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Does Gender Equality Translate into Economic Equality? Evidence from about 150 Nations

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Does Gender Equality Translate into Economic Equality? Evidence from about 150 Nations

Abstract

This paper adds to our understanding of the causes of income inequality across nations by examining the influence of different aspects of gender equality or female empowerment. Whereas the economics of income inequality has been an area of active academic inquiry, the role of gender equality has largely been ignored. Are there positive spillovers from gender equality onto income equality? The answer to this question, using data for nearly 150 nations over the years 1985-2019, is in the affirmative. Specifically, nations with a history of women's suffrage, greater representation of women in the government, lower fertility rates, and better overall gender equality experienced lower income inequality, *ceteris paribus*. These results are largely supported in considerations of cross-section versus pooled data, simultaneity issues, and the measurement of income inequality. The spillovers from some dimensions of gender equality are found to be sensitive to the existing prevalence of income inequality. Policymakers ignoring the payoffs from gender empowerment on income distribution might be underinvesting in initiatives to empower women.

JEL-Codes: D310, D630, E250, I320, J160, O150.

Keywords: income inequality, gender inequality, suffrage, fertility, women in parliament, colonialism, GINI coefficient, government, quantile regression.

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Comments by Kunal Sen are appreciated.

1. Introduction

Unequal distribution of income within and across nations has existed for a long time. Its persistence over time has intrigued researchers and troubled policymakers. Numerous studies of the causes (and consequences) of income inequality have been conducted with different data and focus. Periodically, surveys of the relevant literature have emerged to summarize the findings and set up directions for future work (see Aghion et al. (1999), de Haan and Sturm (2017), Foerster and Tóth (2015), Furceri and Ostry (2019)).

While our understanding of the causes of inequality has improved, there do not seem to be a sure-fire set of policy prescriptions that would lower income disparities in a somewhat specified frame of time. A part of the underlying problem might be the overarching nature of the factors driving income inequality, with linkages to political science, sociology, etc. For example, ethnic and historical differences might have persistence over time that underlie persistent economic disparities (see Acemoglu et al. (2001), Angeles (2007), Casey and Owen (2014), Frankema (2010), Putterman and Weil (2010), Strum and de Haan (2015), Vu (2021)). Thus, policy prescriptions from any one discipline might be somewhat myopic and fail to produce desired results.

This paper adds to the literature by considering the impact of gender empowerment on economic equality. Does women's empowerment translate into overall economic empowerment and more egalitarian outcomes in the distribution of economic resources? Somewhat surprisingly, while the literature has considered many aspects related to gender empowerment, the influence of gender empowerment on economic equality has not been studied. It is, however, quite plausible that greater female freedoms (political as well as economic), and opportunities for women enable them to better their economic well-being (via household income, etc.) and thereby have implications for overall income inequality in a nation.

While not considering the spillovers from gender equality on income equality, a body of research has noted the gender wage differences and offered an analysis of factors behind trends in these gaps over time. There is some evidence, for example, that gender differences exist in pensions (Bonnet et al. (2018)), and among top income groups (Atkinson et al. (2018)); also see Edlund and Kopczuk (2009)). Blau and Kahn (2017) provide an informative related literature survey on the extensive literature on the gender wage gap.

The gender wage gap can certainly have implications for overall income inequality and the driving forces behind trends in this gap is therefore relevant in understanding trends in income inequality, both over time and among countries. Of interest here is less on market-driven factors stemming from the demand side of labor markets (e.g., shifting demand for skills driven by technical change). Instead, the focus is more on how gender empowerment can affect access to labor markets from the supply side (e.g., access to educational opportunities) along with its relevance in understanding how other institutional factors (e.g., minimum wage laws, tax policy, centralized collective bargaining trends) may be influenced by greater female opportunity to affect the economic, social, and political outcomes of a society.

Since gender empowerment is a somewhat broad concept with a number of qualitatively different dimensions, we consider both an overall index of gender equality as well as specific

dimensions, including fertility rates, female representation in the legislative branch of government, and women's suffrage. Higher fertility rates, for example, mean fewer chances for women to take advantage of economic opportunities outside their homes in child-bearing years, whereas women's suffrage and their representation in the government would suggest more women-friendly policies and opportunities.

Central questions in the analysis that follows are:

(1) what impact, if any, do each of these dimensions to women empowerment have on income inequality; and

(2) how significant are these considerations relative to other factors driving differences in inequality across countries and over time that have already been identified in the extant literature on this topic?

For the purposes of this analysis, we employ a data set of approximately 150 nations over the 1985-2019 period. The data set makes use of the Standardized World Inequality Database (Solt (2020)) made distinctive by the fact that it offers an income equality measure that is consistently defined in the same manner, across countries and over time, thus making it more appropriate for the type of analysis being done in this paper.

Besides contributing to the literature, the findings will have obvious policy value. If, for example, greater gender equality does indeed translate into economic equality, then the payoffs from policies empowering women would have greater social and economic spillovers.

Results show that nations with a history of women's suffrage, greater representation of women in the government, lower fertility rates, and better overall gender equality experienced lower income inequality, *ceteris paribus*. These results are largely supported in considerations of cross-section versus pooled data, simultaneity issues, and the measurement of income inequality. Furthermore, the quantile regression results, to determine how the prevalence of inequality might be impacted by its drivers, show that the influence of some dimensions of gender equality varies across nations with different prevalence of income inequality.

The structure of the rest of this paper includes the literature and the model in the next section, followed by data and estimation, results, and conclusions.

2. Literature and the model

2.1 Literature

Although there are extensive and informative surveys of the literature on income inequality that are available it is still useful to provide a brief overview of that literature as an anchor to our work. Broadly speaking, the existing literature can be viewed as considering two dimensions: (a) causes of income inequality; and (b) issues with measuring income inequality.

Drivers of Inequality. There have been many causes considered as potential drivers of income inequality (see Foerster and Tóth (2015) and Furceri and Ostry (2019) for informative compilations). Among these are the relevance of historical factors, including nations' colonial

past (Acemoglu et al. (2001), Angeles (2007), Frankema (2010), Vu (2021)), population characteristics such as migration (Putterman and Weil (2010)) and ethnic and linguistic fractionalization (Casey and Owen (2014), Sturm and de Haan (2015)). Other dimensions of inertia impacting income distribution over time could arise from a nation's institutional setup, the technological trajectories chosen, and the degrees of openness/globalization of the economy (see Furceri and Ostry (2019)). Steele (2015) notes that attitudes towards redistribution might be impacted by social mobility in a nation.

The impact of the stage of development and economic growth on income inequality has perhaps garnered the most attention in the literature. The seminal work in this respect is due to Kuznets (1955) who hypothesized that the relationship between income and income inequality is nonlinear, or in other words of an inverted-U shape relationship (Moran 2005). Since that time, a substantial body of the literature has focused on assessing the empirical validity of the Kuznets hypothesis with different data and jurisdictions (see, for example, Mollick (2012), Sepulveda and Martinez-Vazquez (2011), Ram (1989)). Aghion et al. (1999) provide an update on the inequality-growth literature, with Aiyar and Ebeke (2019), and Sturm and de Haan (2015) being some of the other significant contributions. Overall, “[e]vidence from studies of the inequality/development relationship remains broadly inconclusive” (Forster and Tóth (2015), p. 1757).

Another macro-related dimension to income inequality considered in the literature is the observed cross-country positive correlation between inflation with income distribution. Albanesi (2007) argues that this is due to lower-income households being more vulnerable to inflation (also see Furceri and Ostry (2019)). This line of inquiry is examined more generally by de Haan and Sturm (2017) by considering different financial variables and their impacts on income inequality. Beyond macro-related factors and historically-related inertia, many other potential drivers of inequality have been identified in the literature and can be broadly categorized in the following areas: globalization (including technical change), labor institutions and regulations, political processes, democratic and social structure, and redistribution via taxes and transfer payments.¹

The small subset of the literature that has considered the influence of female empowerment on income inequality has almost exclusively considered female employment or female labor force participation as an indicator of gender equality. As females participate in gainful employment in the formal sector, one would expect income distribution to be relatively more even. The findings of the literature in this regard, not unexpectedly, found greater female labor force participation to lower income inequality (Forster and Tóth (2015) provide a detailed summary of the related literature; also see Asongu and Odhiambo (2020)).

Beyond these considerations, the influence of gender equality on income equality (or a more equal distribution of income) has not been formally addressed and this issue forms the main thrust of this work.² Greater empowerment of women opens more economic opportunities for

¹ For further details see, Forster and Tóth (2015), especially Figure 19.3.

² One could, however, envision that one channel might be where greater gender empowerment leads to greater social mobility, which, in turn, in the vein of Steele (2015), impacts income distribution. Specifically, she argues that those who live in countries with greater social mobility are more supportive of income redistribution while individuals

them, which would result in income inequality going down. More than simple labor force participation (Asongu and Odhiambo (2020)), these opportunities are likely shaped by facilitating government policies (via greater representation in government and in female voter turnout in elections) and their health (captured, in part, via fertility rates). Furthermore, greater opportunities are likely associated with more of the informal sector work coming into the formal sector as *measured* production and income, and in many cultures women are disproportionately involved in the informal sector (Goel and Saunoris (2017), Gregory (2009)).

Measuring Income Inequality. In recent years, several alternative primary and secondary cross-country databases have become available for conducting empirical research on income inequality topics. Inequality measures such as the Gini index found in these data sets are typically produced at the country-level and vary in terms of quality (Deininger and Squire (1998)) and geographic regions of the world covered. Moreover, individual country data may also vary in a number of other important ways that affect cross-country comparisons, including characteristics of the population within a country covered by the measure (age, location, employment status) and the methodological approach taken to measure inequality. Regarding the latter, inequality indices can vary in terms of the details as to how equality/inequality is defined (e.g., market income, disposable income, consumption) and with respect to the “equivalence scale” or reference unit (how the size and scale of the household are accounted for in the calculations). All of this can pose a challenge to researchers interested in cross-country analysis using income inequality secondary databases in a meaningful way to make valid cross-country comparisons. These issues are well known and a strand of the inequality literature has focused on related measurement issues (see Forster and Tóth (2015), Francois and Rojas-Romagosa (2005), Gasparini and Tornarolli (2015), Ravallion (2015), Smeeding and Latner (2015), and Solt (2009, 2020)).

Another issue is how well any measure of income inequality can capture household production and activity in the informal or the underground sector. These factors might be especially relevant in many cultures, given the more traditional gender roles. Therefore, a universally acceptable, superior measure of income inequality has not seemed to emerge.

In summary, while the literature has considered many causes and effects of income inequality and also has become aware of the underlying measurement issues, the present paper attempts to plug a hole in the literature by empirically considering the spillovers from female empowerment on income equality.^{3,4} For this purpose, we will draw on some of the significant causes of income inequality identified in the literature cited above to anchor our empirical modeling presented below.

2.2 Model

who have experienced upward mobility themselves are less supportive of such endeavors. Further consideration is beyond the scope of this paper.

³ It is possible, however, that there may be bi-directional causality between gender equality and income equality and we address this aspect as a robustness check (see Section 4.2).

⁴ A notable exception is a recent paper by Asongu and Odhiambo (2020), where using data for African nations and using female labor force participation and female employment as indicators of female empowerment, the authors find positive effects on inequality from greater gender inclusion.

Based on the above discussion we formulate our main hypothesis:

H1: *Greater gender equality has positive spillovers on income inequality, ceteris paribus.*

As mentioned above, the literature linking female empowerment on income inequality has almost exclusively considered female employment or female labor force participation as an indicator of gender equality. As females participate in gainful employment in the formal sector, one would expect income distribution to be relatively more even.

We also consider the role of female employment (through the overall index of gender inequality – *GII*), but consider a wider set of indicators of female empowerment (including fertility rate, suffrage, and women in parliament). Not only do these considerations provide additional possible dimensions of viewing and mitigating income inequalities through greater gender equality, but they also provide examples of instances where, even with female employment remaining the same, female empowerment can impact income inequality. In particular, fertility rates likely dictate females' choices between part-time and full-time work, at least in the short term. Women in childbearing years tend to substitute childcare efforts for formal employment. Thus, income (and income distribution) would be impacted, with the labor force participation remaining the same.⁵ This would especially noteworthy in nations that do not have generous maternity leave policies (see Esping-Andersen (1996)) - which brings to light the issue as to how such policies might be enacted or changed.

In this regard, women's participation in the political process, either directly through membership in legislative bodies or indirectly via voting rights (suffrage) would be relevant.⁶ Thus, women in parliament or given the opportunity to vote in elections via suffrage laws could impact income inequality, without necessarily changing women's labor force participation rates. Furthermore, other policies that might disproportionately benefit women and that would result from female political action include minimum wage laws (since women are likely to be disproportionately represented at entry-level jobs in many cases), policies to have a certain share of women in higher-level jobs, etc. (Cooper et al. (2019)).⁷

Beyond the dismantling of entry barriers (in politics, for example) that empower women and has spillovers on income distribution, another channel is via behavioral differences between men and women. Women have generally been viewed to have different attitudes towards competitiveness (Booth and Nolen (2012), Buser et al. (2014)) and risk (Barber and Odean (2001)). The evidence indicates that women tend to be more risk-averse and as a result, they may be more supportive of social safety-net programs to reduce poverty. Further, they are likely to have different attitudes towards benevolence, and thereby towards income distribution through more egalitarian tax-subsidy policies (Hofstede (2001, 2011), Schmid Mast (2004)). With this line of

⁵ It is possible, however, that income inequality could increase fertility (Berg et al. (2018)).

⁶ Further, about half of the countries in the world today have enacted gender quotas in elections. These can take several forms, including: (a) reserved seats (constitutional and/or legislative); (b) legal candidate quotas (constitutional and/or legislative); and (c) political party quotas (voluntary)- see <https://www.idea.int/data-tools/data/gender-quotas/quotas>.

⁷ https://www.washingtonpost.com/business/economy/80-nations-set-quotas-for-female-leaders-should-the-us-be-next/2019/03/29/a27434ba-45c4-11e9-aaf8-4512a6fe3439_story.html; <https://www.ipu.org/news/press-releases/2019-03/new-ipu-report-shows-well-designed-quotas-lead-significantly-more-women-mps>.

reasoning, women in positions of power (in politics or otherwise) would be less prone than men to just serving their own self-interests.⁸

With the unit of observation being a country (maximum 144 nations) and data drawn from the years 1985 to 2019, our formal empirical model to test the hypothesis takes the following general form:

$$\text{Income inequality}_j = f(\text{Gender equality}_m, \text{GDPpc}, \text{GDPpcSQ}, \text{GOVT}, \text{INFLATION}, \\ \text{LATITUDE}, \text{NOcolony}, \text{Continent}_z) \quad \dots(1)$$

$$j = \text{GINI1}, \text{GINI2}$$

$$m = \text{Suffrage}, \text{womenPARL}, \text{GII}, \text{Fertility}$$

$$z = \text{America}, \text{Asia}, \text{Africa}, \text{Oceania}$$

The dependent variable is the GINI index of disposable income inequality. We consider from two GINI measures – *GINI1* and *GINI2* – drawn for two alternative databases that strike a somewhat different balance between comparability and coverage. These will be discussed further in the Data section below.

The main focus of this paper is on female empowerment as a driver of income equality or distribution. We consider female empowerment along four dimensions: (i) the longevity of women’s suffrage in a nation (*Suffrage*); (ii) the proportion of women serving in a nation’s parliament (or legislative) branch of government (*womenPARL*); (iii) an overall index of gender inequality (*GII*); and (iv) the country’s fertility rate (*Fertility*).⁹ *Suffrage* and *womenPARL* can be seen as capturing political empowerment, *GII* is an overall index capturing various dimensions of gender differences (including health, empowerment and labor force participation) and the fertility rate is tied to women’s health and opportunities outside the household – all of which could impact women empowerment politically or otherwise.

The consideration *GDPpc* and its squared term tests the relationship between economic prosperity and income inequality (Baymul and Sen (2020), Deininger and Squire (1998), Kuznets (1955), Ota (2007), Ram (1989)). Also related to this, a country’s inflation rate has been included as a regressor (Albanesi (2007)). For example, inflation is tied to economic uncertainty and rapid inflation can create income distortions when wages in certain sectors are unable to keep up with inflation. These income distortions might disproportionately affect households across income groups, especially in nations lacking good financial development.

The role of government is important in allocating resources to redistribution. Accordingly, we include, *GOVT*, which is the share of government expenditures in GDP.¹⁰ This variable takes

⁸ Men’s incentives for sharing power with women are discussed by Doepke and Tertilt (2009). The possible two-way causality between women’s rights and economic development is reviewed by Doepke et al. (2012) and Duflo (2012).

⁹ See Dollar and Gatti (1999) for different measures to capture gender inequality. Also, see Goel and Nelson (2020).

¹⁰ See Forster and Tóth (2015), especially Annex Table A19.1, for a summary of the extant literature that has considered the relationship between income inequality and government size or related measures (e.g., public

account of the role or the size of the government. A nation's colonial past can impact income inequality through coercive redistributive policies (in favor of the foreign state) of colonizers and the exploitation of resources (Acemoglu et al. (2011), Angeles (2007), Frankema (2010)). We include a dummy variable for nations that were never colonized (*NOcolony*) to address this aspect.

Regarding geographic influences, we control for a nation's distance from the equator and continent fixed effects.

3. Data and estimation

3.1 Data

Databases on income inequality vary in terms of the tradeoff made between comparability and coverage. Income inequality estimates generated by the Luxembourg Income Study (LIS) are widely regarded as the best in terms of the inter-country comparability standard in that it is built on microdata that uses a common set of assumptions and definitions across countries to maximize comparability. Specifically, for the purposes of calculating the net-income GINI index they define income as Aggregate Equivalised Disposable Household Income, which includes non-cash income and transfer payments net of income taxes social insurance contributions.¹¹ However, the premium placed on comparability in the construction of this data set comes at a cost in that the number of countries is restricted to approximately 50, with only limited annual data coverage for many of these countries before 1990.

Because of its limited coverage, we use the net-GINI estimates drawn from the LIS database for robustness analysis presented later in the paper and we refer to the LIS-based inequality measure as *GINI2*. Instead, for most of the analysis presented below, we use the Standardized World Income Inequality Database (SWIID) produced by Solt (2009, 2020) for the disposable country/year GINI index estimates and refer to this measure as *GINI1* below. SWIID estimates are developed through an algorithm using the relationships between LIS and other GINI databases to estimate what a similarly measured LIS Gini would be for many countries not included in the LIS data set (Solt (2020)). Relative to other data sets, SWIID offers the broadest set of estimates available to researchers with comparable data across 174 countries and over the 1960-2019 time period.¹² However, because of a lack of available data for other variables used in

investment, tax structure variables). An analysis of the relationship between income inequality and decentralized government structures can be found in Sepulveda and Martinez-Vazquez (2011).

¹¹ More specifically, this income measure “refers to cash and non-cash income from labour, income from capital, income from pensions (including private and public pensions) and non-pension public social benefits stemming from insurance, universal or assistance schemes (including in-kind social assistance transfers), as well as cash and non-cash private transfers, after deduction of the amount of income taxes and social contributions paid. Disposable Household Income is equivalised at individual level as the total amount divided by the square root of household members”, (<https://dart.lisdatacenter.org/dart>.)

¹² Since its development in 2009, this dataset has been widely used in the cross-country research on income inequality, both within the economics discipline and others (see <https://onlinelibrary.wiley.com/doi/10.1111/j.1540-6237.2009.00614.x>). For our data set, the correlation between the LIS and SWIID net GINI index is 0.99.

our analysis, the number of countries included in the present analysis is approximately 150 beginning with the year 1985.

The remaining data sources used in this paper are all widely used in the literature and available in the public domain. Details about all the variables used, including definitions, summary statistics and data sources are in Table 1. With regard to the dimensions of female empowerment, on average there were three births per woman (*Fertility*), women constituted 18 percent of parliamentary seats (*womenPARL*), and 76 years had elapsed since women were given a right to vote (*Suffrage*). The sample mean value of the gender inequality index (*GII*) was 0.39 and had a 2018 value ranging from 0.037 (Switzerland) to a high of .834 (Yemen). Next, we discuss our estimation strategy.

3.2 Estimation

We employ four different estimation techniques to appropriately address different econometric issues and to test the validity and robustness of our results. Tables 2 and 5 use ordinary least squares estimation and is applied to a pooled country-level averages of all available data over the 1985-2019 period. The SWIID data on income inequality is used in Table 2, while robustness checks using the LIS data set is used in Table 5. Estimates presented in Tables 3 and 4 below are based on a panel data set consisting of country-level 5-year averages of all available data over the 1985-2019 period using the SWIID data set. Table 3 presents the results of two-stage least squares analysis to address potential reverse-causality issues, Table 4 employs Hausman-Taylor estimation for panel data. Finally, Table 6 summarizes the results using quantile regression using the pooled SWIID data set.

The overall fit of the various models estimated is quite respectable as shown by goodness-of-fit statistics reported at the bottom of the respective tables. The results section follows.

4. Results

4.1 Cross-sectional estimation

The baseline results, pooling the SWIID data over 1985-2019, are presented in Table 2. Continent fixed effects are included, and the reported t-statistics (absolute values) are based on standard errors clustered at the country level.

Discussing first the results with respect to the four measures of gender empowerment, we see overall support for the argument that greater gender equality has positive spillovers on income inequality, with some differences in the statistical significance of individual dimensions. In particular, nations with a longer history of women's suffrage and those with greater overall gender equality (denoted by a lower value of the *GII* index – see Table 1) experience lower overall income inequality. These findings support the argument that granting voting rights to women and adopting policies to empower women in other important aspects of human development (e.g., reproductive health) enables women-friendly redistributive and other policies that result in less disparity in income distribution. The estimate for the *Suffrage* variable (Model 1.1) suggests that 20 additional years of women's right to vote (about one standard deviation in

the data set, see Table 1) translates into approximately a 2-point reduction in the (disposable) GINI index. Similarly, based on the results from Model 1.3, a one-standard-deviation reduction in the gender inequality index (*GII*) is associated with about a 3-point reduction in the GINI or about one-third of the sample standard deviation of that Index.

As to the other two women's empowerment variables considered in this analysis, the signs of *womenPARL* (Model 1.2) and *Fertility* (Model 1.4) variables are also supportive of greater gender equality having positive spillovers on income equality, but the statistical significance is low.¹³ It is worth pointing out, however, that the proportion of parliamentary seats held by women is one of the three factors incorporated into the gender inequality index above, suggesting it is important to consider women empowerment more generally when assessing its impact on income inequality.

Our results find that inequality goes down with economic prosperity, although the related relation is non-linear. These findings are consistent across all four models considered and do not lend empirical support for the Kuznets' hypothesis.¹⁴ This is also the case for nations located away from the equator – such nations experienced lower income inequality. On the other hand, nations with larger governments are linked with greater income inequality in our data set. Larger governments do not necessarily have stronger redistribution policies, and, to the extent they do, the second-order labor-market effects and rent-capturing tendencies may mitigate the impact of these policies on reducing income inequality (Doerrenberg and Peichl (2012)). Our results also suggest that countries that did not have a colonial heritage have less egalitarian outcomes when it comes to income distribution. Finally, the impact of inflation is statistically insignificant. We turn next to a series of robustness checks to verify the validity of baseline findings.

4.2 Considering potential simultaneity issues

It is possible that there is a bi-directional relation between income inequality and female empowerment – i.e. income inequality may impact female empowerment. For example, recent estimates for the US indicate that women would benefit more than their male counterparts from an increase in the federal minimum wage to \$15 (Cooper et al. (2019)), thereby creating an incentive for them to invest more in various female empowerment initiatives to effect such an outcome.

To address this, we conduct a two-stage least squares estimation, taking the four female empowerment variables alternately to be endogenous. For this purpose, a country's legal origin is employed as instruments – legal origins capture institutional inertia that would dictate aspects of women's rights. Historical or institutional inertia (via legal origins) can influence how soon or how fast a nation might be able to move towards gender equality. This may be in the form of suffrage, for example. The economic consequences of legal origins are discussed by La Porta et

¹³ A possible explanation for the relative ineffectiveness of women in parliament might be that women parliamentarians have greater difficulties in forming networks and alliances in parliaments to effect meaningful changes in legislations to have appreciable impacts on income distributions.

¹⁴ In the literature, the Kuznets-hypothesis has been found to not hold in certain cases – see Baymul and Sen (2020), Deininger and Squire (1998), Ota (2007).

al. (2008).¹⁵ Furthermore, the legal origin of a country has also been used in explaining other aspects of female empowerment (see Brodeur et al. (2020)).

The results are reported in Table 3 and the various statistics in the table generally support our instrument choice are reported near the bottom of the table. Regarding the gender empowerment variables, the findings are generally in line with those reported in Table 2 – a longer history of women’s right to vote (*Suffrage*) improves income inequality while higher values of the Gender Inequality Index (*GII*) works in the opposite direction. The effect of *Fertility* has the expected positive sign but it remains statistically insignificant at conventional levels. Interestingly, greater representation of women in the parliament now significantly reduces income inequality; however, relative to the other empowerment measures considered in the other models, the overall explanatory power of the model (Model 1.2A) is relatively low. The overidentifying restrictions tests indicate that the hypothesis that the additional instruments are exogenous cannot be rejected at the five percent level or better in all models, except for Model 1.4A. Further insights into the possible link between income inequality and fertility will be provided by the panel data analysis presented in the next section. The results for the other variables in the model are in line with what was reported in Table 2.

4.3 Panel data estimation

A casual inspection of the SWIID income inequality data reveals that for many countries the value of the disposable-income GINI Index was subject to considerable variation over the post-1985 time period. To gain additional insights into the drivers of inter-country income inequality, a panel data set was assembled consisting of 5-year country averages of all available data commencing with the year 1985. The same general model setups presented above were used in this analysis. In each model, the gender-related variable is specified as an endogenous variable to allow for the possibility they are correlated with the unobserved individual-level random effects. All models are based on the Hausman–Taylor estimator for error-components models and include continental and time-period fixed effects estimates that are not reported to conserve space. The results are reported in Table 4.

All gender empowerment variables are statistically significant with parameter estimates generally in line with what was reported in Table 2 using the pooled data set. The effects of the history of women’s suffrage on income inequality (Model 2.1) is roughly double over what was found with the OLS analysis (Model 1.1), while the association between the Gender Inequality Index (Model 2.3) is reduced by approximately one-half. Based on Model 2.2, the results show that greater female representation in parliament leads to a reduction in income inequality, albeit the effect is relatively modest. In particular, the estimated parameter implies that if women were to gain ten percent more of the seats in the lower house of the legislative branch of the government that would lead to about a one-point reduction in the GINI index, other things being equal. The *Fertility* variable, not statistically significant in either of the tables above presenting pooled data results, is statistically stronger using the panel data set. The parameter estimated from Model 2.4 suggests that a one-standard-deviation reduction in a country’s fertility rate

¹⁵ However, the linkage between legal origins, gender, and income inequality is not addressed in that paper.

translates into an approximately 3-point reduction in the disposable GINI Index in a country, all else equal.

Regarding the control variables in each model, the findings are generally in line with what was presented above, with exception that the government size variable is no longer statistically significant in any of the four models estimated.

4.4 Robustness check with an alternative measure of income inequality

As an additional robustness check of the conclusions drawn above, we use the income inequality estimates generated by the Luxembourg Income Study (LIS) and apply that using the same model format presented in Table 2. As noted above, LIS attempts to maximize cross-country comparability of income inequality data, but it comes with a cost of reduced sample size consisting of approximately 50 countries and with only limited annual data for many of these countries before 1990. Nevertheless, the results from a useful check of the earlier findings using a data set viewed as superior in income inequality databases with respect to inter-country comparability.

LIS disposable income inequality estimates are referred to as *GINI2* and the corresponding results to Table 2 using the LIS data are presented in Table 5. We find that the earlier results from Table 2 are largely supported with *GINI2* as the dependent variable. In particular, the coefficient on *GII* remains positive and statistically significant, while that on *womenPARL* remains statistically insignificant. However, the parameter estimate on *Suffrage* empowerment measure, while still negative, is no longer statistically significant at conventional levels, whereas *Fertility* gained statistical significance. Most of the results for the control variables in each model are generally similar in signs and significance to the corresponding model using the large data set in Table 2. An exception was the government size variable [*GOVT*] which lost statistical significance in Table 5.¹⁶

5. Impact of gender equality across nations with different prevalence of income inequality

It is possible that the impact of gender equality on income equality might vary across nations with a different prevalence of income inequality. For instance, nations with wide income disparities might have a different institutional and/or physical infrastructure than other nations, such that when gender equality does improve in such nations, the spillovers onto income equality are not realized or are delayed.

To study this dimension, we employ the quantile regression and report the related results in Table 6 (see Koenker and Hallock (2001) for background on the quantile regression). This consideration also addresses nonlinear aspects in the drivers of income inequality, which have been noted in other contexts (Bahmani-Oskooee and Ardakani (2020)).

Table 6 provides some interesting insights. The impact of women's suffrage is (negatively) significant only at the upper end of the distribution, while *Fertility* and *GII* maintain positive

¹⁶ Some of the differences might be due to the smaller sample size and the inability to control for continent fixed-effects.

signs and statistical significance throughout the distribution of income inequality. In other words, the ability of the longevity of women's voting rights to lower income inequality becomes significant only in nations with high income inequality. This may have to do with the fact that women in nations with high income inequalities have greater incentives to vote (higher voter turnout) to possibly change the status quo. Interestingly, the magnitudes of the coefficients on both *Fertility* and *GII* are the largest at q75 – i.e., nations with high income inequalities experience greater spillovers from changes in fertility rates and in overall gender equality.

On the other hand, consistent with Tables 2 and 5, greater representation of women in the parliament does not have a significant impact on income inequality across the distribution of *GINII*. A part of the underlying reason might be the political and implementation/institutional lags involved in making significant policy changes even when women are significantly represented in the government.

In other findings, nations that were non-colonies had higher income inequality only in nations with a relatively low prevalence of income inequality (i.e., at q25). The impact of *GDP* variables is consistent with earlier findings. The impact of *GOVT* is now insignificant while that of *INFLATION* and *LATITUDE* support earlier results.

To summarize, the use of quantile regression provides two additional insights to the analysis conducted above: (a) the spillovers from some dimensions of gender equality, such as women's suffrage, are sensitive to the prevalence of income inequality; and (b) spillovers from dimensions of gender equality whose effects remain robust across the distribution of income inequality, e.g., *Fertility* and *GII*, experience a change in the magnitude across the distribution of income inequality. The concluding section follows.

6. Concluding remarks

This paper adds to our understanding of the causes of income inequality across nations by examining the influence of different aspects of gender equality or female empowerment. Whereas the economics of income inequality has been an area of active academic inquiry see Aghion et al. (1999), de Haan and Sturm (2017), Foerster and Tóth (2015), Furceri and Ostry (2019)), the role of gender equality has largely been ignored.

Our main hypothesis (H1) is that gender equality should translate into income equality, *ceteris paribus*. Using data for nearly 150 nations over the years 1985-2019, our results show that this hypothesis is largely supported. Specifically, nations with a history of women's suffrage, greater representation of women in the government, lower fertility rates, and better overall gender equality experienced lower income inequality, *ceteris paribus*. Whereas women's labor force participation is an obvious indicator/outcome of women's empowerment, the dimensions we consider are broader, whereby women's equality could improve even with the level of employment remaining the same. While different recommendations and actions to mitigate income inequalities have been undertaken, the spillovers from gender equity initiatives might be providing an overlooked set of options. These results are largely supported in considerations of cross-section versus pooled data, simultaneity issues, and the measurement of income inequality.

The quantile regression results in Table 6 show that the influence and intensity of some dimensions of gender equality varies across nations with different prevalence of income inequality. This finding seems novel in the literature.

In other results, greater economic prosperity lowers income inequality, albeit the relation is nonlinear. Furthermore, greater government spending had perverse impacts on income inequality, as was generally the case for nations that were not colonized. Finally, nations farther away from the equator had lower income inequality, while the impact of inflation was statistically insignificant.

Policymakers ignoring the payoffs from gender empowerment on income distribution might be underinvesting in initiatives to empower women. Furthermore, the quantile regression results imply that policies to bolster women's empowerment might have to be periodically revisited as the prevalence of income inequality changes in a nation. Piecemeal measures, like greater representation of women in parliaments, are less effective than comprehensive improvement in gender equality in terms of payoffs on income equality. On the other hand, general increases in government spending (via the *GOVT* variable we consider) do not seem to help redistribution.

Interestingly, the insignificance of inflation suggests that monetary policy could be considered somewhat independently of income distribution considerations. On the other hand, the geographical location of a nation impacts income inequality and this is beyond the reach of policy manipulation. Yet, policymakers could be cognizant of such a challenge, especially in nations that are located closer to the equator.

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Table 1
Variable definitions, summary statistics and data sources

Variable	Mean (standard deviation)	Source
Income inequality 1: Gini Index measure of net income inequality (multiplied by 100), higher values, greater inequality [<i>GINI1</i>]	38.57 (8.70)	[1]
Income inequality 2: Gini Index of equivalized disposable household income by total population (multiplied by 100); higher values, greater in equality [<i>GINI2</i>]	35.84 (10.15)	[2]
Economic prosperity: Log of GDP per capita (current US\$), [<i>GDPpc</i>]	8.51 (1.49)	[3]
Log of per capita GDP – squared [<i>GDPpcSQ</i>]	4.55 (0.76)	[3]
Government size: General government final consumption expenditure (% of GDP), [<i>GOVT</i>]	15.57 (5.36)	[4]
Inflation, consumer prices (annual %), [<i>INFLATION</i>]	28.26 (195.72)	[5]
Latitude of country, in absolute value [<i>LATITUDE</i>]	28.72 (17.78)	[6]
Colonial past: No colonial heritage (=1 if yes, =0 if no), [<i>NOcolony</i>]	0.18 (0.38)	[7]
Fertility rate, total (births per woman), [<i>Fertility</i>]	2.94 (1.64)	[3]
Women in parliament: Proportion of seats held by women in national parliaments (%), [<i>womenPARL</i>]	18.07 (10.84)	[8]
Suffrage: Number of years since women were granted the right to vote in general elections [<i>Suffrage</i>]	75.89 (19.64)	[9]
Gender equality: Legal Gender Equality Index, (0–1, higher values imply greater inequality), [<i>GII</i>]	0.39 (0.20)	[10]

Notes: Statistics pertain to observations used in the first model that the variable appears.

Sources:

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Table 2
Female Empowerment and Income Inequality: Pooled data set

Dependent variable: *Gini Index (GINII)*

Model	1.1	1.2	1.3	1.4
<i>Women Suffrage [Suffrage]</i>	-0.10** (3.4)			
<i>Women in Parliament [womenPARL]</i>		-0.03 (0.5)		
<i>Gender Inequality [GII]</i>			13.45** (2.2)	
<i>Fertility [Fertility]</i>				0.81 (1.3)
<i>GDPpc</i>	-34.68** (5.9)	-36.92** (4.8)	-33.02** (5.2)	-40.50** (5.9)
<i>GDPpcSQ</i>	66.27** (5.7)	70.58** (4.6)	64.92** (5.2)	78.59** (5.7)
<i>GOVT</i>	0.19** (2.2)	0.27** (2.5)	0.35** (3.2)	0.25** (2.2)
<i>INFLATION</i>	0.00 (0.2)	0.00 (0.2)	0.00 (0.5)	0.00 (0.2)
<i>LATITUDE</i>	-0.14** (3.2)	-0.19** (4.9)	-0.18** (4.8)	-0.18** (4.7)
<i>NOcolony</i>	2.48** (2.1)	2.85** (2.3)	2.28* (1.9)	2.54** (2.1)
<i>Continent</i>				
America	8.57** (4.9)	8.61** (5.0)	7.05** (4.0)	8.04** (4.5)
Asia	2.24 (1.5)	2.70 (1.6)	2.37 (1.6)	2.94* (1.9)
Africa	6.48** (3.0)	7.74** (3.1)	5.61** (2.2)	6.48** (2.4)
Oceania	6.21** (3.7)	3.83** (2.4)	2.04 (1.3)	3.26** (2.1)
Number of Countries	142	143	136	144
F-statistic	45.77**	41.92**	41.03**	42.18**
R-square	0.72	0.69	0.71	0.69

Notes: See Table 1 for variable details. All models are estimated via ordinary least squares. Constant is included but not reported and Europe is the default continent. Data constitute country averages of all available data over the 1985-2019 period.

The numbers in parentheses are (absolute) t-statistics based on country-level clustered standard errors. * denotes statistical significance at the 10% level, and ** denotes significance at the 5% level (or better).

Table 3
Female Empowerment and Income Inequality: Pooled data set
 (IV Estimation to address simultaneity issues)
Dependent variable: *Gini Index (GINII)*

Model	1.1A	1.2A	1.3A	1.4A
<i>Women Suffrage [Suffrage]</i>	-0.18** (2.7)			
<i>Women in Parliament [womenPARL]</i>		-0.81** (2.2)		
<i>Gender Inequality [GII]</i>			40.42** (2.4)	
<i>Fertility [Fertility]</i>				1.68 (0.8)
<i>GDPpc</i>	-31.99** (5.1)	-1.02 (0.1)	-19.72** (2.0)	-43.28** (4.8)
<i>GDPpcSQ</i>	61.12** (5.0)	1.22 (0.0)	43.11** (2.4)	84.99** (4.4)
<i>GOVT</i>	0.15* (1.7)	0.53** (2.8)	0.35** (3.4)	0.26** (2.4)
<i>INFLATION</i>	0.00 (0.3)	-0.00 (0.8)	0.00 (0.5)	0.00 (0.3)
<i>LATITUDE</i>	-0.10** (2.1)	-0.16** (2.5)	-0.13** (2.5)	-0.17** (3.9)
<i>NOcolony</i>	1.55 (1.3)	2.21 (1.1)	0.74 (0.5)	1.91* (1.7)
<i>Continent</i>				
America	7.57** (4.2)	9.61** (3.1)	3.82* (1.9)	6.92** (3.3)
Asia	0.87 (0.5)	-1.97 (0.8)	0.88 (0.6)	2.19 (1.4)
Africa	4.40* (1.8)	4.55 (1.4)	1.42 (0.5)	4.33 (0.9)
Oceania	6.92** (2.9)	-0.07 (0.0)	-1.56 (0.7)	1.89 (0.9)
Number of Countries	136	137	130	138
Wald Chi-sq (11)	473.97**	164.45**	500.73**	515.0**
First stage F-statistic	18.63**	6.35**	77.34**	106.91**
F-test of Endogeneity	2.58 (p=0.11)	8.74 (p=0.00)	4.92 (p=0.03)	0.16 (p=0.69)
χ^2 test of Overidentifying Restrictions	5.27 (p=0.07)	0.89 (p=0.64)	3.61 (p=0.16)	8.61 (p=0.01)
R-square	0.69	0.16	0.65	0.68

Notes: See Table 1 for variable details. All models are estimated via two-stage least squares and include continent fixed effects (Constant not reported and Europe omitted continent). In all estimations, instrumental variables include dummy variables reflecting whether a country's legal origin was British, French, or German Data constitute country averages of all available data over the 1985-2019 period. The numbers in parentheses are (absolute) z-statistics based on country-level clustered standard errors. * denotes statistical significance at the 10% level, and ** denotes significance at the 5% level (or better).

Table 4
Female Empowerment and Income Inequality: Panel data set

Dependent variable: *Gini Index (GINII)*

Model	2.1	2.2	2.3	2.4
<i>Women Suffrage [Suffrage]</i>	-0.19* (1.7)			
<i>Women in Parliament [womenPARL]</i>		-0.06** (2.1)		
<i>Gender Inequality [GII]</i>			6.40** (2.3)	
<i>Fertility [Fertility]</i>				1.63** (4.6)
<i>GDPpc</i>	- 1.45 (0.3)	-9.08** (2.1)	-6.87 (1.6)	-20.90** (3.5)
<i>GDPpcSQ</i>	5.29 (0.5)	17.75** (2.1)	14.00* (1.7)	42.22** (3.5)
<i>GOVT</i>	-0.02 (0.3)	0.01 (0.2)	0.00 (0.0)	-0.01 (0.3)
<i>INFLATION</i>	0.00 (1.0)	-0.00 (0.3)	-0.00 (0.6)	0.00 (1.4)
<i>LATITUDE</i>	-0.11 (1.5)	-0.16** (3.8)	-0.15** (3.8)	-0.14** (3.4)
<i>NOcolony</i>	-0.82 (0.5)	0.49 (0.4)	0.14 (0.1)	0.83 (0.7)
<i>Continent Fixed Effects</i>	Yes	Yes	Yes	Yes
<i>Time Fixed Effects</i>	Yes	Yes	Yes	Yes
Number of Countries	142	143	135	144
Number of Observations	763	602	543	775
Wald Chi-sq	9,746.3**	12,557.1**	11,664.9**	13,102.3**

Notes: See Table 1 for variable details. All models are based on Hausman–Taylor estimator for error-components models. In each model the gender-related variable is specified as endogenous to allow for the possibility they are correlated with the unobserved individual-level random effects. Continental and time-period fixed-effects estimates are not reported to conserve space. Data constitute country 5-year averages of all available data over the 1985-2019 period.

The numbers in parentheses are (absolute) z-statistics based on country-level clustered standard errors. * denotes statistical significance at the 10% level, and ** denotes significance at the 5% level (or better).

Table 5

Female Empowerment and Income Inequality: Alternative GINI measure

Dependent variable: *Gini Index (GINI2)*

Model	3.1	3.2	3.3	3.4
<i>Women Suffrage [Suffrage]</i>	-0.12 (1.3)			
<i>Women in Parliament [womenPARL]</i>		0.07 (0.4)		
<i>Gender Inequality [GII]</i>			43.51** (4.5)	
<i>Fertility [Fertility]</i>				4.90** (3.5)
<i>GDPpc</i>	-38.91* (1.7)	-47.77* (1.7)	-27.25** (2.4)	-57.85** (2.8)
<i>GDPpcSQ</i>	74.47 (1.6)	92.46 (1.6)	56.82* (2.4)	116.05** (2.7)
<i>GOVT</i>	-0.14 (0.5)	-0.27 (1.2)	-0.05 (0.2)	-0.36 (1.5)
<i>INFLATION</i>	-0.00 (0.2)	-0.00 (0.4)	-0.00 (0.6)	0.00 (0.1)
<i>LATITUDE</i>	-0.26** (3.7)	-0.34** (4.5)	-0.18** (2.9)	-0.19** (3.5)
<i>NOcolony</i>	0.88 (0.5)	1.56 (1.0)	2.40** (2.1)	2.27** (2.0)
Number of Countries	49	50	50	50
F-statistic	36.90**	41.76**	82.82**	33.89**
R-square	0.75	0.72	0.82	0.80

Notes: See Table 1 for variable details. All models are estimated via ordinary least squares and include a constant term (not reported). Data constitute country averages of all available data over the 1985-2019 period using the Luxembourg Income Study data set. Due to smaller sample size, continental fixed effects are excluded as the robust variance-covariance to perform the F-test of overall model performance could not be estimated in some cases. The numbers in parentheses are (absolute) t-statistics based on country-level clustered standard errors. * denotes statistical significance at the 10% level, and ** denotes significance at the 5% level (or better).

Table 6a
Female Empowerment and Income Inequality: Quantile Analysis

Dependent variable: *Gini Index (GINII)*

Panel A: Women Suffrage				
	Full Sample	Quantiles		
	OLS	q25	q50	q75
<i>Women Suffrage</i> <i>[Suffrage]</i>	-0.10** (3.2)	-0.03 (0.7)	-0.06 (1.6)	-0.13** (3.9)
<i>GDPpc</i>	-31.55** (5.8)	-27.35** (3.6)	-32.45** (4.8)	-32.99** (3.8)
<i>GDPpcSQ</i>	60.67** (5.7)	52.05** (3.5)	62.24** (4.7)	63.39** (3.7)
<i>GOVT</i>	0.00 (0.0)	0.05 (0.4)	-0.13 (0.9)	-0.00 (0.0)
<i>INFLATION</i>	0.00 (0.1)	0.00 (0.2)	-0.00 (0.0)	0.00 (0.4)
<i>LATITUDE</i>	-0.24** (7.4)	-0.32** (7.5)	-0.23** (5.8)	-0.17** (3.6)
<i>NOcolony</i>	0.49 (0.5)	4.11** (2.5)	0.14 (0.1)	-1.56 (0.9)
Number of Countries	159	159		
R-sq./Pseudo R-sq.	0.62	0.46	0.43	0.38
Panel B: Women in Parliament				
<i>Women in Parliament</i> <i>[womenPARL]</i>	0.02 (0.4)	0.08 (1.5)	-0.06 (1.2)	0.07 (0.8)
<i>GDPpc</i>	-31.90** (4.9)	-33.54** (4.6)	-24.42** (3.2)	-31.76** (3.5)
<i>GDPpcSQ</i>	61.32** (4.8)	64.08** (4.5)	47.28** (3.2)	61.67** (3.4)
<i>GOVT</i>	0.05 (0.4)	-0.01 (0.1)	-0.14 (1.1)	0.05 (0.3)
<i>INFLATION</i>	-0.00 (0.1)	0.00 (0.3)	-0.00 (0.1)	0.00 (0.1)
<i>LATITUDE</i>	-0.31** (10.9)	-0.32** (8.2)	-0.28** (9.6)	-0.32** (6.9)
<i>NOcolony</i>	0.56 (0.5)	2.73* (1.9)	0.88 (0.8)	-0.86 (0.5)
Number of Countries	161	161		
R-sq./Pseudo R-sq.	0.60	0.46	0.43	0.33

Notes: Variable definitions are provided in Table 1. All models included a constant term (not reported). q50 represents the median regression. Reference model (full sample) reflects results estimated via Ordinary Least Squares with absolute t-statistics based on robust country-level clustered standard errors in parentheses. Absolute value of t-statistics is in parentheses based on bootstrapped standard errors (200 replications) in the quantile regressions. * denotes statistical significance at the 10% level, and ** denotes significance at the 5% level (or better).

Table 6b
Female Empowerment and Income Inequality: Quantile Analysis

Dependent variable: <i>Gini Index (GINII)</i>				
Panel C: Gender Inequality				
	Full Sample	Quantiles		
	OLS	q25	q50	q75
<i>Gender Inequality [GII]</i>	21.59** (4.3)	16.33** (2.4)	20.10** (3.8)	30.72** (3.7)
<i>GDPpc</i>	-28.16** (5.5)	-21.67** (2.7)	-25.59** (4.0)	-30.77** (3.7)
<i>GDPpcSQ</i>	56.92** (5.6)	44.51** (3.0)	52.01** (4.1)	63.75** (3.8)
<i>GOVT</i>	0.26** (2.3)	0.11 (0.7)	0.09 (0.4)	0.23 (1.3)
<i>INFLATION</i>	0.00 (0.4)	0.00 (0.2)	0.00 (0.1)	0.00 (0.2)
<i>LATITUDE</i>	-0.25** (7.1)	-0.31** (6.2)	-0.23** (5.6)	-0.20** (4.4)
<i>NOcolony</i>	0.92 (0.9)	2.94** (2.0)	1.15 (0.9)	-0.11 (0.1)
Number of Countries	147	147		
R-sq./Pseudo R-sq.	0.65	0.47	0.47	0.42
Panel D: Fertility				
<i>Fertility [Fertility]</i>	1.46** (2.9)	1.33** (2.0)	1.08* (1.8)	2.09** (2.2)
<i>GDPpc</i>	-38.67** (5.5)	-32.17** (4.0)	-39.50** (4.4)	-45.78** (4.6)
<i>GDPpcSQ</i>	76.43** (5.3)	63.49** (3.8)	77.75** (4.3)	91.31** (4.5)
<i>GOVT</i>	0.02 (0.2)	-0.02 (0.2)	-0.12 (1.0)	-0.02 (0.1)
<i>INFLATION</i>	-0.00 (0.0)	0.00 (0.1)	0.00 (0.0)	0.00 (0.1)
<i>LATITUDE</i>	-0.26** (8.8)	-0.29** (7.1)	-0.24** (6.3)	-0.26** (6.4)
<i>NOcolony</i>	0.84 (0.8)	3.16* (1.8)	0.58 (0.4)	0.40 (0.3)
Number of Countries	162	162		
R-sq./Pseudo R-sq.	0.60	0.47	0.43	0.36
<p>Notes: Variable definitions are provided in Table 1. All models included a constant term (not reported). q50 represents the median regression. Reference model (full sample) reflects results estimated via Ordinary Least Squares with absolute t-statistics based on robust country-level clustered standard errors in parentheses. Absolute value of t-statistics is in parentheses based on bootstrapped standard errors (200 replications) in the quantile regressions. * denotes statistical significance at the 10% level, and ** denotes significance at the 5% level (or better).</p>				

