Gender Inequality and Economic Growth: Evidence from Industry-Level Data ‡

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Abstract

We study whether higher gender equality facilitates economic growth by enabling better allocation of a valuable resource: female labor. By allocating female labor to its more productive use, we hypothesize that reducing gender inequality should disproportionately benefit the industries that are typically more female-dominated. Specifically, we exploit within-country variation between industries to test whether the industries that have a larger share of female labor in their total employment grow relatively faster in countries with ex-ante lower gender inequality. To the extent that different industries have different gender compositions, due to, for example, industry-specific relative marginal product of labor (MPL), the test allows us to identify the causal effect of gender inequality on industry growth in value-added and labor productivity. We provide strong empirical support for our hypothesis in a large sample of emerging and developing countries over the period of the 1990s. Our estimates show that there is a positive growth differential of 1.7% in value-added (1.3% in labor productivity), between industries with high and low female share in total employment, when they are located in a low gender inequality country compared to a country with high gender inequality. The results are economically and statistically significant, and unlikely to be driven by outliers, measurement error, omitted variables and reverse causality. Our findings thus suggest that gender inequality has a causal effect on real economic outcomes.

Keywords: economic growth, economic development, economics of gender

JEL Classification: O40, J16, O1

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1. Introduction

"Gender equality is more than a moral issue; it is a vital economic issue. For the global economy to reach its potential, we need to create conditions in which all women can reach their potential."

— IMF Economic Counsellor Maurice Obstfeld, March 23, 2017 (IMF, 2017)

Gender equality is not merely an issue of human rights, but an economic necessity. Worldwide, productivity growth and the pace of human development are slowing (ILO, 2017), thus women's full and effective participation in the workforce and decent work for all are indispensable to inclusive and sustainable economic growth.[1] While women account for half of the total population, they remain an underutilized resource, constituting less than a third of the actual workforce (Lagarde, 2013). According to the a report of UN High-Level Panel on Women's Economic Empowerment, 700 million fewer women than men of working age were in paid employment in 2016, and even when women are paid, they tend to work in jobs with relatively low earnings, poor working conditions, and limited career prospects (UN, 2016). Implementing policies that remove labor market distortions and create a level playing field for all gives women the opportunity to develop their potential and to participate in economic life more visibly (IMF, 2013). Furthermore, women are more likely to invest their resources in education and health of their children, building human capital to fuel future growth (see, e.g., Schultz, 2002). Helping women fully participate in the economy is not only growth-promoting, but it also diversifies the economies, reduces income inequality, and mitigates demographic shifts (Kochar et al., 2016). In many countries, constraints such as discriminatory laws, lack of legal protection, unfavorable social norms, and a lack of access to real and financial assets have held women back, which, in turn, have held back the economies (WDR, 2012). Gender equality and the empowerment of women are, thus, central to the development agenda (IMF and WB, 2007; IMF, 2017).

Extensive body of work documents gender inequality in both opportunities (e.g., education, health and finance) and outcomes (e.g., employment and earnings), with particularly rich literature

[1] See, for example, UN's 2030 Agenda for Sustainable Development (UN, 2015).

studying the determinants of gender wage gap.[2] The literature dating back at least to Boserup (1970) has emphasized the positive effects of gender equality on development. A number of theoretical contributions have proposed that gender inequality may hamper economic development (e.g., Galor and Weil, 1996; Lagerlöf, 2013), largely due to its effects on creation of human capital and fertility. In Figure 1, we plot GDP per capita growth against gender inequality index for the period of the 1990s for a sample of countries for which the data is available and show that the two variables, indeed, are negatively correlated. Most of the empirical contributions to date also document a significant negative effect of gender inequality on growth (see Cuberes and Teignier, 2014, for a comprehensive literature review).[3] Despite a large number of contributions on the topic, empirically identifying a *causal* impact of gender inequality on economic growth is a major challenge. The standard methodology in this body of work is to use regression analysis to relate the growth rate of country's per capita income to different proxies of gender inequality, controlling for standard growth covariates, such as population growth, level of investment, openness to trade and governmental and institutional quality (see, e.g., Gonzales et al., 2015). This cross-country approach, however, raises endogeneity concerns. The first issue in studying the role of gender inequality for economic progress is that the two are closely related: in one direction, development alone can play a major role in reducing gender inequality; in the other direction, higher gender equality may support development (Duflo, 2012; Stotsky, 2006; IMF, 2013). Furthermore, there may be some omitted factors that are both growth-enhancing and narrowing the gender gap. One avenue would be to use instrumental variable analysis, but a plausible instrument to identify the relationship would require finding a variable that contributes to growth only through its impact on gender inequality – which poses a challenge of its own.[4]

[2] See WDR, 2012, for global trends in gender inequality and Blau and Kahn, 2017, for a recent review on gender wage gap literature. A recent study by Deléchat et al. (2018) discusses gender gap in financial inclusion and its determinants.

[3] For instance, Hill and King (1995), Dollar and Gatti (1999), Lorgelly and Owen (1999), Tzannatos (1999), Forbes (2000), Seguino (2000), Klasen (1999, 2002), Knowles, Lorgelly and Owen (2002), Yamarik and Ghosh (2003), Abu-Ghaida and Klasen (2004), Klasen and Lamanna (2009) and Loko and Diouf (2009) all find that a higher degree of gender inequality in education and/or employment is detrimental to economic growth. In stark contrast are the findings in Barro and Lee (1993, 1994) and several subsequent papers (Barro & Lee, 1996; Barro & Sala-i-Martin, 2003) that report a negative association between female primary and secondary schooling and macroeconomic gains, controlling for male schooling. The authors attribute the finding to a large gender gap in schooling, which is a proxy for country's backwardness. This result, however, does not stand up to more rigorous econometric tests (see, e.g., Stokey, 1994; Caselli et al., 1996; Forbes, 2000; Kazandjian et al., 2016).

[4] In a cross-country study, Klasen (2002) uses instrumental variable method to address the endogeneity of inequality in education and to relate it to economic development. Esteve-Volart (2004) uses instrumental variable technique at the sub-national level providing suggestive evidence that gender discrimination in the labor market may hamper

This paper contributes to the literature on gender inequality and economic growth making a step forward in causal inference by focusing on a particular mechanism through which higher gender equality may support economic growth: by enabling more productive use of female labor. To the extent that different industries typically have different gender compositions, we exploit the heterogeneity across industries to identify the causal effect of gender inequality on economic growth. Namely, we hypothesize that higher gender equality should disproportionately benefit the industries that are typically more female-dominated. This effect may operate through both extensive and intensive margins of employment. On the extensive margin, higher gender equality translates into a bigger pool of talent to recruit from, due to additional women in the labor force. Higher productivity of the marginal worker, in turn, raises industries' productivity and thus boosts industries' growth. Similarly, on the intensive margin, higher gender equality enables women to fully develop their potential in the labor market – i.e., by making their career ladders longer – which is also growth-promoting. The effects on both margins should be more pronounced for the industries that are more female-dominated as, on the extensive margin, larger share of newly hired women joins more female-dominated industries and, on the intensive margin, unlocking women's potential at work is more beneficial to the industries which have higher share of female labor in their total employment.

To test our hypothesis, we construct a test following the difference-in-differences methodology first proposed by Rajan and Zingales (1998 –henceforth RZ) studying the finance-growth nexus. DiD estimator rests on the assumptions that there are industry-inherent features that do not vary across countries and that they are properly measured using the data from a benchmark country (Beck, 2009). We identify an industry's gender composition by looking at its share of female labor in total labor in Sweden, under the assumption that the labor market in this country in the observed period is relatively frictionless concerning women's access and attitudes to jobs across different industries. We, further, assume that industries' gender compositions carry over to other countries, which enables us to investigate whether the industries that typically employ more women grow relatively faster in countries that, a priori, have lower gender inequality. This would imply that, ceteris paribus, an industry such as *wearing apparel*, with is

economic growth. Kazandjian et al. (2016) use instrumental variable generalized method of moments technique (IV-GMM) to show that gender inequality impedes output diversification and lowers exports. Hakura et al. (2016) use system-GMM estimations to show that income and gender inequality jointly impede growth in sub-Saharan Africa, mostly in the initial stages of development.

highly female-dominated, should grow relatively faster than *wood*, which has a low share of female labor in its total employment, in countries that are more gender-equal.

In the context of our analysis that exploits the dynamics in the labor market, the high development on the gender equality front (such as in Sweden) is assumed to entail the elimination of frictions on both the *demand side* of labor (due to, e.g., discrimination in the labor market) and the *supply side* (due to, e.g., engendered social norms). Thus, in the absence of gender-based frictions, the bulk of heterogeneity in gender compositions across industries may be attributed to industry-specific relative marginal product of labor (MPL) between men and women – reflecting women's comparative advantage in a given industry. Namely, the higher the women's relative MPL, the higher the incentive for the industry to employ them. This is somewhat different from an implicit assumption by RZ in the context of the capital markets, where the high financial development (such as in the US) is assumed to remove the constraints solely on the *supply side* of credit. Except differences in the assumptions driving the identification of the industries' features in a "benchmark" country, our methodology is equivalent to their empirical method. Furthermore, in line with their approach, our assumptions do not impose that the industry's gender composition in a "benchmark" country is the optimal one. Neither do we argue that such horizontal segregation, reflected in the differences in gender compositions of labor across industries, is by any means desirable. Instead, we exploit this heterogeneity of gender compositions across industries as an exogenous source of variation that allows us to identify the causal effect of gender inequality on real economic outcomes, at the industry level. We hypothesize that higher gender equality enables firms to make better use of available labor resources, which boosts growth (Barsh and Yee, 2012; CAHRS, 2011), and more so in the industries where women typically constitute a larger share of its total employment.

To this end, we use industry-level employment data from UNIDO database and country-level data on a composite gender inequality index (GII) which has been recently released by the IMF. Unlike the narrower inequality measures used in the majority of the previous literature studying a link between gender inequality and development, which mostly focuses on inequality in education, we use a broader measure of gender inequality that evaluates both equality of opportunities and outcomes – including women's empowerment, female reproductive health, and labor market variables (Gaye et al., 2010; UNDP, 2014). Using a large sample of emerging and developing countries, we show that the industries that are typically more female-dominated grow relatively faster in countries that are more gender-equal. Our findings suggest that gender inequality has a causal effect on real economic outcomes at the industry level. Our estimates predict that the industry at the 75th percentile of female share in total employment compared to the industry at the 25th percentile grows 1.7% faster in terms of value-added (and 1.3% faster in terms of labor productivity) when it is located in a country at the 25th percentile of gender inequality rather than in one at the 75th percentile. The estimated magnitude of the effect is rather large, considering that the real annual growth rate of value-added is, on average, 2.2% per year, whereas average growth of labor productivity is 1.2%. Our results are robust to wide range of alternative explanations such as outliers, measurement error, omitted variables and reverse causality.

2. Hypothesis and Methodology

We hypothesize that the industries that are typically more female-dominated grow relatively slower in countries that, a priori, have higher gender inequality. This effect may operate through both extensive and intensive margins of employment. On the extensive margin, higher gender equality translates into a bigger pool of talent to recruit from, due to additional women in the labor force. Higher productivity of the marginal worker, in turn, raises industries' productivity and thus boosts industries' growth. Similarly, on the intensive margin, higher gender equality enables women to fully develop their potential in the labor market– i.e., by making their career ladders longer – which is also growth-promoting. The effects on both margins should be more pronounced for the industries that are more female-dominated as, on the extensive margin, larger share of newly hired women joins more female-dominated industries and, on the intensive margin, unlocking women's potential at work is more beneficial to the industries which have higher share of female labor in their total employment.

We follow the identification strategy first proposed by RZ in studying finance-growth nexus. To assess the impact of gender inequality on industry growth, we use variation across industries in their gender compositions and variation across countries in their level of gender inequality. To test our hypothesis, we estimate the following Difference-in-Differences (DiD) model:

$$(1)\ Y_{i,k} = \alpha + \beta X_{i,k} + \gamma(\text{Female labor share}_i \times Gender\ Inequality_k) + \nu_i + \mu_k + e_{i,k}$$

The dependent variable is the average real growth rate of value-added in industry *i* in country *k* over the period of the 1990s. We correct for the country and industry characteristics by using a set of dummy variables for each country and industry (μ_k and ν_i, respectively). We also control for industry i's value-added share of manufacturing in country k in 1990 ($X_{i,k}$), that varies across industries and countries and thus is not captured by country nor industry fixed effects. Our main coefficient of interest is for the interaction term of share of female labor in total employment of industry *i* estimated from a "benchmark" country over a given period and country *k*'s level of gender inequality in 1990 – the DiD estimator. If our hypothesis is correct, γ should be negative.

We use all country-level variables from the first year of the analysis, following RZ. Thus, this test analyzes how ex-ante gender inequality affects ex-post growth in industries depending on their gender compositions. As opposed to aggregate level cross-country studies on the gender inequality-growth nexus, this strategy enables us to analyze within-country differences between industries based on the interactions between industries' female shares and country's gender inequality. An industry's female share is defined as a number of female employees to total employees in the countries with the least gender frictions in the labor markets – Sweden having the lowest gender inequality index. Having calculated this ratio for each year, we take simple averages across years for the corresponding periods, as presented in Table 1.

There are two main assumptions in this methodology pioneered by RZ. First, there are some intrinsic reasons which lead certain industries to typically employ more female labor than others. We hold that the main reason for observed horizontal segregation – i.e. the differences in gender compositions of labor across industries – lies in the industry-specific relative marginal product of labor between women and men. Second, these differences across industries carry over countries, so that an industry's female share identified from a "benchmark" country (with little frictions) can be used as a proxy for its gender composition in other countries. Although, we know that female shares in an industry may differ between Sweden and Turkey, for our identification to work all we need is a sort of ordering. For example, if *wearing apparel* industry employs more female labor than *wood* industry in Sweden, it also employs more female labor in Turkey. In support of this assumption, WDR (2012) documents that economic development seems to have a limited impact on gender segregation in employment. Perhaps somewhat surprisingly, they find little, if any, the relationship between GDP per capita and standard measures of horizontal segregation (sectoral and occupational) along gender dimension and that gender segregation in employment is quite persistent (over time) and consistent (over countries). The report highlights that the segregation arises due to a combination of gender-differentiated barriers in access to economic opportunities – including discrimination and gender norms – and sorting based on gender-based preferences. In our identification strategy, however, we assume that even with the full elimination of such frictions, horizontal segregation of employment would still persist due to, i.e., industry-specific relative marginal product of labor (MPL) between women and men. Namely, the higher the women's relative MPL, and thus their competitive advantage, the higher the incentive for the industry to employ them.[5] We document little variation of industry's gender composition in our sample either over time or within a group of our "benchmark" countries (i.e., the countries with relatively high gender equality which we use to identify industries' gender compositions). Figure 2 plots the mean and standard deviation for industries *within* Sweden over the period of the 1980s, and shows that the variation of female share in an industry across time is rather low, around 4% of the mean – as is the case in our alternative "benchmark" countries. Table 1 shows that the industries' gender compositions are also rather similar *between* Sweden and these countries, as confirmed by their high correlations reported in Panel B of Table 3. Hence, the assumption of stable patterns of industries' gender compositions seems reasonable.

Data on actual industries' gender compositions is typically not available for a large majority of countries. But even if it were, it would not be useful for our purpose, as a share of female labor in total employment of an industry in a given country is the equilibrium outcome in the labor market, likely distorted by existing gender-based frictions (e.g., discrimination). As we are interested in the industries' intrinsic heterogeneity arising from women's relative MPLs compared to men's in a given industry, such data would be contaminated.[6] We, thus, start by

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[5] Discrimination – likely the main gender-based friction in the labor market – artificially restricts the demand for female labor, as recognized by IMF (2013). However, such *artificial* barriers are lower in countries with lower GII. Sweden not only has by far the lowest GII in the world, but it seems to be among only a few countries in which large share of the population is aware of gender discrimination laws in hiring process (more than 50% in 2007, according to the IMF).

[6] Our identification exploits the interaction between industry's gender composition (a proxy for women's comparative advantage in an industry) and country's gender inequality. The complicating issue in using *actual* gender compositions would be that these are themselves distorted by gender inequality, due to existing gender-biases in the labor market.

computing the share of female labor in total labor in Sweden. In a country with full gender equality, the actual industries' gender compositions would not be contaminated by gender-based frictions in the labor market, thus there would be no identification problem. Gender equality in Sweden in the 1980s was sufficiently high to make it reasonable to assume that the employment of female labor by an industry in Sweden throughout this period is likely to be a relatively clean measure of relative MPL of female labor compared to men within a given industry.[7] In order to smooth temporal fluctuations in gender composition, we aggregate this measure over time. Specifically, we obtain a share of women in total labor employed per industry in each year and then take the average over the 1980s. We, thus, use the lagged period with respect to our growth statistics on emerging and developing countries under study – which cover the 1990s. We assume that (much of) the change in an industry's relative MPLs of women and men arises due to the technological shocks that change the nature of the available jobs within an industry. For example, mechanization of much of the physically less demanding work in mining (such as hand-picking and sorting ore) led to fewer and fewer women working in the mine, just as in the other industries during the industrialization period (Abrahamsson et al., 2014). To the extent that such technological advances are worldwide and that our regression sample consists of emerging and developing countries in the 1990s, we believe that the state of technology in Sweden in 1980s makes a suitable proxy (especially given we are focusing on the manufacturing industries). Our results are robust to using the sample of the 1990s instead, for two alternative countries for which the data is available (Austria or New Zealand).

3. Data

3.1. Data on industries

We use ISIC 2-digit industry-level dataset from UNIDO (Revision 3), which restricts our analysis to manufacturing sectors (ISIC 15-37). We use industry-level value-added data in current US dollars. The nominal value-added was changed to the real value-added using Producer Price

[7] The first equal opportunities act in Sweden was introduced in 1980 by which gender discrimination in the workplace has been made illegal. In 1990, Sweden had by far the lowest GII on IMF country ranking.

Index from the US, since PPI data is not available for many of our countries in IMF's IFC database.[8]

We also draw data on number of employees and number of female employees from UNIDO for the six countries that we use in calculating female labor shares – Sweden, Canada, Ireland, Austria, New Zealand and Australia. These are the countries with the lowest gender inequality index and the data available on female employees for the corresponding periods. We drop the observations having a value-added share of manufacturing smaller than zero or greater than 1. We drop the industries for which female employment data is missing for the majority of our "benchmark" countries or for the most years in the relevant period. Our final sample consists of 17 industries.

We calculate the value-added share of an industry in country's total manufacturing value-added in 1990. Whenever value-added in 1990 is missing for an industry, we use it from 1991, 1992 or 1993, if it is available. If it is not available for any of these years, we do not use that observation. Labor productivity of an industry is calculated as real value-added divided by number of employees. We use the country-industry observations for which the average growth rate for a sector (over the 1990s) is calculated as the average of at least 3 data points on growth rates. For industries' external finance dependence (that we use in one of our robustness checks), we adopt the measures from Popov (2014) for US firms in the 1980s for corresponding industries.

3.2. Data on countries

3.2.1. Measures of Gender Inequality

In our main analysis, we use a composite index for gender inequality (GII). The GII considers inequality both in opportunities and outcomes and consists of sub-indices on reproductive health (maternal mortality and adolescent fertility), female empowerment (education and political representation) and labor market (participation rate). Based on the calculations by Stotsky et al. (2016), IMF has the most comprehensive database on gender inequality that goes back to the year of 1990. They calculate this index for around 100 economies in the world; the index ranges from 0 to 1 where higher GII indicates higher gender inequality. Sweden is the

[8] This is consistent with, e.g., Guiso et al. (2004), as well as being the standard practice in previous studies of developing countries using UNIDO data.

country with the lowest GII in the 1990s. Its GII has a sizable gap with the rest of the developed economies, thus we use Sweden as the "benchmark" country in our basic results, although, we do perform robustness checks using five other countries having among the lowest GII and female employment data available in UNIDO.

Table 2 tabulates the GII for different countries in 1990. Panel A consists of the emerging and developing countries in our main regression sample and Panel B provides the statistics on the countries used to identify industries' gender compositions. GII in 1990 in our sample varies from around 0.3 in Hungary to around 0.8 in Morocco. In our "benchmark" countries, the GII in 1990 is significantly lower in comparison to Panel A, being as low as 0.093 in Sweden to 0.284 in New Zealand.

We also employ several other proxies for gender inequality in our robustness checks, namely adolescent fertility rate, relative infant mortality, relative labor participation, gender parity index (GPI) and women's rights law score. Adolescent fertility rate, measured as number of births per 100 women aged 15-19 years, captures the detrimental health, economic and social risks and consequences associated with early child bearing. Premature motherhood tends to prevent women from pursuing further education, and thus to obtain higher-skilled jobs (Gaye et al., 2010). Relative infant mortality ratio, being the ratio of infant female mortality to infant male mortality, indicates gender inequality in infant health, where excess female infant mortality rates relative to male rates reflect the discriminatory treatment of women (see, e.g., Sen, 1989, 1990). Gender Parity Index (GPI), which is the ratio of female students to male students, measures the gender parity in schooling. Relative labor participation ratio, measured by labor participation rate of males relative to females, captures the relative underrepresentation of women in the workforce – an important component of gender inequality. Women's rights law score captures the strength of the legal framework for enforcing gender equality. It is constructed using Women's Legal Rights data, that contains questions related to women's legal rights replied as "Yes" or "No", depending on the presence of laws in a country. We construct the law score for each country by dividing the number of negative answers by the number of total replied (i.e., codified) questions for each country in 1990. Panel C of Table 3 shows that although these measures capture different components of gender inequality, their pairwise correlations – among themselves – and those with GII are pointing into the right direction.

3.2.2. Covariates

We use a measure of the rule of law from the World Bank's Worldwide Governance Indicator (WGI) in 1996 since this is the earliest year for which the data is available. We construct a dummy variable to categorize the countries as above (dummy is 1) and below (dummy is 0) the median rule of law.[9] We proxy financial development by broad money from the World Bank's World Development Indicators (WDI), given that the data on equity markets and credit are not available for a large fraction of our countries in the 1990s (see, e.g., King and Levine, 1993). We follow Barro (1991), among others, and use teacher-student ratio in secondary education (a measure of the quality of education) as a proxy for stock of human capital in a country. Gender inequality is likely to bias many human capital measures; as lower gender inequality leads to higher human capital stock. However, the teacher-student ratio would be less affected, since gender inequality would affect both the denominator (as more girls go to school) and the numerator (as more girls become teachers). We draw this variable from the World Bank's WDI database. From the same source, we also get data on real GDP and population, both in logs; foreign direct investment (FDI) inflows, export and import, all scaled by GDP; trade over GDP (as a measure of the openness of a country); population density, being the number of people divided by land area (km square), used in logs.[10] Summary statistics of the sample are provided in Panel A of Table 3.

4. Results

4.1. Gender composition and economic growth

We first consider the actual (rather than estimated) effects of gender inequality on growth of different industries. In Table 4, we summarize the residual growth rate obtained after partialling out industry and country fixed-effects for the top and bottom quartiles of industries – ranked based on their female employment. The results show that only the industries that are highly female-dominated tend to grow significantly faster in the countries with lower gender inequality compared to the countries with higher gender inequality. This suggests that the observed patterns of realized

[9] We do so to address a problem of the raw measure of rule of law (drawn from WGI database) being imprecisely estimated for most of the developing countries. In other words, the estimates are not statistically significantly different from each other for countries in our sample, since the point estimates are very close and the standard errors are quite large.

[10] Whenever a country-level variable is missing in 1990, if available, we use it from the earliest year available in the 1990s. If it is not available until 1993, we do not use that observation in the corresponding robustness check.

growth rates differentials are systematic and that the effect of gender-based frictions is particularly detrimental to the industries that typically have a high share of women in their labor.

Table 5 reports our baseline results. Since the specification controls for country and industry fixed effects (equation 1), the only effects that are identified are those relative to the variables that vary both across countries and across industries. Thus, Table 5 reports only our main coefficient of interest – coefficient of the interaction between share of female labor in total industry's employment and country's GII and coefficient of an industry's value-added share in total manufacturing. The dependent variable is growth of industry's value-added. We need to make sure that our "benchmark" countries provide a sufficiently convincing reference point for identifying industries' gender compositions, for which they need to have low gender inequality relative to the sample under analysis. That is, similar to RZ, the "benchmark" countries should have relatively less (gender-based) frictions. Thus, we do not study the developed economies, as these have high levels of gender inequality comparable to our "benchmark" countries, but we focus our analysis on the emerging and developing countries. Note in Panel A of Table 2 that the country with the lowest GII in our regression sample of emerging and developing countries (Hungary) has a higher GII (i.e., higher gender inequality) than the benchmark country with the highest GII (New Zealand) in Panel B.

We start by estimating the industries' gender compositions using our preferred benchmark country – Sweden. As can be seen in the first column of Table 5, using this benchmark country the coefficient estimate for the interaction term is negative and highly statistically significant.[11] To assess the magnitude of this coefficient, we compute differential growth rates. Specifically, we compare the how much faster the industry at the 75th percentile of female shares (estimated from Sweden, i.e., *rubber and plastics products*) grows compared to the industry at the 25th percentile of female shares (i.e., *non-metallic mineral products*), when it is located in a country at the 25th percentile of gender inequality (*Costa Rica*) rather than in one at the 75th percentile (*Cameroon*). We set the industry's initial value-added share of manufacturing at its overall mean. The coefficient estimate predicts that industry at the 75th percentile of female shares compared to the

[11] In calculating the growth rate of value-added in industries, we reduce the impact of the outliers by constraining growth between -1 and +1, following RZ. Only a few observations are affected in the sample. We note that the signs and significance levels of coefficients do not change if we keep these observations in the sample, although the explanatory power of the regression is lower. Our results are also robust if we winsorize industry growth by 1-99 percent.

industry at the 25th percentile of female shares grows 1.7% faster in terms of value-added in *Costa Rica* than in *Cameroon*. To put the magnitudes in perspective, the real value-added growth rate is, on average, 2.2% per year, so the estimated differential growth rate of 1.7% is substantial. The rest of the columns of the table report the same statistics with industries' female shares estimated from alternative "benchmark" countries (which have among the lowest GII and female employment data available in UNIDO) – Canada, Ireland, Austria, New Zealand and Australia. The statistical significance of our results is unaffected by the use of alternative "benchmark" countries, whereas the magnitude of the estimates increases in some cases.

One concern is that, given an increase in female labor participation underlying lower GII, our results may be driven by a disproportionate increase in labor supply of one industry over the other, rather than by real productivity gains. To rule out this "mechanical" effect, in Table 6 we show that our results are very similar if we use real labor productivity growth in 1990s (value-added based) as a dependent variable instead of real value-added growth over the same period. The coefficient estimate predicts that the industry at the 75th percentile of female shares compared to the industry at the 25th percentile of female shares grows 1.2% faster in terms of value-added labor productivity in *Costa Rica* than in *Cameroon*. The value-added labor productivity growth rate is, on average, 1.2% per year, so the estimated differential growth rate of 1.2% is large.

In Table 7, we test the robustness of our results to using alternative measures of gender inequality including adolescent fertility rate, relative infant mortality, relative labor participation, gender parity index (GPI), and women's rights law score. Each of these measures captures a specific aspect of gender inequality. In comparison, GII is a broader index that reflects different manifestations of gender inequality and is more encompassing than any of these alternative (narrower) measures. GII is, therefore, more suitable to capture the multi-dimensional concept of gender inequality, however it may spark concerns of a measurement error due to the composite nature of the index. Higher value of adolescent fertility rate, relative infant mortality, relative labor participation and lower value of gender parity index (GPI), and women's rights law score indicate higher gender inequality. The results reassure that our conclusions are robust to using these narrower measures of gender inequality. The table reports the results using gender compositions estimated from Sweden, and we get very similar results for each of these inequality measures if we use the alternative benchmark countries (results not reported).

4.2. Additional robustness checks

In Table 8, we aim to address the endogeneity concerns. First, we control for various factors, all in the form of interaction term with female share in employment. In column (1), we control for GDP, as the log of country's real GDP per capita. As the economies develop, the gender inequality may decrease, resulting in reverse causality. In column (2), we control for population, as the log of total population. If population is too low in a country, women may work due to very high demand for labor, which may bias gender inequality index that comprises a measure of labor participation. In column (3), we control for population density, as the log of the ratio of population to total area. In less population dense areas gender inequality may pose a stronger obstacle to female employment as women have to commute (alone) farther distances in order to work, which may be an issue due to social norms and/or safety. Also, the densely populated areas are usually more urbanized and thus more developed, but also less traditional which is likely to result in lower gender inequality. In column (4), we control for female share in population as the ratio of number of females to number of males in the country. If there are a lot of women in the population (e.g., due to a civil war that results in disproportionate male casualties), or few women (e.g., due to, e.g., cultural preferences for male offspring), these demographic features may bias gender compositions of industries.[12] In columns (5)-(7), we control for export, import, openness and FDI, respectively. Export and import are measured as a share of GDP. Openness is measured as export plus import divided by GDP. FDI is measured as the net inflows as a share of GDP. These factors may contribute to greater productivity and thus favor growth.[13] Furthermore, trade activities may also reduce gender inequality, as documented by Juhn et al. (2014), which can result in a spurious correlation between gender inequality and economic growth. In columns (9) and (10), we control for financial development – measured by broad money as a share of GDP – and for rule of law – as a dummy for having higher than median rule of law score as obtained from World Governance Indicators. Both factors can be correlated with GII and are also highly relevant determinants of

[12] The phenomenon of "missing women", referring to the shortfall in the number of women relative to men expected in a population, has been first noted by Amartya Sen (Sen, 1990). Smaller family size – whether desired by parents or imposed by the government – is found to be among the main causes (see, e.g., Jayachandran (2017) for a description of cultural and religious traditions that lead parents in India and China to fervently desire at least one son, and Zhang (2017) on the evolution of China's one child policy and its effects on family outcomes).

[13] See, for example, De Loecker (2013) that documents a positive effect of export on productivity. Kasahara and Rodrigue (2008) show that import increases productivity, Frankel and Romer (1999) document a positive effect of trade on income, whereas Nair-Reichert and Weinhold (2001) suggest that efficacy of FDI is growth-promoting.

growth. In column (11), we control for human capital, as teacher to student ratio in the secondary education (see, e.g., Barro, 1991), as GII gives rise to higher labor participation and more educated female population, so it may be a proxy for human capital in a country. Neither of these additional controls significantly alters our results.

As economic growth also lowers gender inequality, although we use GII from 1990 and relate it to growth outcomes in the following decade, using lagged GII may still expose us to reverse causality concerns if GII is highly persistent over time (as shown in Figure 3, GII indeed varies little throughout our period). To address this concern, in the last column, we estimate our model on a subsample of smaller industries. In doing so, we mitigate the issue of reverse causality by restricting our sample to industries that are relatively small (less than a median of value-added share in their respective countries) and are thus less likely to be responsible for the rate of economic growth in a country. Our coefficient estimate of the interaction term between female share and GII remains statistically significant and roughly doubles in magnitude. The increase in magnitude of the estimated effect is likely due to the fact that the smaller industries have higher growth potential.

Table 9 reports the results controlling for external finance dependence of an industry and financial development, which are the focus of RZ. We obtain the data on industries' external finance from Popov (2014) for US firms in the 1980s for corresponding industries. We show that our results are not a simple artifact of using the methodology inspired by RZ and some spurious correlations between our main variables of interest – being external finance dependence and financial development in their study, and gender composition and gender equality in ours. We see that the external finance dependence is not significant when interacted either with GII or financial development – on its own nor alongside interaction term with female share. Financial development also does not seem to be a relevant omitted factor in our analysis. Our main coefficient of interest throughout Table 9 remains close to our initial estimates in Table 5.

Additional robustness checks are provided in Table 10. We use GII as a proxy for gender inequality. In column (1), we test whether our results are robust to potential outliers. We drop the two countries with the highest and the lowest GII in our sample (Morocco and Hungary, respectively) to show that they do not drive our results. In column (2), rather than using a linear measure of gender composition, we construct a dummy to indicate relatively high vs. relatively low female shares in industries, estimated from Sweden. For industries above the median female share in Sweden, we assign 1 indicating that these industries rely on female labor relatively more than the rest of industries (for which we assign 0). In column (3), in a related robustness check, we use a categorical variable to classify industries' female shares in 4 categories based on quartiles of the distribution. Industries below the 25th percentile of female shares in Sweden are assigned 1 as the level of female shares, industries between the 25th percentile and the 50th percentile are assigned 2, and so on. Next, we study the robustness of our results to alternative measurement of industries' female labor shares. In column (4), for each industry, we take the average of female shares across five benchmark countries, and assign this value as the female share of the industry. In column (5), for each industry, we find the maximum of female shares across five benchmark countries, and assign this value as the female share of the industry. In column (6), we winsorize the mean growth rates 1 and 99 percent, instead of restricting -1 and 1.

5. Conclusion

We study whether gender inequality inhibits economic growth by constraining the use of female labor potential. Specifically, we use a methodology inspired by RZ who studied the finance-growth nexus, which enables us to identify a causal impact of gender inequality on real outcomes at the industry level. Using a sample of industry-employment data on emerging and developing countries from UNIDO and a country-level composite index on gender inequality (GII) recently constructed by Stotsky et al. (2016), we exploit within-country variation and show that the industries that are typically more female-dominated grow relatively faster in countries that are more gender-equal. By focusing on the differential effect of gender inequality on economic growth within countries between industries with different gender compositions, we are able to address a bulk of the endogeneity concerns that arise in aggregate level cross-country studies. Furthermore, we do a series of robustness checks to rule out alternative explanations such as outliers, measurement error, omitted variables and reverse causality. Our findings suggest that gender inequality has a causal effect on real economic outcomes at the industry level.

References

Abrahamsson, L., Segerstedt, E., Nygren, M., Johansson, J., Johansson, B., Edman, I., & Åkerlund, A. (2014). *Mining and Sustainable Development: Gender, Diversity and Work Conditions in Mining*.

Abu-Ghaida, D., & Klasen, S. (2004). The Costs of Missing the Millennium Development Goal on Gender Equity. *World Development* 32(7): 1075–107.

Barro, R.J. (1991). Economic Growth in a Cross-Section of Countries. *Quarterly Journal of Economics*, 106(2), 407-443.

Barro R.J., & Lee, J-W. (1993). International Comparisons of Educational Attainment. *Journal of Monetary Economics*, 32(3), 363–394.

Barro, R.J., & Lee, J-W. (1994). Sources of Economic Growth. *Carnegie-Rochester Conference Series on Public Policy*, 40, 1–46.

Barro, R.J., & Lee, J-W. (1996). International Measures of Schooling Years and Schooling Quality. *American Economic Review,* 86, 218–23.

Barro, R.J., & Sala-i-Martin, X. (2003). Economic Growth. MIT Press. Cambridge, Massachusetts.

Barsh, J., & Yee, L. (2012.) Unlocking the Full Potential of Women at Work. *McKinsey & Company*

Beck, T. (2009). The Econometrics of Finance and Growth. In Palgrave Handbook of Econometrics (pp. 1180-1209). Palgrave Macmillan, London.

Blau, F.D., & Kahn, L.M. (2017). The Gender Wage Gap: Extent, Trends, and Explanations. *Journal of Economic Literature*, 55(3), 789-865.

Boserup, E. (1970). Women's Role in Economic Development. New York: St. Martin's Press

Caselli, F., Esquivel, G., & Lefort, F. (1996). Reopening the Convergence Debate: a New Look at Cross-Country Growth Empirics. *Journal of Economic Growth*, 1(3), 363-389

Center for Advanced Human Resource Studies – CAHRS (2011). Re-Examining the Female Path to Leadership Positions in Business. *Cornell University*.

Cuberes, D., & Teignier, M. (2014). Gender Inequality and Economic Growth: A Critical Review. *Journal of International Development*, 26(2), 260-276.

Esteve-Volart, B. (2004). Gender Discrimination and Growth: Theory and Evidence from India. *STICERD Discussion Papers DEDPS42*, London School of Economics and Political Science.

De Loecker, J. (2013). Detecting Learning by Exporting. *American Economic Journal: Microeconomics*, 5(3), 1-21.

Deléchat, C., Newiak M., Xu, R., Yang F., & Aslan, G. (2018). What is Driving Women's Financial Inclusion Across Countries?. *IMF Working Paper 18/38*

Dollar, D., & Gatti, R. (1999). Gender Inequality, Income, and Growth. Are Good Times Good for Women? *World Bank Gender and Development Working Paper* No. 1

Duflo, E. (2012). Women Empowerment and Economic Development. *Journal of Economic Literature*, 50(4), 1051-1079.

Forbes, K. (2000). A Reassessment of the Relationship between Inequality and Growth. *American Economic Review*, 90(4), 869–87.

Frankel, J.A., & Romer, D. (1999). Does Trade Cause Growth?. *American Economic Review*, 379-399.

Galor, O., & Weil, D.N. (1996). The Gender Gap, Fertility, and Growth. *American Economic Review*, 86(3), 374–87.

Gaye, A., Klugman, J., Kovacevic, M., Twigg S., & Zambrano, E. (2010). Measuring Key Disparities in Human Development: The Gender Inequality Index. *UNDP Human Development Reports Research Paper* 2010//446

Gonzales, C., Jain-Chandra, S., Kochhar, K., Newiak, M., & Zeinullayev, T. (2015). Catalyst for Change: Empowering Women and Tackling Income Inequality. *IMF Stuff Discussion Note 15/20*

Guiso, L., Jappelli, T., Padula, M., & Pagano, M. (2004). Financial Market Integration and Economic Growth in the EU. *Economic Policy*, 19(40), 524-577.

Hakura, M.D.S., Hussain, M.M., Newiak, M., Thakoor, V., & Yang, M.F. (2016). Inequality, Gender Gaps and Economic Growth: Comparative Evidence for Sub-Saharan Africa. *IMF Working Paper 16/111*

Hill, M.A. & King, E. (1995). Women's Education and Economic Well-Being. *Feminist Economics*, 1(2), 21-46.

International Labour Organization (2017). Towards a Better Future for Women and Work: Voices of Women and Men

International Monetary Fund and World Bank (2007). Millennium Development Goals: Confronting the Challenges of Gender Equality and Fragile States, *Global Monitoring Report*

International Monetary Fund (2013). Women, Work and the Economy: Macroeconomic Gains from Gender Equity, *IMF Staff Discussion Note 13/10*

International Monetary Fund (2017). *Annual Report*

Jayachandran, S. (2017). Fertility Decline and Missing Women. *American Economic Journal: Applied Economics*, 9(1), 118-139.

Juhn, C., Ujhelyi, G., & Villegas-Sanchez, C. (2014). Men, Women, and Machines: How Trade Impacts Gender Inequality. *Journal of Development Economics*, 106, 179-193.

Kasahara, H., & Rodrigue, J. (2008). Does the Use of Imported Intermediates Increase Productivity? Plant-Level Evidence. Journal of Development Economics, 87(1), 106-118.

Kazandjian, R., Kolovich, L., Kochar, K., & Newiak, M. (2016). Gender Equality and Economic Diversification. *IMF Working Paper 16/140*

King, R.G., & Levine, R. (1993). Finance and Growth: Schumpeter Might be Right. *Quarterly Journal of Economics*, 108(3), 717-737.

Klasen, S. (1999). Does Gender Inequality Reduce Growth and Development? Evidence from Cross-Country Regressions. *Policy Research Report Working Paper* 7, World Bank, Washington, DC.

Klasen, S. (2002). Low Schooling for Girls, Slower Growth for All? Cross-Country Evidence on the Effect of Gender Inequality in Education on Economic Development. *The World Bank Economic Review*, 16(3), 345-373.

Klasen, S., & Lamanna, F. (2009). The Impact of Gender Inequality in Education and Employment on Economic Growth: New Evidence for a Panel of Countries. *Feminist economics*, 15(3), 91-132.

Kochhar, K., Jain-Chandra, S., & Newiak M. (2016). Women, Work, and Economic Growth: Leveling the Playing Field. *International Monetary Fund*

Knowles, S., Lorgelly, P.K., & Owen, P.D. (2002). Are Educational Gender Gaps a Brake on Economic Development? Some Cross-Country Empirical Evidence. *Oxford Economic Papers*, 54(1), 118-149.

Lagarde, C. (2013). Dare the Difference. *Finance & Development (June)*, International Monetary Fund

Lagerlöf, N.-P. (2003). Gender Equality and Long-Run Growth. *Journal of Economic Growth*, 8(4), 403–26.

Loko, B., & Diouf, M.A. (2009). Revisiting the Determinants of Productivity Growth: What's New? *IMF Working Paper 09/225*

Lorgelly, P.K., & Owen, P.D. (1999). The Effect of Female and Male Schooling on Economic Growth in the Barro-Lee Model. *Empirical Economics*, 24(3), 537-557.

Nair-Reichert, U., & Weinhold, D. (2001). Causality Tests for Cross-Country Panels: a New Look at FDI and Economic Growth in Developing Countries. *Oxford Bulletin of Economics and Statistics*, 63(2), 153-171.

Organization for Economic Cooperation and Development (2012). Closing the Gender Gap: Act Now

Popov, A. (2014). Credit Constraints, Equity Market Liberalization, and Growth Rate Asymmetry. *Journal of Development Economics*, 107, 202-214.

Rajan, R. & Zingales, L. (1998). Financial Dependence and Growth. *American Economic Review*, 88, 559-586.

Schultz, T.P. (2002). Why Governments Should Invest More to Educate Girls. *World Development*, 30(2), 207-225.

Seguino, S. (2000). Gender Inequality and Economic Growth: A Cross-Country Analysis. *World Development*, 28(7), 1211–30.

Sen, A. (1989). Women's Survival as a Development Problem. *Bulletin of the American Academy of Arts and Sciences*, 43(2), 14-29.

Sen, A. (1990). More Than 100 Million Women Are Missing. *The New York Review of Books*, 37(20), 61-66.

Stokey, N.L. (1994). Comments on Barro and Lee. In Carnegie-Rochester Conference Series on Public Policy, 40, 47-57.

Stotsky, J.G. (2006). Gender and Its Relevance to Macroeconomic Policy: A Survey. *IMF Working Paper 06/233.*

Stotsky, M.J.G., Shibuya S., Kolovich L., & Kebhaj S. (2016). Trends in Gender Equality and Women's Advancement. *IMF Working Paper 16/21.*

Tzannatos Z. (1999). Women and Labor Market Changes in the Global Economy: Growth Helps, Inequalities Hurt and Public Policy Matters. *World Development,* 27(3), 551–569.

United Nations General Assembly (2015). Transforming Our World: The 2030 Agenda for Sustainable Development. *United Nations General Assembly, A/RES/70/1*.

United Nations Development Program (2014). Technical Notes: Calculating the Human Development Indices – Graphical Presentation. *UNDP*

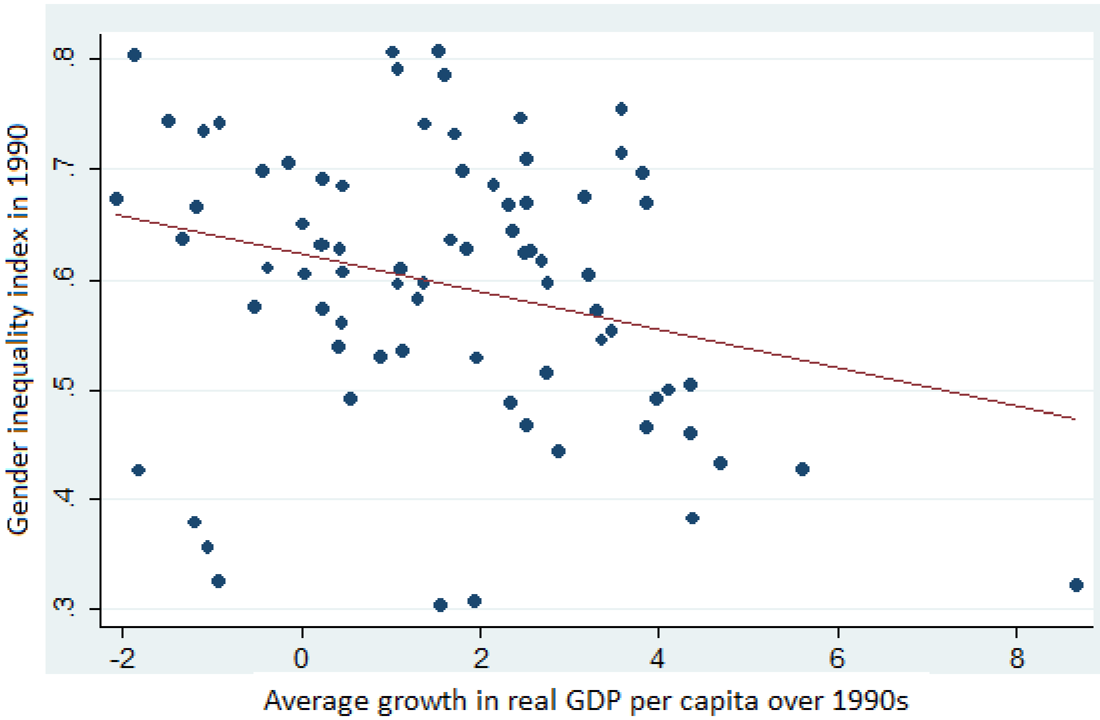
United Nations Secretary-General's High-Level Panel on Women's Economic Empowerment (2016). Leave No One Behind – A Call to Action for Gender Equality and Women's Economic Empowerment. *UN*

World Development Report (2012). Gender Equality and Development. *World Bank.*

Yamarik S., Ghosh S. (2003). Is Female Education Productive? A Reassessment. Mimeograph, Tufts University, Medford, MA.

Zhang, J. (2017). The Evolution of China's One-Child Policy and Its Effects on Family Outcomes. *Journal of Economic Perspectives*, 31(1), 141-160.

FIGURE 1: Gender inequality and real GDP per capita growth



Correlation: -0.269
p-value: 0.019

Source: World Bank WDI database for GDP growth rates in real terms, IMF for GII in 1990.
Notes: This graph plots average growth rate of real GDP per capita for emerging and developing countries over the 1990s and GII in 1990.

FIGURE 2: Mean and standard deviation of share of female labor in total labor within each industry over 1980s in Sweden.

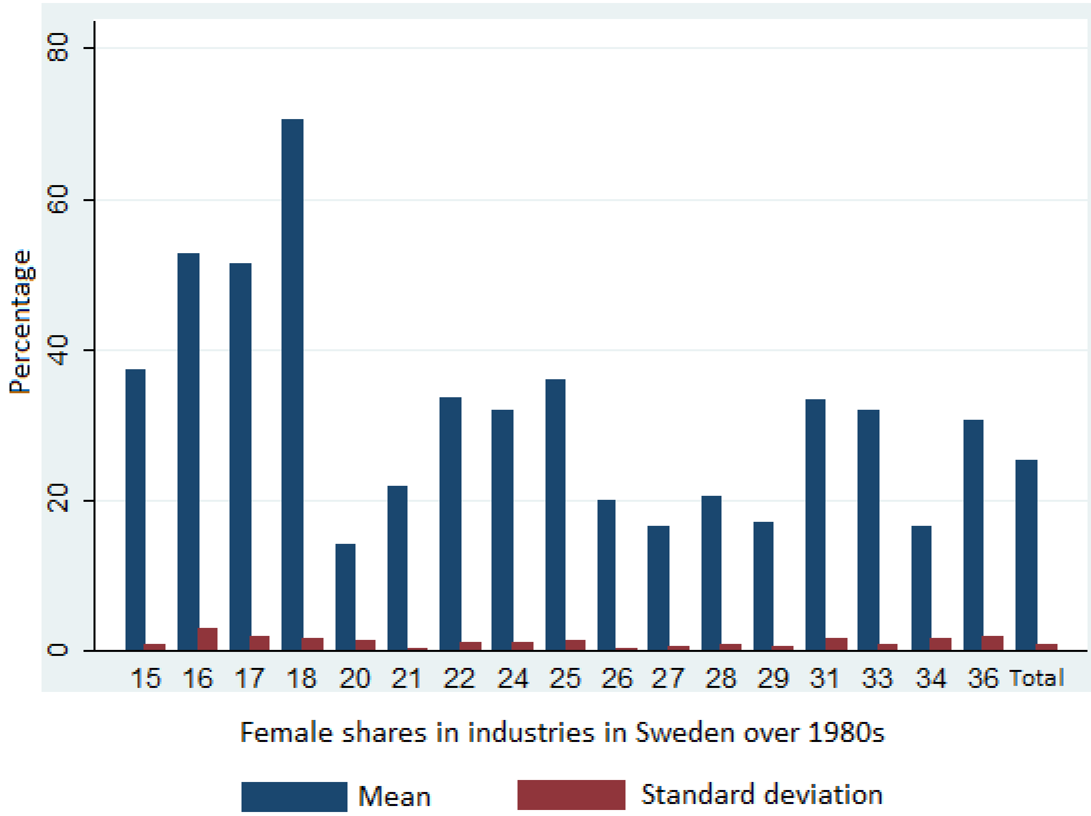


FIGURE 3: Mean and standard deviation of gender inequality index (GII) over 1990s

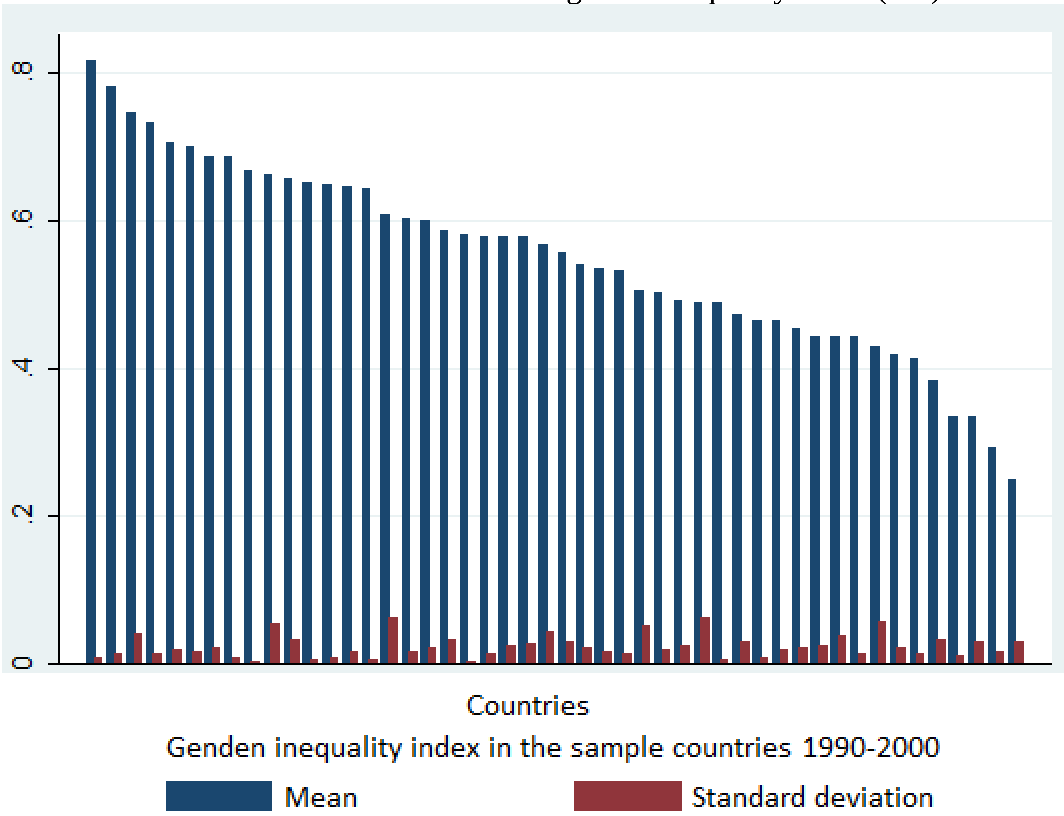


TABLE 1: Industries' female shares (%) in countries with the lowest gender inequality index (GII)

ISIC Code	Industry details	Percentage of female employees to total employees, average during the corresponding period in					
		Sweden 1980s	Canada 1980s	Ireland 1988:95	Austria 1990s	New Zealand 1990s	Australia 1980s
15	**Food and beverages**	37.433	28.686	23.738	39.917	28.340	29.651
16	**Tobacco products**	52.734	36.911	40.203	37.888	42.248	40.086
17	**Textiles**	51.413	44.788	44.743	51.768	45.429	47.219
18	**Wearing apparel**	70.639	75.387	78.421	85.502	77.378	74.598
20	**Wood products (excl. furniture)**	13.995	8.098	10.894	17.628	11.640	12.662
21	**Paper and paper products**	21.797	13.253	25.722	18.955	18.014	18.349
22	**Printing and publishing**	33.726	43.197	30.754	35.662	41.876	34.873
24	**Chemicals and chemical products**	32.160	28.495	31.653	29.574	35.177	28.017
25	**Rubber and plastics products**	36.192	29.308	26.025	28.684	24.166	29.957
26	**Non-metallic mineral products**	19.780	11.400	14.871	19.912	15.075	10.986
27	**Basic metals**	16.347	7.473	9.321	11.749	10.232	7.605
28	**Fabricated metal products**	20.422	15.756	12.877	19.572	15.740	17.879
29	**Machinery and equipment n.e.c.**	16.904	16.104	26.799	14.976	17.130	16.747
31	**Electrical machinery and apparatus**	33.395	41.600	50.243	29.852	30.307	33.312
33	**Medical, precision and optical instr.**	32.110	36.169	56.064	41.513	35.798	46.588
34	**Motor vehicles, trailers, semi-trailers**	16.510	14.930	21.036	13.803	19.674	10.834
36	**Furniture; manufacturing n.e.c.**	30.831	28.852	35.713	31.422	24.261	25.319

Notes: The table reports the average ratio of female employees to total employees in industries in our benchmark countries over the corresponding period. We note that these periods are restricted by the availability of UNIDO data for each of these countries.

TABLE 2: Gender inequality index (GII) by countries

PANEL A

Country	**GII**	**Country**	**GII**	**Country**	**GII**	**Country**	**GII**
Regression sample							
Hungary	0.308	Philippines	0.493	Peru	0.598	Bangladesh	0.669
China	0.322	Mauritius	0.506	Ecuador	0.605	Cameroon	0.674
Bulgaria	0.326	Argentina	0.516	South Africa	0.611	Algeria	0.705
Mongolia	0.379	Mexico	0.529	Botswana	0.618	Nepal	0.710
Malta	0.382	Barbados	0.531	Syria	0.625	India	0.715
Malaysia	0.433	Jamaica	0.537	Turkey	0.627	Kenya	0.742
Romania	0.434	Venezuela	0.540	Bolivia	0.629	Central African Republic	0.744
Sri Lanka	0.462	Brazil	0.561	Honduras	0.632	Iran	0.747
Trinidad and Tobago	0.466	Tunisia	0.572	Egypt	0.644	Belize	0.755
Uruguay	0.468	Gabon	0.576	Senegal	0.651	Niger	0.804
Costa Rica	0.488	Colombia	0.583	Iraq	0.660	Jordan	0.806
Thailand	0.492	Indonesia	0.598	Swaziland	0.668	Morocco	0.807

PANEL B

Country	**GII**	**Country**	**GII**	**Country**	**GII**	**Country**	**GII**
"Benchmark" countries							
Sweden	0.093	Canada	0.214	Ireland	0.255	Austria	0.255
Australia	0.266	New Zealand	0.284				

Notes: Panel A reports GII in 1990 for the countries in our regression sample (for the analyses that use GII). Panel B reports the GII in our "benchmark" countries.

TABLE 3: Descriptive statistics

PANEL A

Variable	Mean	Median	Std. dev.	Min	Max	Obs.
Value-added growth	0.022	0.026	0.172	-1	1	692
Lab. Prod. growth	0.012	0.014	0.128	-0.802	1	660
Value-Added share	0.063	0.035	0.083	0.000	0.615	692
Log GDP per cap	8.193	8.419	0.779	6.372	9.442	46
Log population	16.268	16.338	1.910	12.142	20.850	47
Log pop. density	3.841	3.791	1.485	0.341	7.009	47
Female share in popul.	0.502	0.502	0.009	0.476	0.539	47
Fin. development	0.418	0.343	0.229	0.115	1.270	45
Export	0.302	0.254	0.181	0.059	0.758	47
Import	0.326	0.282	0.203	0.046	0.896	47
Trade	0.628	0.563	0.375	0.150	1.645	47
FDI inflows	0.011	0.009	0.011	-0.010	0.053	47
Teacher/stud. ratio	0.052	0.051	0.017	0.027	0.104	39
Rule of law	-0.236	-0.232	0.662	-1.513	1.062	47
External fin. dep.	-0.089	0.010	0.309	-0.920	0.280	17
GII	0.582	0.598	0.129	0.308	0.807	48
Adolescent fertility rate	7.918	7.050	4.660	0.658	22.221	65
Relative infant mortality	0.828	0.823	0.049	0.685	0.952	62
GPI	0.917	0.973	0.140	0.525	1.080	57
Relative labor part.	2.225	1.741	1.527	1.051	8.341	64
Women's rights law score	0.643	0.649	0.138	0.357	0.857	37
Female shares (%) "Benchmark" countries						
Sweden	31.552	32.110	15.359	13.995	70.639	17
Canada	28.259	28.686	17.436	7.473	75.387	17
Ireland	31.711	26.799	18.062	9.321	78.421	17
Austria	31.081	29.574	17.976	11.749	85.502	17
New Zealand	28.970	24.261	16.688	10.232	77.378	17
Australia	28.551	28.017	17.093	7.605	74.598	17

PANEL B

Correlations table: Female shares (%)	Sweden	Canada	Ireland	Austria	New Zealand	Australia
Sweden	1					
Canada	0.923	1				
Ireland	0.820	0.914	1			
Austria	0.937	0.941	0.865	1		
New Zealand	0.935	0.966	0.885	0.935	1	
Australia	0.934	0.964	0.929	0.965	0.959	1

PANEL C

Variable	**GII**	**Adolescent fertility rate**	**Relative infant mortality**	**Relative labor force participation**	**GPI**	**Women's rights law score**
GII	1					
Adolescent fertility rate	0.541***	1				
Relative infant mortality	0.568***	0.228	1			
Relative labor force participation	0.427***	-0.1616	0.383***	1		
GPI	-0.572***	-0.408***	-0.670***	-0.182***	1	
Law score	-0.555***	-0.297*	-0.2377	-0.292*	0.339**	1

Notes: Panel A reports the descriptive statistics of the variables used in the analyses. Panel B reports the correlations between industries' female shares estimated using different benchmark countries. Panel C reports the pairwise correlations between different measures of gender inequality measures in sample countries. Statistical significance: * $p<0.10$ ** $p<0.05$ *** $p<0.01$

TABLE 4: Gender inequality and actual growth rates in different industries.

	Countries		
	High gender inequality	**Low gender inequality**	**Growth Differential**
Industries	**Average growth in industries with high female employment over the 1990s**		
Industries above 75th pctile of female share	0.4	1.4	1.8
Industries	**Average growth in industries with low female employment over the 1990s**		
Industries below 25th pctile of female share	-0.4	-0.4	0.0

Notes: The table reports the mean residual growth rate (in percentage points) obtained after regressing the average annual growth rate in real value-added for the period of the 1990s on industry and country fixed effects. We report mean residual growth rates for the industries above the 75th percentile (high female share) and below the 25th percentile (low female share) based on the female shares in industries from Sweden. We document these growth rates in countries below and above the median of GII, i.e., countries with high inequality versus low inequality, respectively. To reduce the outliers bias, we drop the industry with the highest and the lowest GII in our sample, Morocco, and Hungary, respectively.

TABLE 5: Industry value-added growth and gender inequality

Variable	**Female shares estimated using**					
	Sweden 1980s	**Canada 1980s**	**Ireland 1988:95**	**Austria 1990s**	**New Zealand 1990s**	**Australia 1980s**
Initial Value-added share	-0.005 (0.012)	-0.006 (0.012)	-0.006 (0.012)	-0.005 (0.012)	-0.005 (0.012)	-0.005 (0.012)
Female share x GII	-0.569** (0.259)	-0.573*** (0.219)	-0.489** (0.203)	-0.522** (0.230)	-0.582** (0.238)	-0.627*** (0.233)
R square	0.409	0.410	0.409	0.410	0.410	0.411
Adjusted R square	0.348	0.349	0.348	0.348	0.349	0.350
No of observations	692	692	692	692	692	692
Differential growth rate	1.7	2.2	1.7	1.7	1.9	2.0

Notes: The dependent variable is the average real growth rate of value-added over the period of the 1990s for each ISIC industry in each country. Female share is the average fraction of female labor in total labor in an industry in a benchmark country – over a given period. The interaction variable is the product of female share and gender inequality index (GII). We use GII as constructed by Stotsky et al. (2016) and average female shares in industries from Table 1 for each benchmark country. Value-added is the share of an industry's value-added in total manufacturing in a country in 1990. Differential growth rate measures (in percentage terms) how much faster the industry at the 75th percentile of female shares grows compared to the industry at the 25th percentile of female shares, when it is located in a country at the 25th percentile of gender inequality (*Costa Rica*) rather than in one at the 75th percentile (*Cameroon*). We set the industry's initial value-added share of manufacturing at its overall mean. All regressions include both country and industry fixed effects (coefficient estimates not reported). Heteroskedasticity-robust standard errors are reported in parentheses, * p<0.10 ** p<0.05 *** p<0.01.

TABLE 6: Labor productivity growth (value-added based) and gender inequality

Variable	Female shares estimated using					
	Sweden 1980s	**Canada 1980s**	**Ireland 1988:95**	**Austria 1990s**	**New Zealand 1990s**	**Australia 1980s**
Initial Value-added share	0.010 (0.007)	0.009 (0.007)	0.009 (0.007)	0.010 (0.007)	0.010 (0.007)	0.010 (0.007)
Female share x GII	-0.446** (0.192)	-0.411*** (0.151)	-0.367*** (0.142)	-0.412*** (0.155)	-0.436*** (0.165)	-0.453*** (0.163)
R square	0.375	0.375	0.374	0.375	0.375	0.376
Adjusted R square	0.310	0.310	0.309	0.310	0.310	0.311
No of observations	660	660	660	660	660	660
Differential growth rate	1.2	1.4	1.1	1.2	1.3	1.3

Notes: The table reports the estimates using real labor productivity growth as the dependent variable instead of real value-added growth over the 1990s. Gender Inequality Index (GII) is constructed by Stotsky et al. (2016) to measure gender inequality, and industries' female shares for corresponding benchmark country are from Table 1. Differential growth rate measures (in percentage terms) how much faster the industry at the 75^{th} percentile of female shares grows compared to the industry at the 25^{th} percentile of female shares, when it is located in a country at the 25th percentile of gender inequality (*Costa Rica*) rather than in one at the 75th percentile (*Cameroon*). All regressions include both country and industry fixed effects (coefficient estimates not reported). Heteroskedasticity-robust standard errors are reported in parentheses, * p<0.10 ** p<0.05 *** p<0.01.

TABLE 7: Industry growth and alternative gender inequality measures

Variable	Gender inequality is measured by				
	Adolescent fertility rate	Relative infant mortality	Relative labor force participation	Gender parity index	Women's rights law score
Initial Value-added share	-0.014 (0.009)	-0.014 (0.010)	-0.014 (0.009)	-0.011 (0.009)	0.004 (0.012)
Female share x GI Variable	-0.252** (0.010)	-1.538** (0.769)	-0.032* (0.019)	0.802** (0.409)	0.773** (0.385)
R square	0.372	0.372	0.365	0.385	0.375
Adjusted R square	0.311	0.310	0.303	0.323	0.305
No of observations	911	878	911	807	537
Differential growth rate	2.5	1.4	0.6	2.6	3.2

Notes: The table replaces GII with alternative proxies for gender inequality in the basic test (1). We use industries' female shares estimated from Sweden. Adolescent fertility rate is measured as number of births per 100 women aged 15-19 years. Relative infant mortality is the ratio of infant female mortality to infant male mortality. Gender parity index (GPI) is the ratio of female students to male students. Relative labor force participation is labor participation rate of males relative to females. Women's rights law score is constructed using Women's Legal Right data, that contains questions related to women's legal rights replied with "Yes" or "No", depending on the presence of laws in a country. We construct the law score for each country by dividing number of affirmative answers to the number of total replied (i.e., codified) questions for each country in 1990. Differential growth rate measures (in percentage terms) how much faster the industry at the 75th percentile of female shares grows compared to the industry at the 25th percentile of female shares, when it is located in a country at the 25th percentile of gender inequality (*Costa Rica*) rather than in one at the 75th percentile (*Cameroon*). All regressions include both country and industry fixed effects (coefficient estimates not reported). Heteroskedasticity-robust standard errors are reported in parentheses. * p<0.10 ** p<0.05 *** p<0.01.

TABLE 8: Robustness checks (GII and gender compositions in Sweden)

An additional interaction term between female shares in industries and the following variable is included in the basic test (1)												
Variable	**GDP**	**Popul.**	**Popul. density**	**Female share in popul.**	**Export**	**Import**	**Openness**	**FDI**	**Fin. Dev.**	**Rule Law**	**Human capital**	**Smaller ind.**
Initial Value-added share	-0.004 (0.013)	-0.004 (0.012)	-0.004 (0.011)	-0.004 (0.012)	-0.004 (0.012)	-0.005 (0.012)	-0.004 (0.012)	-0.004 (0.012)	-0.007 (0.012)	-0.004 (0.012)	-0.000 (0.013)	-0.022 (0.024)
Female share x GII	-0.581*** (0.234)	-0.598** (0.271)	-0.535** (0.270)	-0.597** (0.276)	-0.546** (0.259)	-0.552** (0.259)	-0.541** (0.258)	-0.573** (0.276)	-0.515** (0.261)	-0.547** (0.279)	-0.619** (0.303)	-1.381** (0.541)
Female share x Variable	-0.002 (0.078)	0.009 (0.018)	0.024 (0.027)	-0.612 (2.894)	0.119 (0.169)	0.214 (0.131)	0.092 (0.073)	0.277 (3.505)	0.246 (0.197)	0.049 (0.090)	2.642 (3.136)	
R square	0.393	0.399	0.400	0.399	0.399	0.400	0.400	0.399	0.341	0.399	0.412	0.396
Adjusted R square	0.328	0.335	0.335	0.335	0.335	0.336	0.335	0.335	0.246	0.335	0.344	0.246
No of observations	666	675	675	675	675	675	675	675	651	675	551	322
Differential growth rate	1.7	1.7	1.6	1.7	1.6	1.6	1.6	1.7	1.4	1.6	1.7	3.3

Notes: We use Gender Inequality Index (GII) constructed by Stotsky et al. (2016) to measure gender inequality and industries' female shares estimated from Sweden. All columns – except the last column – include an additional interaction between the macroeconomic variable shown at the column heading and industry's female share. The last column splits the sample and estimates the basic test (1) using only the industries below the median of value-added share in each country (i.e., smaller industries). GDP is the log of country's real GDP per capita. Population is the log of total population, whereas population density is the log of the ratio of population to total area. Female share in population is the ratio of number of females to number of males in the country. Export and import are scaled by GDP, whereas openness is measured as export plus import divided by GDP. FDI is measured by the net inflows as a share of GDP. Financial development is proxied by broad money as a share of GDP. Rule of Law is defined as a dummy for having higher than median rule of law score as obtained from World Governance Indicators. Human capital is teacher to student ratio in the secondary education. All macroeconomic data is from World Bank. Differential growth rate measures (in percentage terms) how much faster the industry at the 75^{th} percentile of female shares grows compared to the industry at the 25^{th} percentile of female shares, when it is located in a country at the 25th percentile of gender inequality (*Costa Rica*) rather than in one at the 75th percentile (*Cameroon*). All regressions include both country and industry fixed effects (coefficient estimates not reported). Heteroskedasticity-robust standard errors are reported in parentheses. * $p<0.10$ ** $p<0.05$ *** $p<0.01$.

TABLE 9: External finance dependence versus gender composition: Tests with financial development and external dependence on finance

Variable	(1)	(2)	(3)	(4)	(5)
Initial Value-added share	-0.004 (0.012)	-0.005 (0.012)	-0.007 (0.013)	-0.007 (0.013)	-0.007 (0.013)
Female share x GII		-0.623** (0.287)			-0.575** (0.293)
Ext. fin. dep x GII	0.150 (0.133)	-0.045 (0.148)			-0.051 (0.161)
Female share x fin. dev.			0.261 (0.202)	0.299 (0.196)	0.281 (0.191)
Ext fin. dep x fin. dev.				0.031 (0.146)	0.029 (0.145)
R square	0.406	0.409	0.338	0.338	0.341
Adjusted R square	0.345	0.347	0.268	0.267	0.268
No of observations	692	692	651	651	651
Differential growth rate	-	1.8	-	-	1.5

Notes: We obtain the data on industries' external finance from Popov (2014) for US firms in the 1980s for corresponding industries. We use Gender Inequality Index (GII) constructed by Stotsky et al. (2016) to measure gender inequality and industries' female shares estimated from Sweden. Differential growth rate measures (in percentage terms) how much faster the industry at the 75th percentile of female shares grows compared to the industry at the 25th percentile of female shares, when it is located in a country at the 25th percentile of gender inequality (*Costa Rica*) rather than in one at the 75th percentile (*Cameroon*). All regressions include both country and industry fixed effects (coefficient estimates not reported). Heteroskedasticity-robust standard errors are reported in parentheses. * p<0.10 ** p<0.05 *** p<0.01.

TABLE 10: Additional robustness checks

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Initial Value-added share	-0.004 (0.012)	-0.005 (0.012)	-0.004 (0.012)	-0.005 (0.012)	-0.006 (0.012)	-0.005 (0.009)
Female share x GII	-0.774** (0.303)	-0.215*** (0.071)	-0.072** (0.031)	-0.594** (0.238)	-0.596** (0.214)	-0.507** (0.233)
R square	0.414	0.411	0.409	0.410	0.411	0.444
Adjusted R square	0.352	0.350	0.348	0.349	0.350	0.386
No of observations	658	692	692	692	692	692

Notes: In column (1), we drop the two countries with the highest and the lowest GII in our sample (Morocco and Hungary, respectively). In column (2), rather than using a linear measure of gender composition, we construct a dummy to indicate relatively high female shares in industries (above the median), estimated from Swedish data. In column (3), we use a categorical variable from 1 to 4 to classify industries' female shares in 4 categories based on quartiles of the distribution. In column (4), for each industry, we take the average of female shares across six benchmark countries and assign this value as the female share for the industry. In column (5), for each industry, we find the maximum of female shares across five benchmark countries and assign this value as the female share for the industry. In column (6), we winsorize the mean growth rates 1 and 99 percent, instead of restricting -1 and 1. We use female shares estimated from Sweden. All regressions include both country and industry fixed effects (coefficient estimates not reported). Heteroskedasticity-robust standard errors are reported in parentheses. * p<0.10 ** p<0.05 *** p<0.01.

Table A1: Description of variables

Variable	Description	Data source
Female shares	The average ratio of female employees to total employees in industries in a benchmark country over the corresponding period.	UNIDO, Rev.3
Value-added growth	The average growth in value-added in an industry over the 1990s. The nominal values in US dollars are deflated by the PPI in the US. PPI for the US is obtained from FRED database.	UNIDO, Rev.3
Labor productivity growth	The average growth in (value-added based) labor productivity (i.e., value-added per worker) in an industry over the 1990s.	UNIDO, Rev.3
Value-added share	The value-added of an industry in the total manufacturing in a country in 1990.	UNIDO, Rev.3
PPI for the US	Producer Price Index for the USA (2010=100)	IMF's IFS
Log GDP per cap	Log of GDP per capita (constant US dollars) in a country in 1990.	WB
Log pop	Log of population in a country in 1990.	WB
Log pop density	Log of the ratio of population to km2 area in a country in 1990.	WB
Financial development	The broad money as a share of GDP in a country in 1990.	WB
Export	The export as a share of GDP in a country in 1990.	WB
Import	The import as a share of GDP in a country in 1990.	WB
Trade	The trade as a share of GDP in a country in 1990.	WB
FDI inflows	The FDI net inflows as a share of GDP in a country in 1990.	WB
Teacher/student ratio	The ratio of the number of teachers to the number of students in the secondary education in a country in 1990.	WB
Rule of law	The rule of law estimate in a country in 1996 (the earliest date available)	WB, WGI
GII	Gender inequality index in a country in 1990, constructed by Stotsky et al. 2016. This is a direct measure of gender inequality.	IMF
Adolescent fertility rate	The fertility rate per 100 females between age 15-19 in a country in 1990. This is a direct measure of gender inequality.	WB
GPI	The number of female students to the number of male students in a country in 1990. This is an inverse measure of gender inequality.	WB
Relative infant mortality	The ratio of female infant mortality to male infant mortality in a country in 1990. This is a direct measure of gender inequality.	WB
Relative labor participation	The ratio of male labor force participation to female infant mortality in a country in 1990. This is a direct measure of gender inequality.	WB
Women's rights law score	The ratio of the number of positive aspects of women's legal rights to total codified aspects of the women's legal rights.	Women, Business and the Law (WBL)