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Abstract

This paper argues that the availability of arable land in antiquity created gender norms that continue to affect current gender inequality. We show that countries with greater ancestral arable land have lower levels of gender inequality, better female reproductive health outcomes, and greater female labor force participation. Using more than 80,000 individual-level observations from over 70 countries, we find that it is positively associated with attitudes regarding women's rights and abilities. We show that the primary mechanism driving this relationship is the shaping of norms that promote female labor force participation.

JEL classification codes: D03, J16, N30
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1 Introduction

The United Nation's Sustainable Development Goals note that gender equality is a fundamental human right that must be pursued to ensure a peaceful, prosperous and sustainable world. To achieve gender parity, it is important to understand the mechanism that led to gender norms determining present gender inequality. Several agricultural and ecological factors in antiquity such as pathogen prevalence (Varnum and Grossmann, 2016), dietary practices (Dong et al., 2017), cool water conditions (Santos Silva et al., 2017), resource scarcity (Hazarika, Jha, and Sarangi, 2019), the timing of neolithic transition (Hansen, Jensen, and Skovsgaard, 2015; Fredriksson and Gupta, 2018), and the adoption of plough (Alesina, Giuliano, and Nunn, 2013a; Alesina, Giuliano, and Nunn, 2018) have been shown to play a key role in shaping gender norms that continue to persist and affect women's role and well-being in society even today. However, one fundamental component of agriculture that has not been examined by any of these studies is the *direct role* of the availability of arable land in antiquity even though it is the complementary input in nearly all the agro-ecological factors that explain modern gender inequality. Our paper introduces this important aspect into the argument by examining how the availability of arable land in antiquity, *i.e.*, ancestral arable land, shaped gender norms that continue to determine modern gender inequality. Moreover, since land is a complementary input, it allows us to throw light on other agriculture-related explanations of gender inequality.

Hypothesis and Mechanisms

We hypothesize that the availability of ancestral arable land negatively impacts modern gender inequality via shaping norms regarding *female labor force participation*. Iversen and Rosenbluth (Iversen and Rosenbluth, 2010) argue that land scarcity placed a premium on male brawn by making the cultivation of food more labor intensive that employed heavy agricultural equipment. An efficient division of labor within a family would require that men use their strength in cultivating food while women specialized in other family duties such as rearing children, preparing food, and even helping in the agricultural activities. So while a woman's contribution was still important for the family's survival, it didn't provide her economic viability on her own. We argue that the abundancy of arable land would also promote women's participation in agricultural activities in the fields as opposed to just contributing from the confines of home simply because there would be a greater need for hands to work in the fields. Consequently, societies with more arable land in antiquity developed norms where women worked on agricultural lands and their economic contributions extended to agricultural output–a visibly measurable contribution unlike household duties. It is well-documented that economic contributions increase women's bargaining power in the allocation of intra-household resources and result in better well-being especially health outcomes (Heath and Jayachandran, 2017; Westeneng and d'Exelle, 2015). We argue, therefore, that women in societies with greater ancestral arable land enjoyed better economic status and stronger bargaining power by being able to contribute to agriculture and hence a greater share of household resources resulting in better health outcomes than their counterparts residing in societies with a scarcity of arable land. These gender norms eventually became ingrained in the culture and even today we can expect to see higher female labor force participation and better female health indicators in these societies.

A second mechanism through which the availability of arable land in antiquity might have resulted in worse outcome for women is through resource scarcity. Multiple studies have suggested that resource scarcity contributed to gender inequality in history (Hazarika, Jha, and Sarangi, 2019), prehistory (Cohen and Bennett, 1993), hunter-gatherer societies (Hayden et al., 1986), and even among primates (Wrangham, 1986). However, this has not been studied in the context of arable land in antiquity. In societies with a scarcity of arable land, there would also be fewer resources available for subsistence leading to more intense bargaining for the intra-household allocation of resources. Men would have an upper hand in this bargaining process because of their advantage over women in physical strength (Alesina, Giuliano, and Nunn, 2013a; Iversen and Rosenbluth, 2010; Boserup, 1970) and also due to existing gender norms that favored men (Cohen and Bennett, 1993; Hayden et al., 1986). Moreover, scholars have argued that "the male comparative advantage in brawn was accentuated by growing land scarcity, which increased the value not only of a man's labor but also his ability to defend the farm against marauders" (Iversen and Rosenbluth, 2010). And, societies that were exposed to external threats or resource scarcity (among other ecological factors), are more likely to punish deviance and hence reinforce existing social norms such as gender norms (Gelfand et al., 2011). Consequently, male-favoring norms would become even stronger in societies with a scarcity of arable land, and continue to affect women's status in society by becoming a part of the culture.

To summarize, we propose that the availability of arable land in antiquity played a role in shaping gender norms that continue to persist and affect gender differences in role and well-being via two important mechanisms. Our primary mechanism, *female labor force participation*, suggests a positive relationship between ancestral arable land and female labor force participation rate. Our second mechanism, which we call *resource scarcity*, therefore, suggests that resource scarcity plays a mediating role between the availability of ancestral arable land and modern gender inequality. We provide evidence in favor of both these mechanisms. In further support of our hypothesis, using the World Values Survey (WVS) data, we show that ancestral arable land, measured at the district-level, is significantly associated with the opinions of individuals and their perceptions regarding women's right and abilities after controlling for individual's characteristics and country fixed effects.

2 Data and Empirical Strategy

2.1 Cross-Country Data and Methodology

Our measure of gender inequality is the United Nations Development Programme (UNDP) Gender Inequality Index (GII)(UNDP, 2013) for the year 2012. The GII is a composite measure of gender inequality that "captures the loss of achievement due to gender inequality in three dimensions: reproductive health, empowerment and labour market participation" and "is designed to provide empirical foundations for policy analysis and advocacy efforts" (UNDP, 2013). It takes values in the range of 0 to 1 with higher values indicating greater gender inequality against women. The GII measures women's disadvantages in three dimensions: reproductive health, empowerment, and the labor market. The reproductive health dimension is constructed using two indicators: the Maternal Mortality Ratio (MMR) and the Adolescent Birth Rate (ABR). The MMR is computed as the number of maternal deaths per 100,000 live births, and the ABR refers to the number of births per 1,000 women in the age group 15-19 years. The empowerment dimension consists of women's share in parliament, and the difference between the proportions of adult women and men with secondary or higher education. Finally, the labor market dimension accounts for the labor force participation rates of men and women. We also individually examine the relationship between ancestral arable land and the components of GII.

Alesina, Giuliano, and Nunn (Alesina, Giuliano, and Nunn, 2013a) provide ancestral arable land data for a large number of countries based on the ancestral land suited to agriculture for all its ethnic groups accounting for the share of each ethnic group in the national population. Alesina, Giuliano, and Nunn (2013a) recognize that nations are often made up of a number of ethnic groups. Each group has a historical centroid, a place where the group originated. They obtain the geographical coordinates of these ethnic centroids using anthropologist George Peter Murdock's Ethnographic Atlas. Then using GIS software they identify the land within a 200 kilometres radius of each such centroid calling it the particular ethnic group's ancestral land. The Food and Agriculture Organization's Global Agro-Ecological Zones 2002 database is used to calculate the share of each ethnic group's ancestral land suited to agriculture, that is, to the cultivation of six major crops: barley, wheat, rye, sorghum, foxtail millet, and pearl millet. Finally, the share of a nation's ancestral lands suited to agriculture is computed as the weighted mean of the shares of its constituent ethnic groups' ancestral lands suited to agriculture, where the weights are the shares of these groups in the national population.

We estimate the following linear regression equation using the ordinary least squares

$$y_i = \beta_1 + \beta_2 AAL_i + \mathbf{X_i'}\gamma + \varepsilon_i \tag{1}$$

wherein the subscript i denotes country, the regressors $\mathbf{X_i}$ consist of a host of contemporaneous and historical controls, and ε_i represents regression error terms. AAL_i is the fraction of ancestral land area suitable to the cultivation of six major crops mentioned above. y_i denotes our dependent variables for country i, primarily, the Gender Inequality Index, and its five components: MMR, ABR, share of women in parliament, female-male secondary education attainment gap, and female-male labor force participation gap.

In the baseline specification, we control for per capita income in 2012 to address concerns that the relationship between historical arable land and the GII may have been driven by the omission of current resource environments that are likely to be correlated with both arable land and gender inequality at present. In addition to per capita income in 2012, our baseline also controls for historical variables discussed below. First, we control for the fraction of land in the tropics because "*tropical regions are hindered in development relative to temperate regions, probably because of higher disease burdens and limitations on agricultural productivity* (Gallup, Sachs, and Mellinger, 1999)." This is important since pathogen prevalence have been found to shape culture regarding gender inequality (Varnum and Grossmann, 2016).

If the fraction of land in the tropics had an influence on gender inequality through any of these factors then its omission may cause the estimates to be biased. Finally, we control for the distance from the coast or sea-navigable river since the latter was an important factor in trade and may have played a role in the exchange of culture including that related to gender inequality. Additionally, we control for continent dummies in our baseline specification and in other specifications thereafter. As robustness checks, we control for a number of economic, institutional, and cultural variables and find consistent results (Tables A1 and A2). Please refer to the Online Appendix for details regarding these variables.

2.2 Individual-level Analysis: Data and Methodology

We rely on the publicly available data from Alesina, Giuliano, and Nunn (2013a) for this analysis.[1] The analysis utilizes three variables from the World Values Survey (WVS). The first variable is constructed from individuals' responses, coded as 'strongly disagree' (1), 'disagree' (2), 'agree' (3), and 'agree strongly' (4), to the statement "On the whole, men make better political leaders than women do". The second variable reflects differences in cultural beliefs regarding women's right to a job in comparison to men's and coded as 'disagree' (0) and 'agree' (1), to the statement "When jobs are scarce, men should have more right to a job than women" to measure attitudes concerning the rights of women. An advantage of using these two measures from the WVS is the fact that by capturing individual attitudes, they reflect their cultural beliefs regarding gender norms. Clearly, these beliefs might play a role in women's labor force participation, especially, when times are tough and jobs are scarce. Finally, the third variable is an indicator of the female labor force participation which takes a value of 1 if a woman reports that she is in the labor force, defined as full-time, part-time, or self-employment or 0 otherwise.

[1] The data was accessed from the following web-page (Alesina, Giuliano, and Nunn, 2013b): https://scholar.harvard.edu/files/nunn/files/alesina_giuliano_nunn_qje_2013_replication_materials.zip.

We utilize the measure of ancestral availability of arable land at the sub-national level from Alesina, Giuliano, and Nunn (2013a). The authors identify the ethnic groups in a sub-national region, look up these groups' historical centroids in the Ethnographic Atlas, and mark land within 200 kilometers of each such centroid, taken to be the concerned ethnic group's ancestral land. They then ascertain the share of each ethnic group's ancestral land suited to agriculture. Finally, they calculate the share of the sub-national region's ancestral lands suited to agriculture as the weighted mean of the shares of its constituent ethnic groups' ancestral lands suited to agriculture, the weights being the shares of these groups' numbers in the region's population. We present the results of the same specifications as reported in (Alesina, Giuliano, and Nunn, 2013a) in this section because the publicly available data do not identify the subnational regions, which limits our ability to modify the data to do more analysis. While their study focuses on ancestral plough use, our variable of interest is the availability of ancestral arable land and the following individual-level equation is estimated for the sub-national analysis

$$y_{i,d,c} = \alpha_c + \beta AAL_d + \mathbf{X'}_i\theta + \mathbf{X'}^H_d\delta + \varepsilon_{i,d,c} \tag{2}$$

where i, d, and c denote an individual, a district, and a country, respectively. α_c denotes country-fixed effects and $\mathbf{X}_i$ denotes individual-level controls. AAL_d is our primary variable of interest and is measured at the district-level. $\mathbf{X}^H_d$ denotes historical district controls and includes ancestral plough use, fraction of ancestral land that was tropical or subtropical, ancestral domestication of large animals, ancestral settlement patterns, and ancestral political complexity. Individual-level control variables include age, age-squared, gender (except for female labor force participation variable in the last two columns), marital status, and dummies for primary and secondary education. Finally, continent dummies are included in the odd-numbered columns along with country-level control variables, whereas country dummies are included in the even-numbered columns. Country-level controls include income per capita and income per capita squared (both in natural logs), measured in the same year as the dependent variable. The specifications reported in Table 5 are identical to the corresponding specifications reported in Table V of Alesina, Giuliano, and Nunn (2013a), except for the fact that the estimated coefficients of ancestral arable land are not reported in their paper.

3 Results

3.1 Cross-Country Analysis

Ancestral Arable Land and the GII

Ancestral arable land is shown to be negatively associated with the GII and positively associated with female-male labor force participation gap in Figure A2a. The negative relationship between ancestral arable land and GII is found to be statistically significant in the multivariate regression analysis in panel A of Table 1, where column 1 estimates the baseline specification shown in equation 1 (see the methodology section in the Appendix). Importantly, the negative relationship between ancestral arable land and gender inequality remains significant when controlling for other important variables suggested by the literature like the ancestral use of the plough (Alesina, Giuliano, and Nunn, 2013a) in column 2, the (ancestry-adjusted) number of years since a country has moved to agriculture (Hansen, Jensen, and Skovsgaard, 2015) in column 3, and the ancestry-adjusted pre-1500 CE crop yield (Hazarika, Jha, and Sarangi, 2019) in column 4. Consistent with earlier studies, these estimates indicate greater gender inequality in countries with longer histories of agriculture (Hansen, Jensen, and Skovsgaard, 2015) and a greater resource scarcity (Hazarika, Jha, and Sarangi, 2019). Additionally, we find that the relationship between ancestral arable land and the GII remains robust in column 5 when we control for a number of variables that account for cultural, economic, and institutional heterogeneity across countries (See Table footnotes for the list of these variables. They have been discussed in greater detail in the Appendix.) Moreover, the robustness and sensitivity of our estimates using alternative measures of historical availability of arable land (namely, migration-adjusted current potential arable land) and gender inequality (Gender Development Index and female-male life expectancy gap) can also be found in the Appendix (Tables A3 and A4).

Evidence on Mechanisms Driving Gender Inequality

Panel B of Table 1 presents evidence in favor of our primary mechanism, *i.e.*, female labor force participation, by documenting a strong positive association between arable land in antiquity and current female labor force participation rate. The coefficient on ancestral arable land is positive and statistically significant at the 5%-level or better in all the columns in panel B. Per the lowest estimate in column 4, the female labor force participation in a country will rise by approximately 3 percentage points if its fraction of ancestral arable land were one-standard deviation (0.32 percentage points) higher. These estimates support our hypothesis that the availability of arable land in antiquity positively influenced women's labor force participation leading to better outcomes for them. We also perform a falsification test that finds no significant association between ancestral arable land and the share of women in parliament, suggesting that the relationship between ancestral arable land and female labor force participation is not driven some omitted factors associated with women's empowerment (see Appendix).

Moreover, by comparing the corresponding columns of Tables 1 (panel A) and 2, we see that female labor force participation plays a mediating role between ancestral arable land and GII: When it is added as a control variable, not only does the coefficient of ancestral arable land becomes significantly smaller but also loses statistical significance. The mediating role of the resource environment–consistent with the resource scarcity mechanism–is observed in column 4, panel A of Table 1, where the coefficient on ancestral arable land decreases upon the inclusion of ancestry-adjusted pre-1500 CE crop yield. However, when resource environment is controlled for, the coefficient of ancestral arable continues to be statistically significant and sizable. A comparison of these two mechanisms clearly indicates that female labor force participation is the primary mechanism responsible for the relationship between ancestral arable land and gender inequality while resource scarcity is the secondary channel.

Examining the Components of GII

Given that GII is an index made up of three components, we now study these components to understand how ancestral arable land affects each of them. Results presented in Table 3 show that ancestral arable land explains the health and labor market participation of women as it is significantly, negatively associated with maternal mortality ratio and adolescent birth rate, and positively associated with the labor force participation gap in favor of women. Interestingly, it is not significantly associated with the share of women in parliament and the female-male secondary education attainment. This finding is not very surprising – while being healthy was important for making contributions to agriculture, education and (political) empowerment was not. As a result, these societies might have developed norms emphasizing health outcomes but not empowerment, which can be observed even today.

Notice further that a greater share of ancestral land suitable for agriculture is positively and significantly associated with the female-male labor force participation gap in column 5 of Table 3. This finding further confirms our primary mechanism–female labor force participation, which suggests that a greater availability of ancestral arable land led to norms in which women worked in agriculture outside the home. It led to better outcomes for women because, as argued earlier, agricultural output is easily measurable, and women's labor force participation and economic contributions are positively associated with their intra-household bargaining power and reproductive health (Heath and Jayachandran, 2017; Westeneng and d'Exelle, 2015).

3.2 Robustness Checks

Does Current Arable Land Matter?

We report the results of a horse-race between ancestral land suited to agriculture and current potential arable land in Panel A of Table 4. The objective is to demonstrate that the effects on gender inequality that we observe are due to the availability of arable land in antiquity, and not driven by the availability of current potential arable land. As we can see while ancestral arable land is negatively, significantly associated with the GII, MMR, and ABR, current potential arable land is not significantly associated with either of these three variables.

Interestingly, in column 6, both current potential arable land and ancestral arable land are found to be positively associated with the labor force participation gap in favor of women. This result is intuitively appealing – while ancestral arable land would impact current female labor force participation through its effect on norms regarding women working outside the home, current arable land would encourage female labor force participation due to a greater need for labor in agricultural activity.[2] The fact that ancestral arable land variable remains significantly associated with the GII and its indicators (the MMR and the ABR) in the horse-race further illustrates the importance of arable land endowment in antiquity in shaping gender norms.

Finally, there might still be some concern that our measure of the historic availability

[2]The relationship between ancestral arable land and female labor force participation remains robust when we include additional control variables along with current potential arable land. Interestingly, we find that when additional controls are added to the model, the availability of current potential arable land loses significance while arable land in antiquity remains significantly associated with female labor force participation. These results suggest that the norms shaped by the availability of arable land in antiquity play a more important role in determining women's participation in the labor force than current arable land (interested readers can refer to Table A7) in the Appendix.

of arable land – ancestral arable land – may not pertain to the historical times but rather may be capturing the contemporaneous effect. Our findings indicate that this is not the case. If it were driven by the historical influence on culture, then current potential arable land should be correlated with gender inequality in the Old World but not in the New World. After all, gender inequality in the New World, extensively repopulated after 1492, ought to derive in large part from the cultures of its European, African, and Asian settlers, influenced by conditions in their Old World nations of origin. On the other hand, since it takes this re-population into account, the correlation between ancestral arable land and gender inequality should be significantly different between the New World and the Old World. Our findings point to the historical influence of culture: While current potential arable land is statistically significantly negatively associated with modern gender inequality in the Old World, the relationship between these variables is not statistically significantly different from zero in the New World. On the other hand, the negative association between ancestral arable land and modern gender inequality does not significantly vary between countries in the New and Old Worlds. These results are reported in Table A5 in the Appendix.

Comparing Alternative Explanations

Which historical factors play important roles in determining present levels of gender inequality? To answer this question, we regress the GII and its components on ancestral arable land and three other historical variables identified by the current literature, *i.e.*, transition to agriculture (Hansen, Jensen, and Skovsgaard, 2015), historical plough use (Alesina, Giuliano, and Nunn, 2013a), and pre-1500 average crop yield (Hazarika, Jha, and Sarangi, 2019). Results presented in panel B of Table 4 indicate ancestral arable land to be the most significant correlate of the GII and its components. It is significantly associated with the GII, the MMR, the ABR, and female-male labor force participation gap. Among other historical factors, the timing of the neolithic transition is significantly associated with gender educational attainment gap as well as female-male labor force participation gap and the ancestral use of the plough is found to be weakly significantly associated with the ABR. Finally, pre-1500 average crop yield is significantly associated with the female-male labor force participation gap and female-male education gap. Moreover, ancestral arable land continues to be the most significant correlate when the endowment of current arable land is included as a control variable (see Table A8 in the Appendix).

An earlier study finds that ancestral ecological endowment measured by the historical caloric yield per hectare is capable of affecting women's well-being without affecting their participation in the labor force (Hazarika, Jha, and Sarangi, 2019). Is this inconsistent with our finding especially since we propose resource scarcity in historical times as one of the channels through which the availability of arable land in antiquity continues to exert an influence on modern gender inequality? We argue that this difference in findings regarding female labor force participation is not inconsistent and actually quite intuitive. While ancestry-adjusted pre-1500 CE crop yield, the measure of historical resource scarcity, can be considered an output-based measure of resource endowment, ancestral land suited to agriculture is an input-based measure. The availability of ancestral arable land is one of many inputs including the level of technology that determined potential caloric yield of an agricultural society. Not surprisingly, then the correlation coefficient between ancestral arable land and ancestry-adjusted pre-1500 CE crop yield is quite low: only 0.32 for the sample of countries included in our analysis (see Table A11 in the Appendix). The abundancy of arable land meant less brawn-favoring labor intensive cultivation and a greater need for workers in the fields leading to norms in which women worked in the fields. But there was little reason for women to work outside in the fields in resource rich societies that could produce sufficient caloric yield and hence the absence of a significant association between ancestry-adjusted pre-1500 CE crop yield and female labor force participation at present.

3.3 Individual-level Analysis

In this section, we explore whether ancestral arable land at the district-level can explain the perception of the World Values Survey (WVS) respondents regarding women's rights and abilities. Such an exercise has two important advantages. First, while GII and its components are objective measures of gender inequality, WVS responses are subjective measures that reflect norms and values and are likely factors in these objective measures. Second, individual-level data with over 43,000 observations from at least 48 countries (specification with fewest observations) across the world allows us to look at this relationship after controlling for individual and district level variables along with country dummies. This rules out the possibility that our results are driven by the omission of country-specific fixed factors. We utilize data from three waves of the WVS covering the period 1995-2007 to explore links between ancestral lands suited to agriculture in the different parts of a country and women's labor force participation (15-64 year old) as well as individuals' attitudes about the rights and abilities of women.

In all the six specifications reported in Table 5, we control for individual and district level variables. Further, odd-numbered columns control for country-level variables while even-numbered columns include country dummies. We find that residents of sub-national regions with ancestral lands better suited to agriculture are significantly less likely to agree that (i) men ought to have more right to a scarce job, and (ii) men make better political leaders. Further, the ancestral land is found to be positively associated with women's participation in the labor force in column 5, but this relationship becomes insignificant when country dummies are included in the last column. Overall, these results support our cross-country findings by indicating a positive connection between arable land in antiquity and attitudes regarding women's rights and abilities.

4 Concluding Remarks

This article contributes to our understanding of how events in our past affect current gender inequality in several important ways. We introduce a very important missing piece in the context of agricultural and ecological factors, namely, the availability of arable land in antiquity to study its role in shaping norms regarding gender inequality, and demonstrate how it continues to exert an influence on modern gender inequality. While earlier studies focus either only on women's roles (Alesina, Giuliano, and Nunn, 2013a; Hansen, Jensen, and Skovsgaard, 2015) or well-being, (Hazarika, Jha, and Sarangi, 2019; Alesina, Giuliano, and Nunn, 2018; Fredriksson and Gupta, 2018) our analysis takes the interaction between these two variables into account by using the GII as a measure of gender inequality. The literature has also largely ignored the effects of historical factors on reproductive health outcomes and mostly focused on female-male sex ratios, with some studies utilizing other variables such as female-male life expectancy gap (Hazarika, Jha, and Sarangi, 2019; Alesina, Giuliano, and Nunn, 2018; Fredriksson and Gupta, 2018). Reproductive health outcomes (ABR and MMR) are important to examine because they play a crucial role in determining women's role in the society. Since pregnant women and new mothers cannot work in the fields, frequent pregnancies would be undesirable in societies with abundant arable land needing workers. In fact, the frequency of pregnancies is believed to be an important factor for explaining lower levels of gender inequality in hunter-gatherer societies relative to agricultural societies (Diamond, 1987). Consequently, arable land abundant societies would restrict the number of pregnancies and devote more resources to new mothers to enable them to return to fields as soon as possible. Our results provide evidence in support of this argument since we find that the availability of arable land in antiquity is positively associated with both women's labor force participation as well as reproductive health outcomes.

While it is generally believed and has even been shown that economic development is negatively associated with gender inequality (Jayachandran, 2015), there is a considerable range of gender inequality among countries with comparable per capita incomes. Compare for instance, Qatar to Switzerland, the United Arab Emirates to France, Saudi Arabia to Slovenia, and Afghanistan to Rwanda or Nepal. All these countries have comparable levels of GDP per capita (see Figure A1 in the Appendix to visualize this), yet the first country in each of these pairs has considerably low levels of gender inequality than the second. It may seem like a coincidence that the second country with lower GII in every comparison pair has Islam as a predominant religion. Our findings offer an alternative explanation for this phenomenon. Religions arise within social contexts, and therefore, it is plausible that they embraced aspects of the cultures within which they were born. After all, Christianity began to "absorb and Christianize pagan religious ideas and practices" in the fourth century (Bradshaw, 2002). Thus, it is plausible that aspects of Islam that seem to impose greater restrictions on women really predate Islam, and our findings suggest that this may be due to the fact that the majority of land area in all these countries was not arable. The second country, on the other hand, in each of these pairs has significantly more ancestral arable land than the first country.

Gender norms shaped by the historical factors such as the availability of ancestral arable land continue to dictate women's role in the society and well-being even after a society's level of economic development rises. For the sample of countries used in our analysis, we find that in each decile of per capita income, the country with the least gender inequality has more ancestral arable land than the country with the most gender inequality in each decile but one (see Table A9 in the Appendix). Our findings therefore reinforce the idea that we cannot rely on economic development alone: gender inequality in status is partly driven by the existence of gender stereotypes that are persistent because the division of labor by gender prevents women from demonstrating their competence in various economic and political arenas (Evans, 2015). Hence, we must adopt active policy measures to address gender inequality. Moreover, such policies need to be twofold: (i) policies aimed directly at modifying attitudes and norms, and (ii) policies aimed at improving the bargaining power of women. Recent research can provide a guidance in designing such policies. For instance, affirmative policy actions providing women access to public offices may be helpful in modifying attitudes regarding women's capabilities as they weaken gender stereotypes (Beaman et al., 2009), and as discussed in Heath and Jayachandran (2017), policies that generate employment opportunities (especially for women) can improve women's bargaining power.

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Table 1: Ancestral Arable Land and Gender Inequality

	(1)	(2)	(3)	(4)	(5)
Panel A: Dependent Variable: Gender Inequality Index					
Ancestral arable land	-0.106	-0.106	-0.0911	-0.0668	-0.0885
	(0.0337)	(0.0340)	(0.0335)	(0.0346)	(0.0396)
Fraction of population with ancestors who used the plough		-0.00676	-0.00480	-0.0196	0.0710
		(0.0530)	(0.0523)	(0.0471)	(0.0334)
Years since neolithic transition (migration-adjusted)			0.0121	0.0127	0.00571
			(0.00590)	(0.00508)	(0.00750)
Pre-1500 CE average crop yield (ancestry-adjusted)				-0.00006	-0.00005
				(0.00002)	(0.00002)
Baseline controls	Yes	Yes	Yes	Yes	Yes
Additional controls					Yes
Continent dummies	Yes	Yes	Yes	Yes	Yes
Observations	134	134	133	133	96
Adjusted R^2	0.773	0.771	0.775	0.798	0.877
Panel B: Dependent Variable: Female Labor Force Participation					
Ancestral arable land	18.22	18.18	12.40	9.449	15.14
	(5.508)	(5.351)	(4.899)	(4.734)	(5.965)
Fraction of population with ancestors who used the plough		-4.084	-4.847	-3.041	-4.509
		(6.187)	(6.180)	(5.125)	(4.696)
Years since neolithic transition (migration-adjusted)			-4.397	-4.466	-2.315
			(0.921)	(0.974)	(1.063)
Pre-1500CE average crop yield (ancestry-adjusted)				0.0072	0.0066
				(0.00213)	(0.00236)
Baseline controls	Yes	Yes	Yes	Yes	Yes
Additional controls					Yes
Continent dummies	Yes	Yes	Yes	Yes	Yes
Observations	134	134	133	133	96
Adjusted R^2	0.384	0.382	0.489	0.536	0.608

Robust standard errors in parentheses. Baseline controls: Ln(per capita income) and its squared term, land area in geographical tropics, distance to nearest coastline or sea-navigable river (see methodology section in the supplementary materials for detail). Additional controls: share of agriculture in GDP, share of industry in GDP, religious fractionalization, democracy, state antiquity index, legal origins, social infrastructure index, and the experience of communism. Constant not reported.

Table 2: Ancestral Arable Land and Gender Inequality Index: Does Labor Force Participation Play a Mediating Role?

	(1)	(2)	(3)	(4)
Ancestral arable land	-0.0486	-0.0483	-0.0500	-0.0406
	(0.0384)	(0.0385)	(0.0382)	(0.0378)
Fraction of population with ancestors who used the plough		-0.0198	-0.0209	-0.0280
		(0.0427)	(0.0433)	(0.0418)
Years since neolithic transition (migration-adjusted)			-0.00243	0.000284
			(0.00654)	(0.00597)
Pre-1500 CE average crop yield (ancestry adjusted)				-0.0000391
				(0.0000137)
Female Labor Force Participation	-0.00317	-0.00320	-0.00331	-0.00278
	(0.000714)	(0.000726)	(0.000843)	(0.000827)
Continent dummies	Yes	Yes	Yes	Yes
Baseline controls	Yes	Yes	Yes	Yes
Observations	134	134	133	133
Adjusted R^2	0.817	0.817	0.815	0.823

Robust standard errors in parentheses. Baseline controls: Ln(per capita income) and its squared term, land area in geographical tropics, distance to nearest coastline or sea-navigable river (see methodology section in the supplementary materials for detail). Additional controls: share of agriculture in GDP, share of industry in GDP, religious fractionalization, democracy, state antiquity index, legal origins, social infrastructure index, and the experience of communism. Constant not reported.

Table 3: Ancestral Arable Land and Components of Gender Inequality Index

	Health Dimension		*Empowerment Dimension*		*Labor Market Dimension*
	MMR	ABR	WP	Education gap	LFP Gap
	(1)	(2)	(3)	(4)	(5)
Ancestral arable land	-135.8	-19.89	1.998	-1.023	14.10
	(45.12)	(9.769)	(4.025)	(3.228)	(5.710)
Ln(Per capita income)	-274.5	-24.61	-12.84	7.793	-9.497
	(76.15)	(22.88)	(6.926)	(5.256)	(8.471)
Ln(Per capita income)–squared	12.26	0.750	0.744	-0.255	0.529
	(4.043)	(1.221)	(0.386)	(0.278)	(0.447)
Fraction of land area in the geographical tropics	-6.725	1.545	-2.196	0.900	4.828
	(33.54)	(6.951)	(3.077)	(2.648)	(5.112)
Distance to nearest coastline or sea-navigable river	17.00	3.102	0.753	1.756	1.835
	(23.59)	(6.055)	(2.279)	(1.659)	(3.031)
Continent dummies	Yes	Yes	Yes	Yes	Yes
Observations	133	133	133	133	133
Adjusted R^2	0.796	0.658	0.094	0.254	0.344

Robust standard errors in parentheses. MMR = Maternal Mortality Ratio. ABR = Adolescent Birth Rate. WP = Percentage of Women in Parliament. Education gap = Percentage of females with at least secondary education −Percentage of males with at least secondary education. LFP gap = Female Labor Force Participation Rate − Male Labor Force Participation Rate. Continent dummy variables: Asia, Europe, North America, South America, Oceania, Sub-Saharan Africa; Northern Africa (omitted). Constant not reported.

Table 4: Importance of Historical Factors in Determining Gender Inequality

	GII (1)	MMR (2)	ABR (3)	WP (4)	Education gap (5)	LFP Gap (6)
Panel A: The effect of norms? Horse-race between current and ancestral arable land						
Current potentially arable land	0.0379	68.44	20.29	-5.852	-5.712	16.37
	(0.0467)	(51.36)	(12.88)	(4.165)	(3.139)	(5.593)
Ancestral arable land	-0.125	-128.8	-23.25	5.799	0.145	9.479
	(0.0386)	(52.54)	(7.914)	(3.544)	(3.534)	(4.148)
Continent dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	133	133	133	133	133	133
Adjusted R^2	0.620	0.690	0.569	0.096	0.098	0.396
Panel B: Horse-race between historical factors						
Ancestral arable land	-0.0970	-117.2	-19.65	4.414	-1.104	8.392
	(0.0423)	(50.15)	(7.893)	(3.695)	(3.563)	(3.992)
Years since neolithic transition (migration-adjusted)	0.00586	-6.589	0.196	-0.772	-1.144	-3.960
	(0.00874)	(7.487)	(1.647)	(0.627)	(0.498)	(0.900)
Fraction of population with ancestors who used the plough	-0.0651	-5.131	-14.78	0.133	2.565	-4.285
	(0.0413)	(34.52)	(8.648)	(2.907)	(2.450)	(5.355)
Pre-1500 CE average crop yield (ancestry-adjusted)	-0.00002	-0.00177	0.00287	-0.0001	-0.00195	0.00663
	(0.00002)	(0.0142)	(0.00411)	(0.00166)	(0.0011)	(0.00193)
Continent dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	133	133	133	133	133	133
Adjusted R^2	0.627	0.683	0.568	0.074	0.120	0.496

Robust standard errors in parentheses. GII: Gender Inequality Index. MMR = Maternal Mortality Ratio. ABR = Adolescent Birth Rate. WP = Percentage of Women in Parliament. Education gap = Percentage of females with at least secondary education −Percentage of males with at least secondary education. LFP gap = Female Labor Force Participation Rate − Male Labor Force Participation Rate. Constant not reported.

Table 5: Ancestral Arable Land and Attitudes Regarding Women's Rights and Capabilities: Individual-level Estimates

	Men Make Better Political Leaders		**When Jobs are scarce, men should have more right**		**Female Labor Force Participation**	
	(1)	(2)	(3)	(4)	(5)	(6)
Ancestral arable land	-0.621	-0.423	-0.177	-0.196	0.117	0.0195
	(0.0919)	(0.170)	(0.0444)	(0.0642)	(0.0442)	(0.0405)
Individual-level controls	Yes	Yes	Yes	Yes	Yes	Yes
District-level controls	Yes	Yes	Yes	Yes	Yes	Yes
Country-level controls	Yes		Yes		Yes	
Continent dummies	Yes		Yes		Yes	
Country dummies		Yes		Yes		Yes
Countries	48	53	70	74	69	73
Districts	453	479	674	700	672	698
Observations	64215	72152	80303	87528	43801	47587
Adjusted R^2	0.191	0.258	0.206	0.275	0.169	0.266

Standard errors clustered at district-level in parentheses. Individual-level controls: age, age^2, dummies for primary and secondary education, gender, and dummy for being married. District-level controls: ancestral plough use, fraction of ancestral land that was tropical or subtropical, ancestral domestication of large animals, ancestral settlement patterns, and ancestral political complexity. Country-level controls: income per capita and income per capita squared in natural logs measured in the same year, as the dependent variable. Note that the specifications reported in this Table are identical to the corresponding specifications reported in Table V of Alesina, Giuliano, and Nunn (2013a). Constant not reported.

A Online Appendix

In this section, we present the results of a variety of robustness checks for the results reported in the paper, *i.e.*, on the relationship between (i) ancestral arable land and gender inequality index and (ii) ancestral arable land and female labor force participation. First, we include a number of control variables that capture economic, institutional, and cultural heterogeneity across countries to minimize the possibility of an omitted variable bias. Second, we check the robustness of our results utilizing an alternative measure of the historical availability of arable land. Third, we investigate whether arable land in antiquity is significantly and negatively associated with alternative measures of gender inequality. Fourth, we check and provide evidence that our measures of the historical availability of arable land are indeed historical and not capturing the effects of the contemporaneous availability of arable land. Fifth, we perform the falsification test of the association between ancestral arable land and female labor force participation. Sixth, we show that the effects of ancestral arable land on gender inequality and female labor force participation remains robust even when current arable land is controlled for. Seventh, we present some stylized facts that further ascertain the association between ancestral arable land and modern gender inequality. Finally, we present additional exhibits (Tables and Figures) that further support our findings.

A.1 Controlling for Institutions, Economic, and Cultural Factors

Table A1 presents estimates of the coefficients of the baseline version of equation (1) sequentially expanded to account for international differences in institutions and level of democracy. We use the widely-used Polity2 Index for the year 2000 as a measure of democracy. The index takes values in the range of −10 (hereditary monarchy) to +10 (consolidated democracy). Further, a nation's past sophistication of political organization within its borders, measured by the State Antiquity Index (Bockstette, Chanda, and Putterman, 2002), is included as a regressor in column 2. Countries that are characterized by tribal governments score low in this index, whereas higher scores are assigned to countries that had more sophisticated political organization since antiquity. It has been argued that all national legal systems are of either British, French, German, or Scandinavian extraction (La Porta, Silanes, and Shleifer, 2008). Since the laws of Britain, France, Germany, and Scandinavia differ in their support of private market outcomes, the origins of nations' legal systems may be a significant influence upon their economies, impacting the current levels of present gender inequality. Hence, column 3 controls for the legal origins. We control for the experience of communism in column 4 because gender equality has been a communist ideal. Finally, in column 5, we control for the Social Infrastructure Index (Hall and Jones, 1999). This index measures the "institutions and government policies that determine the economic environment within which individuals accumulate skills, and firms accumulate capital and produce output". It is the combination of a measure of the contemporary efficacy of government support for production and a measure of current openness to trade, and, hence, may be considered a factor in nations' contemporary economic circumstances. The negative relationship between ancestral arable land and modern gender inequality remains robust to the inclusion of the above host of variables in both these Tables.

Table A2 reports estimates of the extended specifications that control for the contemporary structure of nations' economies and religious fractionalization index to account for cultural heterogeneity (Alesina et al., 2003) in columns 1 and 2. Finally, columns 3 control for all the variables introduced before except the pre-1500 CE caloric yield and in column 4, we also include pre-1500 CE caloric yield. The negative relationship between ancestral arable land and modern gender inequality remains robust. Again, note that when pre-1500 CE caloric yield is controlled for in column 4, the coefficient of ancestral arable land remains statistically significant but the size of the coefficient is expectedly slightly smaller than that in the comparable specification in column 3, suggesting that while the availability of arable

Table A1: Ancestral Arable Land and Gender Inequality: Democracy and Institutions

	(1)	(2)	(3)	(4)	(5)
Ancestral arable land	-0.0961	-0.0759	-0.0763	-0.0734	-0.0938
to agriculture	(0.0307)	(0.0307)	(0.0305)	(0.0306)	(0.0358)
Index of democracy in 2000	-0.00335	0.0000298	0.000239	-0.0000773	0.000176
	(0.00224)	(0.00220)	(0.00210)	(0.00199)	(0.00237)
State Antiquity Index		0.0119	0.0266	0.00831	0.0191
		(0.0397)	(0.0383)	(0.0379)	(0.0453)
Origins of national			-0.0110	-0.00377	-0.00855
legal system = France			(0.0167)	(0.0169)	(0.0200)
Origins of national			-0.0442	-0.0284	-0.0693
legal system = Germany			(0.0248)	(0.0278)	(0.0347)
Origins of national			0.0115	0.0109	0.000575
legal system = Scandinavia			(0.0289)	(0.0290)	(0.0298)
Indicator of experience				-0.0293	0.00129
of communism				(0.0240)	(0.0328)
Social Infrastructure Index					-0.0644
					(0.0760)
Baseline controls	Yes	Yes	Yes	Yes	Yes
Continent dummies	Yes	Yes	Yes	Yes	Yes
Observations	130	121	121	121	96
Adjusted R^2	0.789	0.843	0.844	0.845	0.867

Robust standard errors in parentheses. Excluded origins of national legal system = British. Constant not reported.

Table A2: Ancestral Arable Land and Gender Inequality: Additional Controls

	(1)	(2)	(3)	(4)
Ancestral arable land	-0.0843	-0.0909	-0.0940	-0.0885
	(0.0389)	(0.0337)	(0.0374)	(0.0396)
Share of agriculture in GDP	0.0210		-0.0170	-0.0312
	(0.136)		(0.167)	(0.155)
Share of industry in GDP	0.191		0.0292	0.0119
	(0.122)		(0.122)	(0.119)
Religious Fractionalization		-0.0781	-0.00698	0.0137
		(0.0386)	(0.0377)	(0.0365)
Years since neolithic transition (migration-adjusted)			0.00645	0.00571
			(0.00801)	(0.00750)
Ancestral plough use			0.0760	0.0710
			(0.0338)	(0.0334)
Pre-1500 CE average crop yield (ancestry-adjusted)				-0.00005
				(0.00002)
Index of democracy in 2000			0.00092	0.00234
			(0.00268)	(0.00247)
State Antiquity Index			0.0172	0.0257
			(0.0506)	(0.0517)
Legal Origin=French			-0.00829	0.00224
			(0.0194)	(0.0186)
Legal Origin=German			-0.0589	-0.0334
			(0.0359)	(0.0336)
Legal Origin=Scandinavian			0.0122	-0.0111
			(0.0349)	(0.0325)
Social Infrastructure Index			-0.0853	-0.0788
			(0.0722)	(0.0669)
Experience of communism			-0.0013	-0.0042
			(0.0324)	(0.0282)
Baseline controls	Yes	Yes	Yes	Yes
Continent dummies	Yes	Yes	Yes	Yes
Observations	134	134	96	96
Adjusted R^2	0.780	0.779	0.867	0.877

Robust standard errors in parentheses. Excluded origin of national legal system = British. Constant not reported.

land in antiquity impacted gender inequality through the resource scarcity channel, there is some other mechanism at play too. As discussed earlier, we argue and provide evidence in support of the other channel–the labor force participation channel–and show that the availability of arable land in antiquity is positively associated with the both female labor force participation rate.

A.2 Alternative Measure of the Historical Availability of Arable Land

We check the robustness of our estimates using an alternative measure of the historical suitability of land for cultivation. The Food and Agricultural Organization (FAO) provides estimates of each country's potential arable land (Bot, Nachtergaele, and Young, 2000). In most cases, potential arable land exceeds actual arable land, in that a portion of potential arable land, such as currently forested land, has not yet been brought under cultivation. In a few countries, like Egypt however, modern irrigation has permitted actual arable land to exceed land suited to rainfed cultivation. The FAO bases its estimates of potential arable land on a soil map of the world that identifies major soil constraints such as salinity, a global climatic database, and a database of the climatic and soil requirements of 21 major crops. The FAO's estimate of a country's current potential arable land is a plausible measure of its historical resource endowment for the following reasons. First, agriculture has been the mainstay of mankind since the Neolithic Revolution 12,000 years ago, and potential arable land speaks to the agricultural potential of a region in the absence of modern irrigation and technologies that mitigate soil constraints. Second, a modern soil map of the world is also historical, as are the climatic and soil requirements of mankind's main crops, in that almost nothing has changed in their regard. Third, while the world's climate has seen considerable change during the geological epoch of the Holocene, within which the Neolithic Revolution occurred, it has, at any rate, been fairly stable for the past one to two millennia (Jones and Mann, 2004). Notice that while FAO's estimate of potential arable land is based on 21 major crops, ancestral arable land (Alesina, Giuliano, and Nunn, 2013a) is based on only six major crops. As can be seen in Table A11, the correlation between the two measures is 0.48 suggesting that the use of this measures might be useful for robustness check.

Column 1 of Table A3 presents the estimates of the baseline regression specification given in equation 1 with the alternative measure of the availability of arable land in antiquity. We add additional control variables in subsequent columns as in Table 1. The coefficient of the current potential arable land adjusted for migration remains statistically significant in all the columns but the last one, upon the inclusion of ancestry-adjusted pre-1500 CE crop yield as a control variable. This could be a result of the high correlation between migration-adjusted potential arable land and ancestry-adjusted pre-1500 CE crop yield variable ($\rho = 0.54$) as shown in Table A11. Overall, there is evidence of a negative connection between this alternative measure of the historical availability of arable land and gender inequality index.

A.3 Sensitivity to Alternative Measures of Gender Inequality

We check the sensitivity of our results using two alternative measures of gender inequality and examine whether the historical availability of arable land is an influence upon the Gender Development Index (GDI) and gender difference in life expectancy at birth. The GDI is the ratio of the UNDP's Human Development Index (HDI) for females to that for males. The HDI is constructed using three indicators: life expectancy at birth, expected years of schooling of children and the mean years of schooling of adults, and the control over resources. Consistent with our hypothesis, both these variables–GDI in 2013 and female-male life expectancy gap at birth in 2013–are shown to be positively associated with the historical availability of arable land in Table A4.

Table A3: Migration-Adjusted Potential Arable Land and Gender Inequality Index

	(1)	(2)	(3)	(4)
Migration-adjusted potential	-0.109	-0.109	-0.103	-0.0372
arable land	(0.0401)	(0.0413)	(0.0398)	(0.0368)
Ln(per capita income)	0.0496	0.0495	0.0456	0.0627
	(0.0652)	(0.0655)	(0.0660)	(0.0658)
Ln(Per capita income)–squared	-0.00635	-0.00635	-0.00612	-0.00758
	(0.00385)	(0.00387)	(0.00389)	(0.00393)
Land area in the geographical	0.0478	0.0440	0.0625	0.0221
tropics	(0.0276)	(0.0294)	(0.0286)	(0.0303)
Mean distance to nearest	-0.0285	-0.0303	-0.0265	-0.0501
coastline or sea-navigable river	(0.0208)	(0.0230)	(0.0236)	(0.0246)
Fraction of population with		-0.0103	-0.00792	-0.0199
ancestors who used the plough		(0.0491)	(0.0484)	(0.0454)
Years since neolithic transition			0.0150	0.0152
(migration-adjusted)			(0.00558)	(0.00490)
Pre-1500 CE average crop yield				-0.0000584
(ancestry-adjusted)				(0.0000155)
Continent dummies	Yes	Yes	Yes	Yes
Observations	133	133	133	133
Adjusted R^2	0.768	0.766	0.774	0.793

Robust standard errors in parentheses. Constant not reported.

Table A4: Endowments of Arable Land and Alternative Measures of Gender Inequality

	Gender Development Index in 2013		Female-male life expectancy gap at birth in 2013	
	(1)	(2)	(3)	(4)
Migration-adjusted potential arable land	0.0783		1.866	
	(0.0304)		(0.849)	
Ancestral lands suited to agriculture		0.0840		1.682
		(0.0217)		(0.600)
Ln(per capita income)	0.126	0.127	6.049	6.124
	(0.0491)	(0.0464)	(1.074)	(1.138)
Ln(Per capita income)–squared	-0.00584	-0.00593	-0.348	-0.351
	(0.00256)	(0.00242)	(0.0613)	(0.0643)
Fraction of land area in the geographical tropics	-0.00474	0.0252	0.275	0.923
	(0.0230)	(0.0241)	(0.559)	(0.580)
Distance to nearest coastline or sea-navigable river	0.0248	0.0110	1.747	1.459
	(0.0130)	(0.0115)	(0.414)	(0.359)
Continent dummies	Yes	Yes	Yes	Yes
Observations	128	129	146	146
Adjusted R^2	0.507	0.530	0.559	0.561

Robust standard errors in parentheses. Constant not reported.

A.4 Historical Availability of Arable Land

Finally, there might still be some concern that our measure of the historic availability of arable land – ancestral arable land – may not pertain to the historical times but rather may be capturing the contemporaneous effect. Our findings indicate that this is not the case. If it were driven by the historical influence on culture, then current potential arable land should be correlated with gender inequality in the Old World but not in the New World. After all, gender inequality in the New World, extensively repopulated after 1492, ought to derive in large part from the cultures of its European, African, and Asian settlers, influenced by conditions in their Old World nations of origin. On the other hand, since it takes this re-population into account, the correlation between ancestral arable land and gender inequality should be significantly different between the New World and the Old World. The same applies to the migration-adjusted potential arable land that takes into account the migration that has happened since 1500. This may be tested by including our measures of resource scarcity interacted with an indicator of nations in the Americas and Oceania in the baseline specification.

The resulting estimates, presented in Table A5, indicate that whereas current potentially arable land is statistically significantly negatively correlated with modern gender inequality in the Old World, correlation between these variables is not statistically significantly different from zero in the New World. An F-test fails to reject the null hypothesis that the coefficients of *potentially arable land* and *potential arable land* $\times$ *Dummy for countries in the New World* sum to zero. On the other hand, the negative correlation between ancestral arable land and modern gender inequality does not significantly vary between countries in the New and Old Worlds. The same holds for the migration-adjusted percentage of land suited to rainfed cultivation at present. These results are certainly consistent with the contention that our measures of agro-ecological endowments in the present largely gauge nations' past resource environments and that the effects that we observed are due to the transmission of norms.

Table A5: Arable Land and Gender Inequality: Historical Availability of Arable Land.

	(1)	(2)	(3)
Migration-unadjusted potential arable land	-0.128		
	(0.0436)		
Migration-unadjusted potential arable land × Countries in the Americas and Oceania	0.174		
	(0.0636)		
Migration-adjusted potential arable land		-0.111	
		(0.0430)	
Migration-adjusted potential arable land × Countries in the Americas and Oceania		0.0345	
		(0.122)	
Ancestral arable land			-0.123
			(0.0375)
Ancestral arable land × Countries in the Americas and Oceania			0.0679
			(0.0581)
Baseline Controls	Yes	Yes	Yes
Continent dummies	Yes	Yes	Yes
Observations	133	133	134
Adjusted R^2	0.770	0.766	0.773

Robust standard errors in parentheses.

A.5 Falsification Test: Ancestral Arable Land and the Share of Women in Parliament

Table A6 presents the results of a falsification test on the association between ancestral arable land and female labor force participation. To ensure that our results are not spurious and are not capturing the effect of unobserved omitted variables that might be associated with women's empowerment across countries, we estimate the specifications reported in each column of Table 1 by replacing female labor force participation rate with the share of women in parliament as the dependent variable. The idea is that if the results were driven by some omitted factors that are associated with women's empowerment, then we should observe a significant relationship between ancestral arable land and measures of women's empowerment such as their share in national parliaments. However, no significant association between ancestral arable land and the share of women in parliament is observed in A6.

A.6 Gender Norms: Ancestral vs. Current Arable Land

Results reported in Table A7 suggest that ancestral arable land has significant predictive power in explaining the female labor force participation. When the baseline specification is estimated without ancestral arable land as a control variable, the adjusted-R^2 is 0.322, which rises to 0.384 following the inclusion of ancestral arable land to the model. Further, the relationship between ancestral arable land and female labor force participation remains qualitatively unchanged when we control for the fraction of land area that is currently potentially arable. In fact, ancestral arable land remains statistically significant while the current potential arable land loses significance when additional control variables are included in the model, suggesting that the effect that we observe is indeed a result of the cultural transmission of gender norms.

Table A6: Ancestral Arable Land and the Share of Women in Parliament

	(1)	(2)	(3)	(4)	(5)
Ancestral arable land	2.207	2.187	0.556	0.803	3.416
suited to agriculture	(4.001)	(4.004)	(4.012)	(4.244)	(5.867)
Fraction of population with		-1.711	-1.939	-2.090	-9.895
ancestors who used the plough		(3.394)	(3.307)	(3.543)	(5.280)
Years since neolithic transition			-1.167	-1.161	-0.241
(migration-adjusted)			(0.642)	(0.636)	(1.390)
Pre-1500 CE average crop yield				-0.0006	-0.0006
(ancestry-adjusted)				(0.002)	(0.003)
Baseline controls	Yes	Yes	Yes	Yes	Yes
Additional controls					Yes
Continent dummies	Yes	Yes	Yes	Yes	Yes
Observations	134	134	133	133	96
Adjusted R^2	0.093	0.087	0.096	0.089	0.129

Robust standard errors in parentheses. Baseline controls: Ln(per capita income) and its squared term, land area in geographical tropics, distance to nearest coastline or sea-navigable river (see methodology section in the supplementary materials for detail). Additional controls: share of agriculture in GDP, share of industry in GDP, religious fractionalization, democracy, state antiquity index, legal origins, social infrastructure index, and the experience of communism. Constant not reported.

Table A7: Ancestral vs. Current Arable Land and Female Labor Force Participation

	(1)	(2)	(3)	(4)	(5)	(6)
Ancestral arable land		18.22	13.21		15.14	12.40
		(5.508)	(5.015)		(5.965)	(5.603)
Migration-unadjusted current potentially arable land			14.09			8.842
			(6.348)			(6.746)
Ln(per capita income)	-25.98	-21.84	-21.13	-24.09	-17.72	-15.44
	(8.332)	(8.354)	(8.411)	(10.10)	(10.66)	(10.63)
Ln(Per capita income)–squared	1.430	1.233	1.217	1.462	1.159	0.972
	(0.441)	(0.438)	(0.440)	(0.575)	(0.595)	(0.618)
Land area in the geographical tropics	7.449	13.70	10.37	11.01	14.81	10.46
	(4.549)	(5.221)	(5.262)	(5.685)	(5.279)	(6.614)
Distance to nearest coastline or sea-navigable river	3.841	3.502	5.963	5.600	5.539	6.685
	(2.830)	(2.485)	(2.474)	(5.120)	(5.084)	(5.034)
Fraction of population with ancestors who used the plough				-2.109	-4.509	-5.557
				(5.653)	(4.696)	(4.751)
Years since neolithic transition (migration-adjusted)				-2.889	-2.315	-2.500
				(1.043)	(1.063)	(1.068)
Pre-1500CE average crop yield (ancestry-adjusted)				0.007	0.007	0.004
				(0.0025)	(0.0024)	(0.0028)
Additional controls				Yes	Yes	Yes
Continent dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	134	134	133	96	96	96
Adjusted R^2	0.322	0.384	0.405	0.574	0.608	0.609

Robust standard errors in parentheses. Additional controls: share of agriculture in GDP, share of industry in GDP, religious fractionalization, democracy, state antiquity index, legal origins, social infrastructure index, and the experience of communism. Constant not reported.

Table A8 presents the estimates of a regression specification that includes the historical variables identified by the literature (Alesina, Giuliano, and Nunn, 2013a; Hansen, Jensen, and Skovsgaard, 2015; Hazarika, Jha, and Sarangi, 2019) along with our variable of interest, ancestral arable land. In this table, we also control for the availability of current potential arable land to ensure that the estimates of ancestral arable land are not picking up the effects of the current availability of arable land. These results confirm that ancestral arable land influences GII and women's reproductive health outcome, and labor force participation through its effect on gender norms. By contrast, current arable land is not significantly associated with the GII and either of its components, further underscoring the importance of norms that have been shaped by the availability of arable land in antiquity. Also note that, among all historical factors considered, ancestral arable land continues to be the most significant correlate of the GII and its components.

Table A8: Horse-Race between Current and Ancestral Arable Land and Other Historical Factors

	GII	MMR	ABR	WP	Education gap	LFP Gap
	(1)	(2)	(3)	(4)	(5)	(6)
Potentially arable land	0.0747	92.93	21.40	-6.856	-4.500	7.487
(migration-unadjusted)	(0.0488)	(65.83)	(13.57)	(4.507)	(3.594)	(5.169)
Ancestral arable land	-0.105	-127.5	-22.01	5.215	-0.641	7.606
	(0.0419)	(52.82)	(7.646)	(3.681)	(3.681)	(3.907)
Years since neolithic transition	0.00705	-5.034	0.550	-0.871	-1.230	-3.822
(migration-adjusted)	(0.00883)	(7.767)	(1.634)	(0.645)	(0.499)	(0.899)
Fraction of population with	-0.0575	4.171	-12.63	-0.574	2.129	-3.553
ancestors who used the plough	(0.0420)	(35.22)	(8.323)	(2.835)	(2.307)	(5.208)
Pre-1500 CE average crop yield	-0.0000330	-0.0206	-0.00148	0.000508	-0.00110	0.00518
(ancestry-adjusted)	(0.0000246)	(0.0195)	(0.00428)	(0.00177)	(0.00132)	(0.00204)
Continent dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	132	132	132	132	132	132
Adjusted R^2	0.626	0.686	0.572	0.084	0.123	0.500

Robust standard errors in parentheses. GII: Gender Inequality Index. MMR = Maternal Mortality Ratio. ABR = Adolescent Birth Rate. WP = Percentage of Women in Parliament. Education gap = Percentage of females with at least secondary education −Percentage of males with at least secondary education. LFP gap = Female Labor Force Participation Rate − Male Labor Force Participation Rate. Constant not reported.

A.7 Arable Land in Antiquity, Economic Development, and GII: The Persistence of Gender Norms

Please refer to the Discussion section in the main text for further analysis. Figure A1 shows that even countries with similar levels of economic development have very different levels of gender inequality. Compare for instance, Qatar to Switzerland, the United Arab Emirates to France, Saudi Arabia to Slovenia, and Afghanistan to Rwanda or Nepal. As discussed in the main text, the first country in each of these pairs have greater ancestral arable land and lower gender inequality than the second country. Table A9 further underscores the role of the persistence of gender norms in determining gender inequality by showing that ancestral arable land can explain differences in the GII of countries that have similar levels of income per capita. It lists the country with the least gender inequality and that with the most gender inequality within each decile of per capita income. With the exception of 8^{th} decile, the country with the least gender inequality has a larger percentage of ancestral land area that is arable than the country with the most gender inequality. The explanation of the 8^{th} decile exception may lie in that fact that perhaps Slovenia, carved from former communist Yugoslavia, benefits from communism's preoccupation with gender equality and therefore has less gender inequality than Uruguay despite having less ancestral arable land.

A.8 Additional Exhibits and Ancestral Arable Land Data

Finally, Table A10 present the summary statistic for the variables used in the cross-coutnry analysis. Panels A and B of Figure A2 show the scatter plot of ancestral arable land and gender inequality index (our hypothesis) and ancestral arable land and female labor force participation (primary mechanism) respectively. Correlation coefficients between all the historical variables are reported in Table A11. And, Table A12 provides the gender inequality index and ancestral arable land for the countries included in the analysis of this paper.

Table A9: Gender Inequality and Potential arable land: An Illustrative Summary

Per capita income in 2012	*Gender Inequality*	*Country*	*Gender Inequality Index in 2012*	*Ancestral Arable Land (%)*
1st decile	least inequality	Rwanda	0.414	54.59
	most inequality	Niger	0.707	53.20
2nd decile	least inequality	Tajikistan	0.338	28.74
	most inequality	Afghanistan	0.712	22.93
3rd decile	least inequality	Vietnam	0.299	15.64
	most inequality	Yemen	0.747	0.39
4th decile	least inequality	Mongolia	0.328	24.92
	most inequality	Rep. Congo	0.61	15.81
5th decile	least inequality	Macedonia	0.162	70.74
	most inequality	Jordan	0.482	13.85
6th decile	least inequality	China	0.213	60.24
	most inequality	Iraq	0.557	3.86
7th decile	least inequality	Poland	0.14	90.30
	most inequality	Panama	0.503	2.60
8th decile	least inequality	Slovenia	0.08	80.84
	most inequality	Uruguay	0.367	86.00
9th decile	least inequality	Germany	0.075	80.91
	most inequality	Saudi Arabia	0.682	19.56
10th decile	least inequality	Netherlands	0.045	80.62
	most inequality	Qatar	0.546	3.96

Table A10: Summary statistics

Variable	**Mean**	**Std. Dev.**	**N**
Gender Inequality Index	0.383	0.188	134
Female-male labor force participation gap	-21.628	15.751	134
Female labor force participation	52.947	16.174	134
Adolescent fertility rate	47.767	40.236	134
Maternal mortality ratio	164.358	211.945	134
Gender development index	0.933	0.075	122
Female-male life expectancy gap at birth	4.869	2.532	134
Ancestral arable land	0.54	0.321	134
Migration-adjusted potential arable land	0.464	0.244	133
Ln(Per capita income)	8.605	1.538	134
Ln(Per capita income)–squared	76.210	26.842	134
Land area in the geographical tropics	0.455	0.476	134
Mean distance to nearest coastline or sea-navigable river (in '000kms)	0.33	0.448	134
Years since neolithic transition (migration-adjusted)	5.44	2.063	133
Fraction of population with ancestors who used the plough	0.572	0.467	134
Pre-1500 CE average crop yield (ancestry-adjusted)	1386.1	692.57	133
Index of democracy in 2000	3.862	6.389	130
State Antiquity Index	0.457	0.242	122
Origins of national legal system = Britain	0.291	0.456	134
Origins of national legal system = France	0.552	0.499	134
Origins of national legal system = Germany	0.127	0.334	134
Origins of national legal system = Scandinavia	0.03	0.171	134
Social Infrastructure Index	0.474	0.249	103
Indicator of experience of communism	0.276	0.449	134
Percentage share of agriculture in GDP	0.125	0.127	134
Percentage share of industry in GDP	0.311	0.128	134

UNDP Gender Development Index = female to male ratio of HDI. Both migration-adjusted potential arable land ancestral arable land are the fractions of total land area in the respective category. The data source for shares of agriculture and services in GDP is the CIA Factbook.

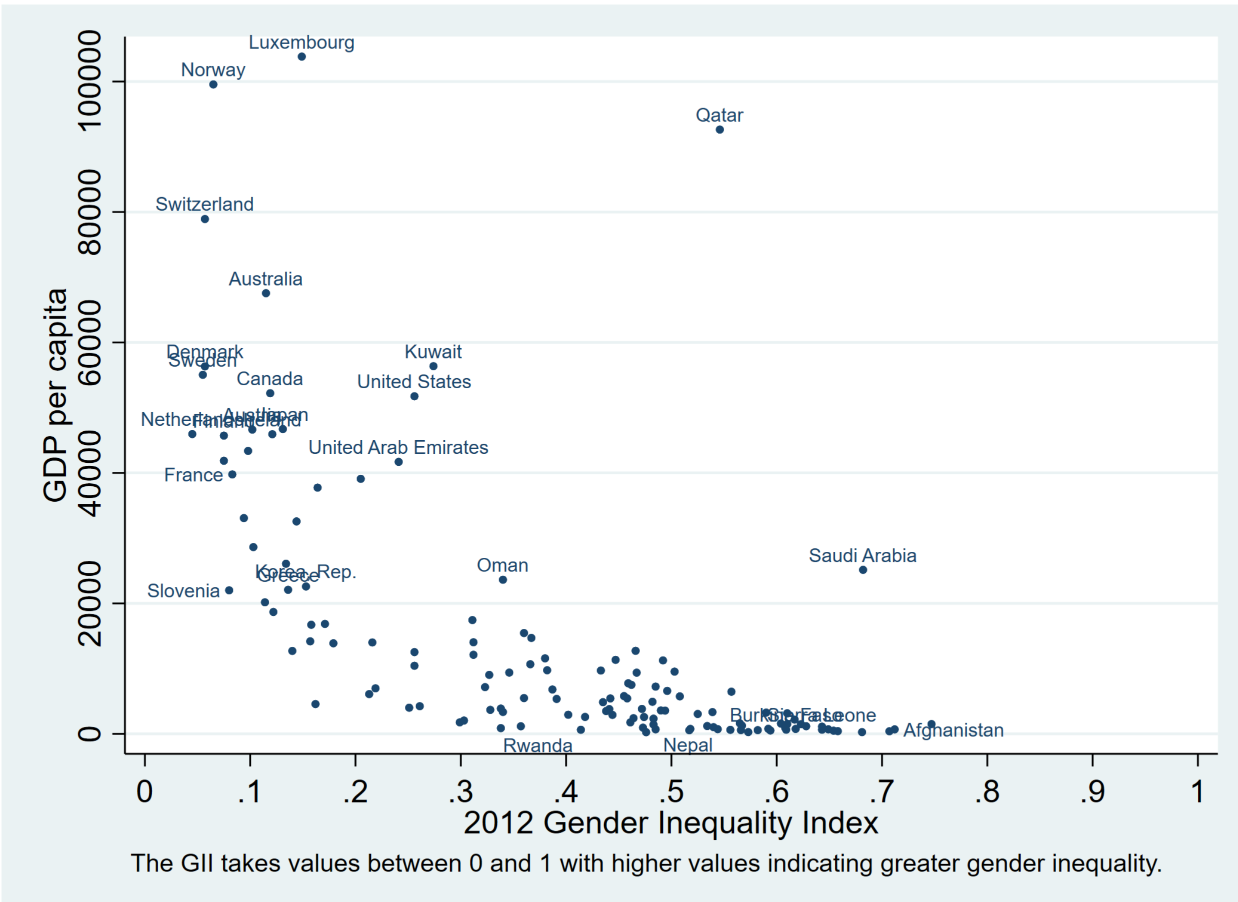
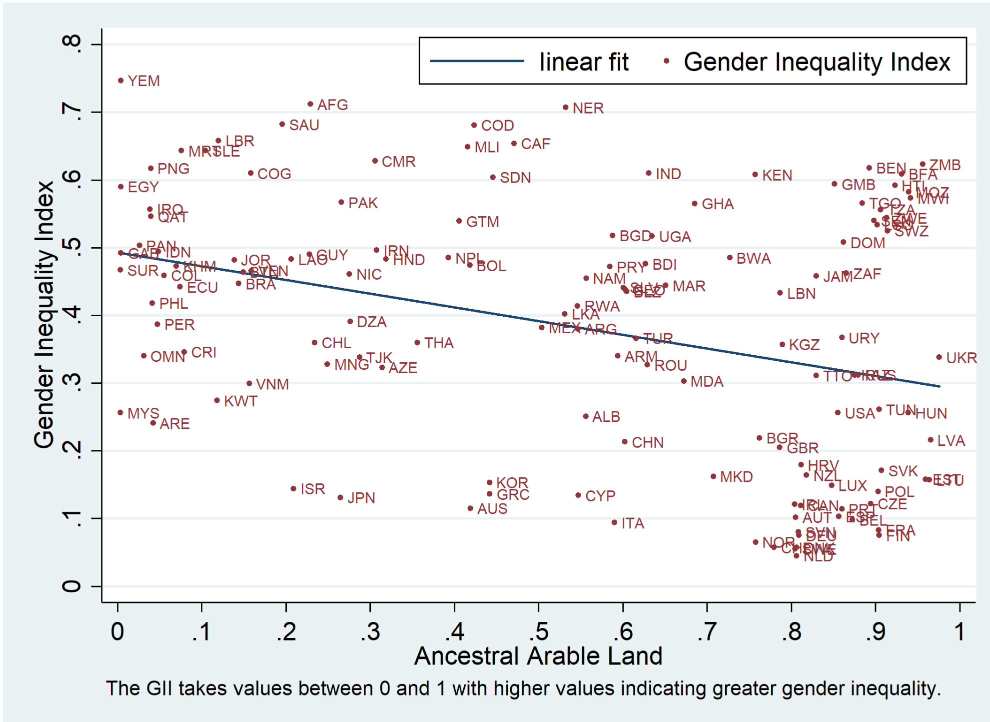
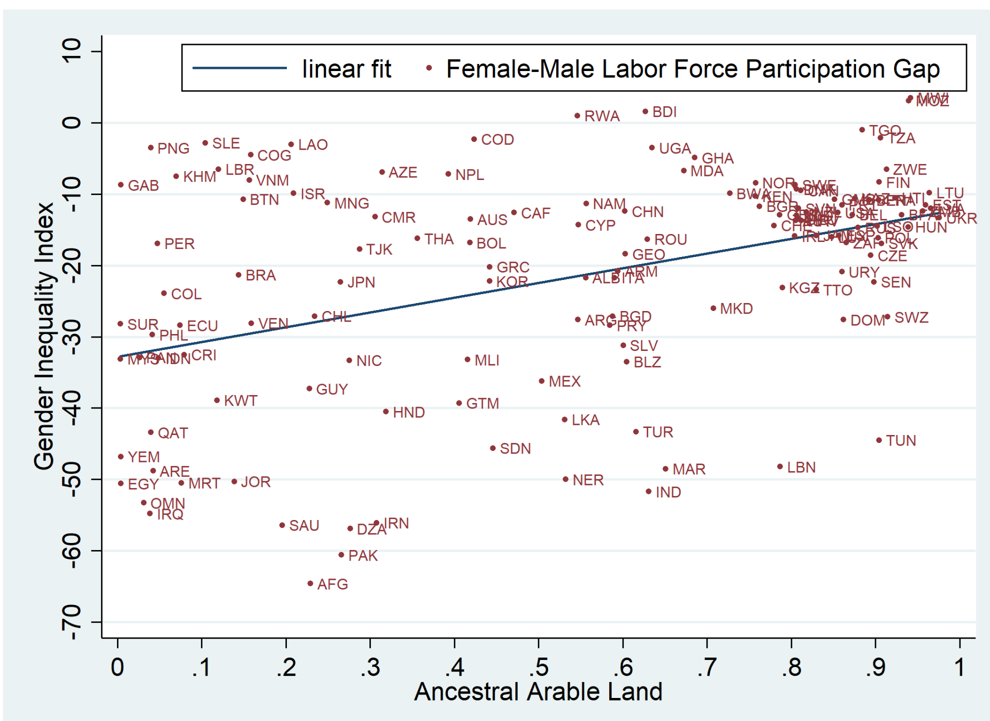


Figure A1: GDP Per Capita and 2012 Gender Inequality Index



(a) Ancestral Arable Land and Gender Inequality Index



(b) Ancestral Arable Land and Female-Male Labor Force Participation Gap

Figure A2: Ancestral Arable Land and Gender Inequality

Table A11: Cross-correlation table between historical factors

Variables	Migration-adjusted potential arable land	Ancestral lands suited to agriculture	Migration-adjusted years since neolithic transition	Ancestral plough use	Ancestry-adjusted Pre-1500 CE average crop yield
Migration-adjusted potential arable land	1.00				
Ancestral lands suited to agriculture	0.48 (0.00)	1.00			
Migration-adjusted years since neolithic transition	-0.25 (0.00)	-0.22 (0.00)	1.00		
Ancestral plough use	-0.23 (0.00)	0.07 (0.36)	0.54 (0.00)	1.00	
Ancestry-adjusted Pre-1500 CE average crop yield	0.54 (0.00)	0.32 (0.00)	0.07 (0.35)	0.12 (0.11)	1.00

$p-$value in parentheses.

Table A12: Ancestral Arable Land and 2012 Gender Inequality Index (GII)

Country	Gender Inequality Index	Ancestral Arable Land (%)	Country	Gender Inequality Index	Ancestral Arable Land (%)
Afghanistan	0.712	22.93	Latvia	0.216	96.54
Albania	0.251	55.59	Lebanon	0.433	78.67
Algeria	0.391	27.61	Lesotho	0.534	90.19
Argentina	0.380	54.68	Liberia	0.658	11.99
Armenia	0.340	59.41	Lithuania	0.157	96.39
Australia	0.115	41.93	Luxembourg	0.149	84.78
Austria	0.102	80.52	Macedonia	0.162	70.74
Azerbaijan	0.323	31.41	Malawi	0.573	94.17
Bangladesh	0.518	58.78	Malaysia	0.256	0.34
Belgium	0.098	87.27	Mali	0.649	41.58
Belize	0.435	60.47	Mauritania	0.643	7.59
Benin	0.618	89.25	Mexico	0.382	50.36
Bhutan	0.464	14.91	Moldova	0.303	67.23
Bolivia	0.474	41.82	Mongolia	0.328	24.92
Botswana	0.485	72.69	Morocco	0.444	65.11
Brazil	0.447	14.40	Mozambique	0.582	93.94
Bulgaria	0.219	76.24	Namibia	0.455	55.64
Burkina Faso	0.609	93.13	Nepal	0.485	39.30
Burundi	0.476	62.68	Netherlands	0.045	80.62
Cambodia	0.473	6.99	New Zealand	0.164	81.82
Cameroon	0.628	30.58	Nicaragua	0.461	27.53
Canada	0.119	81.13	Niger	0.707	53.20
Central African Republic	0.654	47.10	Norway	0.065	75.75
Chile	0.360	23.40	Oman	0.340	3.10
China	0.213	60.24	Pakistan	0.567	26.58
Colombia	0.459	5.52	Panama	0.503	2.60
Congo, Dem. Rep.	0.681	42.37	Papua New Guinea	0.617	3.93
Congo, Rep.	0.610	15.81	Paraguay	0.472	58.48
Costa Rica	0.346	7.92	Peru	0.387	4.74
Croatia	0.179	81.16	Philippines	0.418	4.15
Cyprus	0.134	54.74	Poland	0.140	90.30
Czech Republic	0.122	89.41	Portugal	0.114	86.00
Denmark	0.057	80.62	Qatar	0.546	3.96
Dominican Republic	0.508	86.20	Romania	0.327	62.93

Continued on next page

Country	Gender Inequality Index	Ancestral Arable Land (%)	Country	Gender Inequality Index	Ancestral Arable Land (%)
Ecuador	0.442	7.41	Russian Federation	0.312	87.93
Egypt, Arab Rep.	0.590	0.40	Rwanda	0.414	54.59
El Salvador	0.441	60.05	Saudi Arabia	0.682	19.56
Estonia	0.158	95.93	Senegal	0.540	89.84
Finland	0.075	90.42	Sierra Leone	0.643	10.41
France	0.083	90.38	Slovak Republic	0.171	90.73
Gabon	0.492	0.40	Slovenia	0.080	80.84
Gambia	0.594	85.13	South Africa	0.462	86.55
Georgia	0.438	60.30	Spain	0.103	85.67
Germany	0.075	80.91	Sri Lanka	0.402	53.11
Ghana	0.565	68.52	Sudan	0.604	44.57
Greece	0.136	44.18	Suriname	0.467	0.36
Guatemala	0.539	40.55	Swaziland	0.525	91.46
Guyana	0.490	22.78	Sweden	0.055	80.45
Haiti	0.592	92.31	Switzerland	0.057	77.95
Honduras	0.483	31.88	Tajikistan	0.338	28.74
Hungary	0.256	93.89	Tanzania	0.556	90.63
India	0.610	63.08	Thailand	0.360	35.62
Indonesia	0.494	4.87	Togo	0.566	88.42
Iran, Islamic Rep.	0.496	30.79	Trinidad and Tobago	0.311	82.98
Iraq	0.557	3.86	Tunisia	0.261	90.44
Ireland	0.121	80.41	Turkey	0.366	61.59
Israel	0.144	20.90	Uganda	0.517	63.46
Italy	0.094	59.03	Ukraine	0.338	97.57
Jamaica	0.458	82.98	United Arab Emirates	0.241	4.22
Japan	0.131	26.49	United Kingdom	0.205	78.64
Jordan	0.482	13.85	United States	0.256	85.54
Kazakhstan	0.312	87.51	Uruguay	0.367	86.00
Kenya	0.608	75.71	Venezuela	0.466	15.90
Korea, Rep.	0.153	44.17	Vietnam	0.299	15.64
Kuwait	0.274	11.83	Yemen	0.747	0.39
Kyrgyz Republic	0.357	78.92	Zambia	0.623	95.59
Lao	0.483	20.64	Zimbabwe	0.544	91.31