source	Obs	Mean	Std. Dev.	Min	Max
Micro-variables							
Age	Age	WVS-EVS	64,954	41.780	16.441	16	99
Sex	Sex	WVS-EVS	64,954	1.515	0.500	1 (male)	2 (female)
Education	Education	WVS-EVS	64,954	4.936	2.152	1 (elementary)	8 (higher)
Income	Income scale	WVS-EVS	64,954	4.934	2.083	1	10
Women want a home and children	'A job is alright but what most women really want is a home and children'	WVS-EVS	30,136	2.177	0.879	1 (strongly agree)	4 (strongly disagree)
Job best way for women to be independent	'Having a job is the best way for a woman to be an independent person'	WVS-EVS	30,542	2.003	0.836	1 (strongly disagree)	4 (strongly agree)
Problem if women have more income	'If a woman earns more money than her husband, it's almost certain to cause problems'	WVS-EVS	64,954	2.128	0.845	1 (agree)	3 (disagree)
Fathers suited looking after children as mothers	'Fathers are well suited for looking after children'	WVS-EVS	26,727	2.009	0.793	1 (strongly disagree)	4 (strongly agree)
Abortion when woman not married	'Abortion when the woman is not married'	WVS-EVS	33,744	0.514	0.500	0 (approve)	1 (disapprove)
Wearing weil	'Wearing a veil in public places'	WVS-EVS	12,572	2.183	1.471	1 (very important)	5 (no important at all)
Good mother	'Being a good mother'	WVS-EVS	15,169	1.148	0.435	1 (very important)	5 (no important at all)
Good wife	'Being a good wife'	WVS-EVS	15,163	1.146	0.431	1 (very important)	5 (no important at all)
Religious	'Being religious'	WVS-EVS	15,153	1.368	0.800	1 (very important)	5 (no important at all)
Educated	'Being educated'	WVS-EVS	15,145	1.521	0.825	1 (very important)	5 (no important at all)
Men should have more right to a job than women	'When jobs are scarce, men should have more right to a job than women'	WVS-EVS	252,217	1.807	0.703	1 (strongly agree)	4 (strongly disagree)
Men make better political leaders than women do	'On the whole, men make better political leaders than women do'	WVS-EVS	208,590	2.493	0.978	1 (strongly agree)	4 (strongly disagree)
Men make better business executives than women do	'On the whole, men make better business executives than women do'	WVS-EVS	118,274	2.667	0.952	1 (strongly agree)	4 (strongly disagree)
Women have the same rights as men	'Women have the same rights as men'	WVS-EVS	116,976	8.284	2.391	1 (not essential)	10 (essential)
Macro-variables							
ECI	Improved economic complexity index	OEC	64,954	0.382	0.773	-1.829	1.539
GDPpc	(log) GDP per capita (constant 2010 US$)	World Bank	64,954	9.027	1.203	6.442	11.127
Openness	Sum of exports and imports of goods and services (% GDP)	World Bank	64,954	86.593	72.343	23.96	404.97