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

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Gender Inequality and Economic Growth: Evidence from Industry-Level Data[1]

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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 industries with typically higher female share in their employment relative to other industries. Specifically, we exploit within-country variation across industries to test whether those that typically employ more women grow relatively faster in countries with ex-ante lower gender inequality. The test allows us to identify the causal effect of gender inequality on industry growth in value-added and labor productivity. Our findings show that gender inequality affects real economic outcomes.

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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."

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

Worldwide, productivity growth and the pace of human development are slowing (ILO 2017), and women's full and effective participation in the workforce and decent work for all are critical to inclusive and sustainable economic growth[1]. While women account for half of the total population, they remain an underused resource, constituting less than a third of the actual workforce (Lagarde 2013). According to the report of the United Nations (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 the health of their children, building human capital to fuel future growth (see, for example, Schultz 2002). Helping women fully participate in the economy is not only growth promoting, but it also diversifies the economies, reduces income inequality, mitigates demographic shifts, and contributes to financial sector stability (Gonzales and others 2015; Kochhar and others 2017; IMF 2018a). In many countries, constraints such as discriminatory laws, a 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 (*World Development Report* (WDR) 2012). Gender equality and the empowerment of women are, thus, not merely issues of human rights, but also economic necessities, and central to the development agenda (IMF and WB 2007; IMF 2017).

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

An extensive body of work documents gender inequality in both opportunities (for example, education, health, and finance) and outcomes (for example, employment and earnings), with a particularly rich literature 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 (for example, Galor and Weil 1996; Lagerlöf 2003), largely due to its effects on the creation of human capital and on fertility. In Figure 1, we plot GDP per capita growth against the gender inequality index for the period of the 1990s for a sample of countries for which the data are available and show that the two variables are, indeed, negatively correlated. Most 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 macroeconomic literature is to use a regression analysis to relate the countries' per capita income growth 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, for example, Gonzales and others 2015). Such cross-country approaches, however, raise endogeneity concerns—well known in the economic growth literature. Reverse causality is an issue in studying the role of gender inequality for economic progress, as 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 both enhance the growth of and narrow the gender gap. One avenue to take to address these challenges would

[2] See WDR (2012) for the global trends in gender inequality, and Blau and Kahn (2017) for a recent review on gender wage gap literature. A recent study by Deléchat and others (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 and Lee 1996; Barro and 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 a country's backwardness. This result, however, does not stand up to more rigorous econometric tests (see, for example, Stokey 1994; Caselli and others 1996; Forbes 2000; Kazandjian and others 2016).

be to use an 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].

This paper contributes to the literature on gender inequality and economic growth making a step forward in causal inference by focusing on a particular channel through which higher gender equality may support economic growth: by allocating female labor to its more productive use. We argue that higher gender equality enables firms to make better use of available labor resources, which boosts growth (see, for example, Barsh and Yee 2012 and Cornell Center for Advanced Human Resource Studies (CAHRS) 2011). To the extent that different industries typically have different gender compositions, we exploit the heterogeneity across manufacturing industries to identify the causal effect of gender inequality on economic growth. By focusing on the differential effect of gender inequality on economic growth within countries between industries, we address the bulk of the endogeneity concerns that arise in aggregate level cross-country studies.

We hypothesize that higher gender equality should disproportionately benefit industries with a typically greater share of women in their employment relative to other industries. 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 (Cuberes and Teignier 2016; Kochhar and others 2017). 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—for example, by making their career ladders higher—which is also growth promoting (Islam and Amin 2016). The effects on both margins would be more evident for high-female-share industries as, on the extensive margin, a larger share of newly hired women join these industries and, on the intensive margin, unlocking women's

[4] In a cross-country study, Klasen (2002) uses the instrumental variable method to address the endogeneity of gender inequality in education and to relate it to economic development. Esteve-Volart (2004) uses the instrumental variable technique at the subnational level, providing suggestive evidence that gender discrimination in the labor market may hamper economic growth. Kazandjian and others (2016) use the instrumental variable generalized method of moments technique (IV-GMM) to show that gender inequality impedes output diversification and lowers exports. Hakura and others (2016) use the system-GMM estimations to show that income and gender inequality jointly impede growth in sub-Saharan Africa, mostly in the initial stages of development.

potential at work is more beneficial to industries that have a greater share of female labor in their total employment[5].

To test our hypothesis, we adapt the difference-in-differences (DiD) application by Rajan and Zingales (1998—henceforth RZ) studying the finance-growth nexus. The 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 intrinsic gender composition by looking at its share of female labor in total labor in Sweden (the country with by far the lowest GII in the relevant period), under the assumption that the labor market in this country in the observed period is relatively frictionless regarding women's access and attitudes to jobs across different industries. We further assume that these estimated industries' "clean" gender compositions carry over to other countries, which enables us to investigate whether industries that typically employ more women grow relatively faster in countries that, a priori, have lower gender inequality. This assumption implies that, ceteris paribus, a high-female-share industry such as *wearing apparel*, should grow relatively faster than *wood*, which has a low share of female labor in its total employment, in more gender-equal countries.

In the context of our analysis that exploits the dynamics in the labor market, high development on the gender equality front (such as in Sweden) is assumed to entail a large reduction of frictions on both the *demand side* of labor (due to, for example, discrimination in the labor market) and the *supply side* (due to, for example, gender social norms). Thus, in the absence of gender-based frictions, the bulk of the heterogeneity in gender compositions across industries may be attributed to the 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 an industry to employ them. This is somewhat different from an implicit assumption by RZ in the context of the capital markets analysis, where the high financial development (such as in the US) is assumed to remove the constraints solely on the *supply side* of credit. Except for differences in the assumptions driving the identification of the industries' features in a benchmark country, our methodology is equivalent to their empirical method.

[5] "High-female-share" does not strictly imply that the share of women in an industry's employment is higher than the share of men (that is, >50 percent), but that it is high relative to other industries.

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 facilitates identifying the causal effect of gender inequality on real economic outcomes.

To this end, we use industry-level employment data on manufacturing from the UN Industrial Development Organization (UNIDO) database and country-level data on a composite gender inequality index (GII), which have been released by the IMF (Stotsky and others 2016). 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 and others 2010; UN Development Programme (UNDP) 2014).

Our findings suggest that gender inequality has a causal effect on real economic outcomes at the industry level. Using a large sample of emerging-market and developing economies, we show that the industries with a typically greater share of women in their employment compared to other industries grow relatively faster in more gender-equal countries. Our estimates predict that an industry at the 75th percentile of the female share in total employment, compared to an industry at the 25th percentile, grows 1.7 percentage points faster in terms of value-added (and 1.2 percentage points 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 percent per year, whereas the average growth of labor productivity is 1.2 percent. Our results are robust to using different measures of gender inequality and to a wide range of alternative explanations such as outliers, measurement error, omitted variables, and reverse causality.

2. Hypothesis and Methodology

We hypothesize that industries with a typically greater share of women in their employment compared to other industries grow relatively slower in countries that, a priori, have higher gender inequality. Both extensive and intensive margins of employment may relate to this effect. On the extensive margin, higher gender equality would lead to more and better educated women entering the labor force and thus to a larger pool of talent for firms to hire from. Higher productivity of the marginal worker, in turn, raises industries' productivity and boosts industries' growth. On the intensive margin, higher gender equality would empower women to fulfill their full potential in the labor market—for example, by promoting them to managerial positions (or positions of influence)—which is also growth promoting. The effects on both margins would be more evident for high-female-share industries: on the extensive margin, a larger share of newly hired women joins industries that typically hire more women; on the intensive margin, unlocking women's potential at work is more beneficial to industries that have a greater share of female labor in their total employment[6].

We follow the identification strategy first proposed by RZ in studying the 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 DiD model:

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

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 control for the country and industry characteristics by using a set of dummy variables for each country and industry (μ_k and ν_i, respectively). Many of the core determinants of growth, such as differences in capital accumulation of different industries, will be captured by industry fixed effects, while factors such as institutional differences

[6] Our methodology focuses on the differentials in industry growth rates, thus it does not imply that the low-female-share industries do not grow. We also do not rule out potential complementarities between female and male labor as a relevant determinant of industry growth, as proposed by IMF 2018b. Any such complementarities could provide an additional boost to productivity beyond the direct effect of hiring (or promoting) a more talented woman over a less talented man.

will be captured by country fixed effects. We also control for industry *i*'s value-added share of manufacturing in country k in 1990 ($X_{i,k}$) to deal with possible convergence effects, which varies across industries and countries and thus is not captured by country nor industry fixed effects (Rajan and Subramanian 2011). Our main coefficient of interest is for the interaction term of a 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 across industries based on the interactions between industries' female shares and a country's gender inequality. An industry's female share is defined as a number of female employees to total employees in the country 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 specific DiD application by RZ. First, there are some intrinsic reasons that lead certain industries to typically employ more female labor than others. We propose that the main reason for observed horizontal segregation—that is, the differences in gender compositions of labor across industries—lies in the industry-specific relative MPL 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 small 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 the *wearing apparel* industry employs more female labor than the *wood* industry in Sweden, it also employs more female labor in Turkey. In line with this assumption, the WDR (2012) documents that economic development seems to have a limited impact on gender segregation in employment. Perhaps somewhat surprisingly, the report finds little, if any, relationship between GDP per capita and standard measures of segregation (sectoral and occupational) along gender dimension and that gender segregation in employment is quite persistent (over time) and consistent (across countries). The WDR 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 industry-specific relative MPL between women and men. Namely, the higher the women's relative MPL in an industry with respect to men's, and thus their comparative advantage, the higher the incentive for an industry to employ them[7]. We document little variation of industries' gender composition in our sample either over time or within a group of our benchmark countries (that is, 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 the female share in an industry across time is rather low, around 4 percent 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, our assumption of stable patterns of industries' gender compositions is reasonable.

Data on actual industries' gender compositions are typically not available for a large majority of countries. But even if they were, the data would not be useful for our purpose, as a share of female labor in total employment of an industry in a given country is an equilibrium outcome in the labor market, likely distorted by existing gender-based frictions (for example, discrimination). As we are interested in industries' intrinsic heterogeneity arising from women's relative MPLs compared to men's in a given industry, such data would be contaminated[8]. We thus start by computing the share of female labor in total labor in Sweden. In a country with full gender equality, industries' actual gender compositions would not be contaminated by gender-based frictions in the labor market, thus there would be no identification problem. Gender equality in

[7] Discrimination—often one of the main gender-based frictions in the labor market—artificially restricts the demand for female labor, as recognized by the 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 a large share of the population is aware of gender discrimination laws in the hiring process (more than 50 percent in 2007, according to the IMF).

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

Sweden in the 1980s was sufficiently high to make it reasonable to assume that employment of female labor by an industry in Sweden throughout this period was likely to be a relatively clean measure of women's relative MPL compared to men's within a given industry[9]. 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-market and developing economies under study—which cover the 1990s. We assume that (the bulk of) the change in an industry's relative MPLs of women and men, shaping an industry's intrinsic gender composition, arises due to the technological shocks that change the nature of the available jobs within an industry. Women generally perform more routine tasks that are more prone to automation (IMF 2018c; Brussevich and others 2019). For example, mechanization of much of the physically less demanding work in mining (such as handpicking and sorting ore) led to fewer and fewer women working in the mine, just as in the other industries during the industrialization period (Abrahamsson and others 2014). To the extent that such technological advances are worldwide and that our regression sample consists of emerging-market and developing economies in the 1990s, the state of production technologies in Sweden in the 1980s makes a suitable proxy (especially given our focus on the manufacturing sector). Our results are robust to using alternative dates and countries for benchmarking. Our benchmark countries should 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-market and developing economies[10].

[9] 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 in the IMF country ranking.

[10] Note that in Panel A of Table 2, the country with the lowest GII in our regression sample of emerging-market and developing economies (Hungary) has a higher GII (that is, higher gender inequality) than the benchmark country with the highest GII (New Zealand) in Panel B.

3. Data

3.1. Data on industries

We use the ISIC 2-digit industry-level dataset from UNIDO (Revision 3), which restricts our analysis to manufacturing sectors (ISIC 15-37)[11]. We use industry-level value-added data in current US dollars. The nominal value-added was changed to the real value-added using the Producer Price Index (PPI) from the US, since the PPI data are not available for many of our countries[12].

We also draw data on the number of employees and the number of female employees from UNIDO for six countries that we use in calculating female labor shares: Australia, Austria, Canada, Ireland, New Zealand, and Sweden—our main benchmark country. 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 with a value-added share of manufacturing smaller than 0 or greater than 1. We drop the industries for which female employment data are missing for the majority of our benchmark countries or for most years in the relevant period. Our final sample consists of 17 industries.

We calculate the value-added share of an industry in a 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 the real value-added divided by the 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 three data points on growth rates. For industries' external finance dependence (which we use in one of our robustness checks), we adopt the measures from Popov (2014) for US firms in the 1980s for corresponding industries.

[11] Even if the data on the service sector would have been available, services would be less suited for the analysis due to likely lower variation in gender compositions across industries, given that services are documented to be more gender equal in employment than other sectors in both developing and developed economies (Weinberg 2000; Borghans, Weel, and Weinberg 2014; IMF 2018b).

[12] This is consistent with, for example, Guiso and others (2004) and Erman and Kaat (2019), as well as being the standard practice in previous studies of developing countries using UNIDO data.

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 subindexes 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 and others (2016), the IMF has the most comprehensive gender inequality database, which goes back to the year 1990. The IMF calculates this index for approximately 100 economies in the world; the index ranges from 0 to 1, where higher GII indicates higher gender inequality. Sweden is the country with the lowest GII in the 1990s. Its GII has a sizable gap with respect to the rest of the developed economies, thus we use Sweden as the benchmark country in our basic results; we do, however, perform robustness checks using five other countries, with 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-market and developing economies 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 approximately 0.3 in Hungary to approximately 0.8 in Morocco. In our benchmark countries, the GII in 1990 is significantly lower in comparison to Panel A—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, the adolescent fertility rate, relative infant mortality, relative labor force participation, the gender parity index (GPI), and the women's rights law score. The adolescent fertility rate, measured as the number of births per 100 women ages 15–19 years, captures the detrimental health, economic, and social risks and consequences associated with early childbearing. Premature motherhood tends to prevent women from pursuing further education, and thus to obtain higher-skilled jobs (Gaye and others 2010). The relative infant mortality ratio, which is 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, for example Sen 1989, 1990). The GPI, which is the ratio of female students to male students, measures the gender parity in schooling. The relative labor participation ratio, measured by the labor participation rate of males relative to females, captures the relative underrepresentation of women in the workforce—an important component of gender inequality. The 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 contain 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 (that is, 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 in the right direction.

3.2.2. Covariates

We control for institutional quality using a measure of political competition from the Polity IV database (see, for example, Cavallo and Cavallo 2010, and Durdu and others 2019**)**. The index ranges from 0 to 10, with a higher value indicating greater political competition. 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, for example, King and Levine 1993). We follow Barro (1991), among others, and use the teacher-student ratio in secondary education (a measure of the quality of education) as a proxy for the 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 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); and population density, being the number of people divided by land area (km square), used in logs[13]. Summary statistics of the sample are provided in Panel A of Table 3.

[13] 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.

4. Results

We first provide suggestive evidence supporting our hypothesis by documenting growth differentials between high- and low-female-share industries in high and low gender inequality countries. 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 high-female-share industries tend to grow significantly faster in countries with lower gender inequality compared to countries with higher gender inequality. This suggests that the observed patterns of realized growth rate differentials are systematic and that the effect of gender-based frictions is particularly detrimental to industries that typically have a high share of women in their labor.

4.1. Baseline results

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—the coefficient of the interaction between the share of female labor in the total of an industry's employment and a country's GII, and the coefficient of an industry's value-added share in total manufacturing. The dependent variable is an industry's value-added growth.

We start by estimating the industries' gender compositions using our preferred benchmark country—Sweden. As 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[14]. To assess the magnitude of this coefficient estimate, we compute the differential growth rates. Specifically, we compare how much faster an industry at the 75th percentile of female shares (estimated from Sweden, that is, *rubber and plastics products*) grows compared to an industry at the 25th percentile of female shares (that is, *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

[14] 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, although the explanatory power of the regression is lower. Our results are also robust if we winsorize industry growth by 1–99 percent.

overall mean. The coefficient estimate predicts that an industry at the 75th percentile of female shares compared to an industry at the 25th percentile of female shares grows 1.7 percentage points 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 percent per year, so the estimated differential growth rate of 1.7 percentage points 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): Australia, Austria, Canada, Ireland, and New Zealand. The statistical significance of our results is unaffected by the use of alternative benchmark countries, whereas the estimates' magnitude increases in some cases.

As we focus on the differential effects, a potential 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, without real productivity gains. To test this, in Table 6, we show that our results are very similar if we use real labor productivity growth in the 1990s (value-added based) as a dependent variable instead of real value-added growth over the same period. The coefficient estimate predicts that an industry at the 75th percentile of female shares compared to an industry at the 25th percentile of female shares grows 1.2 percentage points 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 percent per year, so the estimated differential growth rate of 1.2 percentage points is large.

4.2. Alternative measures of gender inequality

In Table 7, we test the robustness of our results using alternative measures of gender inequality, including the adolescent fertility rate, relative infant mortality, relative labor participation, GPI, and the women's rights law score. Each of these measures captures a specific aspect of gender inequality in opportunities or outcomes. 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 multidimensional concept of gender inequality. However, it may spark concerns of a measurement error due to the composite nature of the index. A higher value of the adolescent fertility rate, relative infant mortality, and relative labor participation and a lower value of GPI and the women's rights law score indicate higher gender inequality. The results reassure us that our conclusions are robust to using these narrower measures of gender inequality, while showing that inequality in both opportunities (as measured by women's rights law, education, and health) and outcomes (employment) plays a role for growth. 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).

4.3. Omitted variable bias

In Table 8, we aim to address some endogeneity concerns. First, we control for various factors, all in the form of an interaction term with the female share in employment. In column (1), we control for GDP, as the log of real GDP per capita. As the economies develop, gender inequality may decrease, resulting in reverse causality. In column (2), we control for population, as the log of total population. If the population is too low in a country, women may work due to the very high demand for labor, which may bias the 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, 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 the female share in population as the ratio of the number of females to the number of males in a country. If there are a lot of women in the population (for example, due to a civil war that results in disproportionate male casualties) or few women (for example, due to cultural preferences for male offspring), these demographic features may bias gender compositions of industries[15]. 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

[15] The phenomenon of "missing women," referring to the shortfall in the number of women relative to men expected in a population, was first noted by Amartya Sen (Sen 1990). A smaller family size—whether desired by parents or imposed by the government—is found to be among the main causes (see, for example, 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).

GDP. These factors may contribute to greater productivity and thus favor growth[16]. Furthermore, trade activities may also reduce gender inequality, as documented by Juhn and others (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 institutional quality (proxied by political competition measure from the Polity IV database), respectively. Both factors can be correlated with GII and are also highly relevant determinants of growth. In column (11), we control for human capital, as the teacher-to-student ratio in the secondary education (see, for example, Barro 1991), as GII gives rise to higher labor participation and a more educated female population; therefore, it may be a proxy for human capital in a country. Neither of these additional controls significantly alters our results. We conclude that our results are unlikely to be biased by omitted variables.

4.4. Reverse causality

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 of Table 8, 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 shares in their respective countries) and are thus less likely to be responsible for the rate of economic growth in a country. In addition, it is less likely that any underlying heterogeneity among small industries in a given country will drive country-level gender equality. One such example would be different countries having a comparative advantage in different industries, which would be reflected in the particularly high demand for labor for specific industries in specific countries. This, in turn, may drive industries' growth differentials between countries and also, through women's job creation, have a potential feedback loop to gender equality. Namely, it is plausible that in a country with a comparative advantage in some high-female-share industry (country A), a higher demand for labor in that industry will increase that

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

country's female employment more than in a country where the comparative advantage lies in an industry that typically employs few women (country B). As a result, higher female employment in country A may eventually lead to higher gender equality than in country B. If this is true, then it would be wrong to infer from our results that gender equality benefits high-female-share industries more; instead, it might imply that countries that have a comparative advantage in these industries would have *both* higher gender equality and higher growth gap between high-female-share industries and those inherently employing fewer women. It is, however, less likely that differences in a comparative advantage between small industries in a given country are macro relevant. In this subsample analysis, our coefficient estimate of the interaction term between female share and GII remains statistically significant and roughly doubles in magnitude. The increase in the magnitude of the estimated effect is likely due to the higher growth potential of smaller industries.

4.5. External finance dependence

Table 9 reports the results controlling for external finance dependence of an industry and financial development, which are the focus of RZ. Extensive literature documents the importance of finance for growth (see, for example, Levine 2005) and equality (see IMF 2020 for a recent discussion), which may bias our results. We show that our results are not a simple artifact of using the DiD application by RZ and some spurious correlations between our main variables of interest—which are external finance dependence and financial development in their study, and gender composition and gender equality in ours. We obtain the data on industries' external financing from Popov (2014) for US firms in the 1980s for corresponding industries. The interaction term between external finance dependence and financial development is positive, in line with RZ, albeit insignificant. We see that the external finance dependence is also insignificant when interacted either with GII on its own or alongside an 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 baseline estimates in Table 5.

4.6. Additional robustness checks

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, using data on Swedish industries, we construct a dummy to indicate relatively high versus relatively low female shares in industries. 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 four 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 the alternative measurements of industries' female labor shares. 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 of the industry. In column (5), for each industry, we find the maximum of female shares across six 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 it between -1 and 1. The results from all these alternative specifications are similar to our baseline results.

5. Conclusion

We study whether gender inequality inhibits economic growth by constraining the use of female labor potential. Specifically, we adapt the difference-in-differences (DiD) application by Rajan and Zingales (1998), who studied the finance-growth nexus, which facilitates identifying a causal impact of gender inequality on real outcomes at the industry level. Using a sample of industry-employment data on emerging market and developing economies in the 1990s from UNIDO and a country-level composite index on gender inequality (GII), constructed by Stotsky and others (2016), we exploit within-country variation and show that high-female-share industries 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 the 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.

We focus on a particular mechanism through which higher gender equality may support economic growth: by allocating female labor to its more productive use. While our empirical aproach restricts our analysis to the manufacturing sector of a group of emerging-market and developing countries in the 1990s, the channel we identify is likely present in other sectors, time periods, and countries.

We thus provide empirical support to the argument that gender equality is macrocritical, and should be assigned a high priority on the policymakers' agenda. Policies designed to ensure a level playing field for women, such as improving the rule of law and women's legal rights in particular, women's health, access to education, financial services, and technology (Jain-Chandra and others 2018; Stotsky 2016), are not only a matter of human rights, equity, and social justice, but relevant policy levers to boost economic growth—benefiting the economy as a whole.

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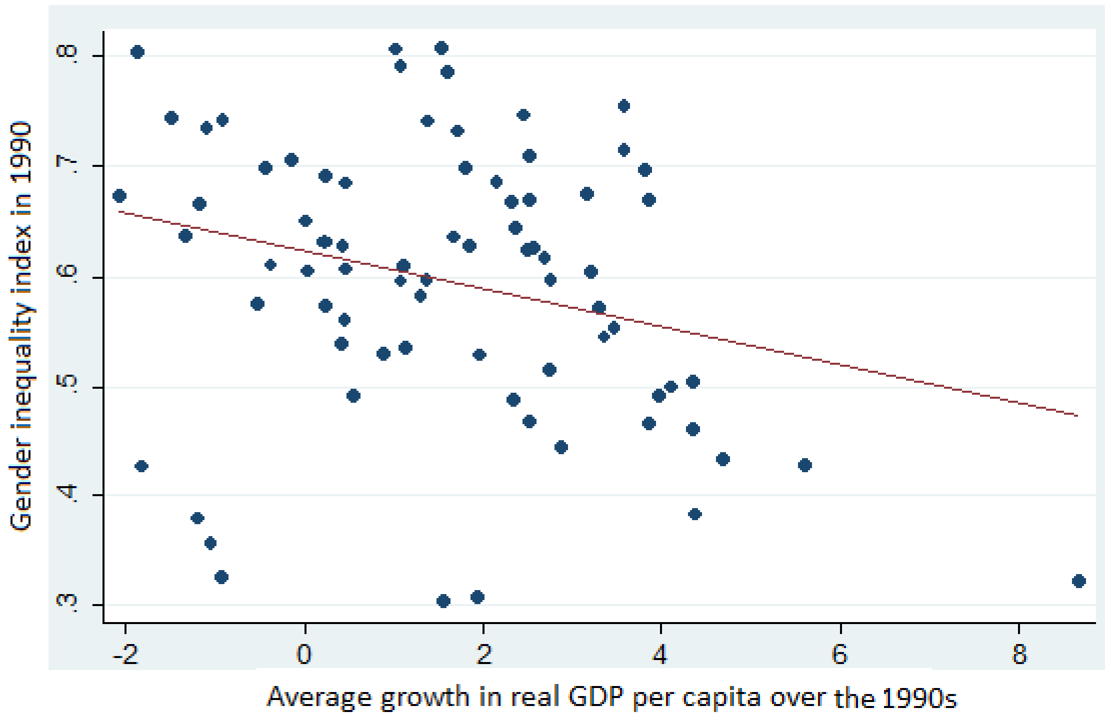
FIGURE 1: Gender inequality and real GDP per capita growth



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 the average growth rate of real GDP per capita for emerging-market and developing economies over the 1990s and GII in 1990.

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

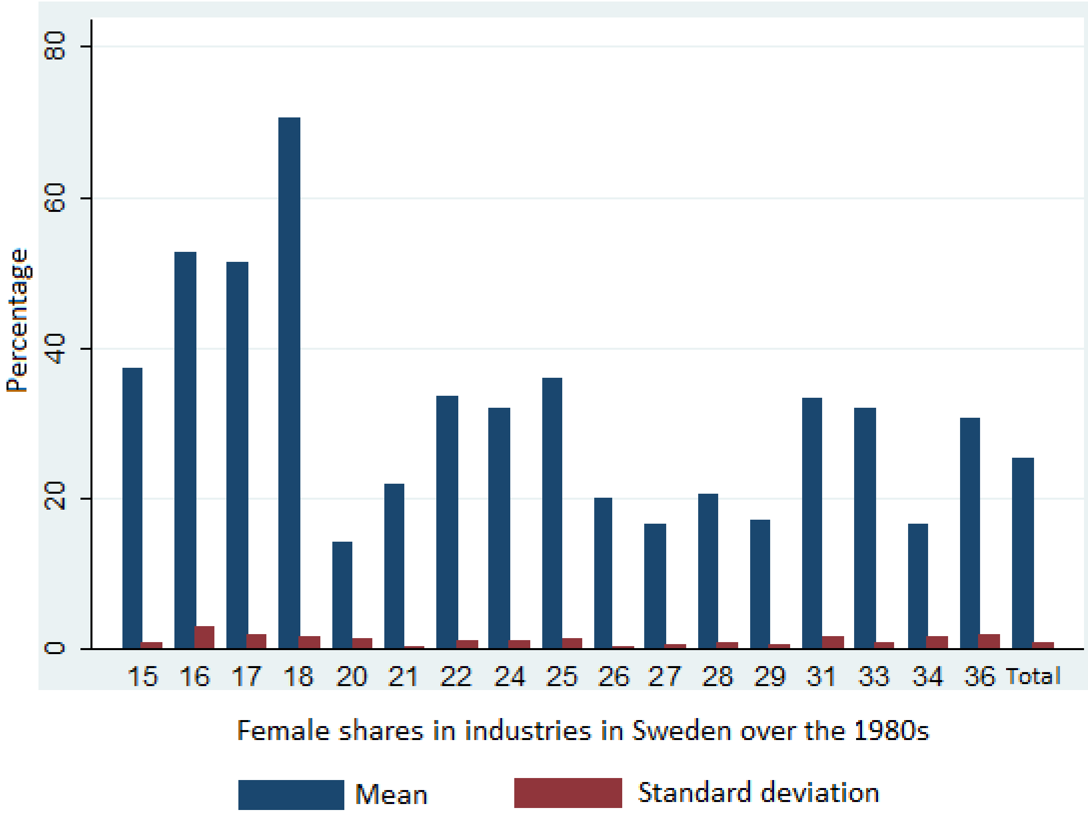


FIGURE 3: Mean and standard deviation of gender inequality index (GII) over the 1990s

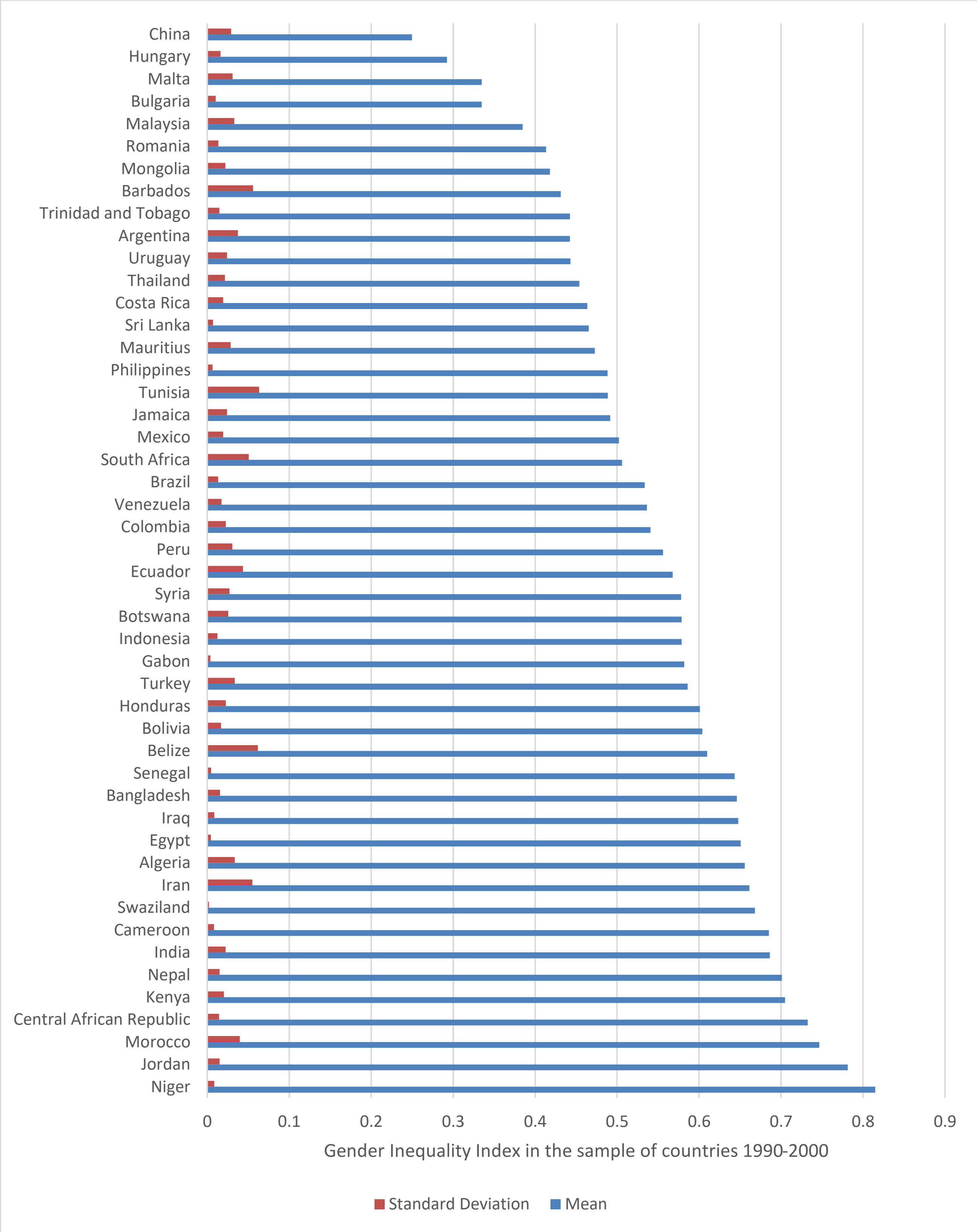


TABLE 1: Industries' female shares (%) in countries with the lowest gender inequality index (GII)

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 in 1990

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
Political competition	5.711	7	3.455	0	10	45
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 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 of high-female-share industries over the 1990s**		
Industries above the 75th pctile. of female share	0.4	1.4	1.8
Industries	**Average growth of low-female-share industries over the 1990s**		
Industries below the 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 industries above the 75th percentile (high female share) and for those 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, that is, countries with high inequality versus low inequality, respectively. To reduce the outliers bias, we drop the two countries with the highest and the lowest GII in our sample, Morocco and Hungary, respectively.

TABLE 5: Industry value-added growth and gender inequality

	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 the female share and gender inequality index (GII). We use GII as constructed by Stotsky and others (2016) and the 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 an industry at the 75th percentile of female shares grows compared to an 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 an 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 and others (2016) to measure gender inequality, and the industries' female shares for corresponding benchmark country are from Table 1. The differential growth rate measures (in percentage terms) how much faster an industry at the 75th percentile of female shares grows compared to an 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 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	-0.024** (0.010)	-1.538** (0.769)	-0.037** (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	0.7	2.6	3.2

Notes: The table replaces GII with alternative proxies for gender inequality in the basic test (equation 1). We use the industries' female shares estimated from Sweden. Adolescent fertility rate is measured as the number of births per 100 women ages 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 the labor participation rate of males relative to females. Women's rights law score is constructed using Women's Legal Rights data, which contain 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 the number of affirmative answers by the number of total replied (that is, codified) questions for each country in 1990. The differential growth rate measures (in percentage terms) how much faster an industry at the 75^{th} percentile of female shares grows compared to an 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 8: Robustness checks (GII and gender compositions in Sweden)

Variable	(1) GDP	(2) Popul.	(3) Popul. density	(4) Female share in popul.	(5) Export	(6) Import	(7) Openness	(8) FDI	(9) Fin. Dev.	(10) Pol. comp.	(11) Human capital	(12) 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)	-0.003 (0.013)	-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)	-0.510** (0.308)	-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)	0.001 (0.014)	2.642 (3.136)	
R square	0.393	0.399	0.400	0.399	0.399	0.400	0.400	0.399	0.341	0.407	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	0.344	0.344	0.246
No. of observations	666	675	675	675	675	675	675	675	651	653	551	322
Differential growth rate	1.7	1.7	1.6	1.7	1.6	1.6	1.6	1.7	1.4	1.5	1.7	3.3

Notes: We use the Gender Inequality Index (GII), constructed by Stotsky and others (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 an industry's female share. The last column splits the sample and conducts the basic test (equation 1) using only industries below the median of value-added share in each country (that is, smaller industries). GDP is the log of 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 a ratio of the number of females to the 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. Political competition is an index coded from 0 to 10, with larger values indicating higher degree of political competition. Human capital is the teacher-to-student ratio in secondary education. All macroeconomic data are from the World Bank. The differential growth rate measures (in percentage terms) how much faster an industry at the 75th percentile of female shares grows compared to an 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 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** (0.292)
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 the Gender Inequality Index (GII), constructed by Stotsky and others (2016), to measure gender inequality and the industries' female shares estimated from Sweden. The differential growth rate measures (in percentage terms) how much faster an industry at the 75th percentile of female shares grows compared to an 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)	-0.063** (0.030)	-0.683*** (0.152)	-0.602** (0.214)	-0.507** (0.233)
R square	0.414	0.411	0.409	0.405	0.411	0.444
Adjusted R square	0.352	0.350	0.348	0.344	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 the industries' female shares in four 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 the 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 the FRED database.	UNIDO, Rev.3
Labor productivity growth	The average growth in (value-added-based) labor productivity (that is, value-added per worker) in an industry over the 1990s.	UNIDO, Rev.3
Value-added share	The value-added of an industry in total manufacturing in a country in 1990.	UNIDO, Rev.3
External finance dependence	Industry`s dependence on external financing calculated using US firms in the 1980s.	Popov (2014)
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 secondary education in a country in 1990.	WB
Political competition	An index coded from 0 to 10, with larger values indicating higher degree of political competition.	Polity IV
GII	Gender inequality index in a country in 1990, constructed by Stotsky and others (2016). This is a direct measure of gender inequality.	IMF
Adolescent fertility rate	The fertility rate per 100 females ages 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 labor force participation 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 women's legal rights.	Women, Business and the Law (WBL)