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The impact of gender inequality on economic performance in developing countries

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The impact of gender inequality on economic performance in developing Countries

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The impact of gender inequality on economic performance in developing Countries

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Abstract

Despite substantial progress, gender gaps persist in many developing countries. Since the 1990s, a literature has emerged arguing that these gaps are not only inequitable, but also reduce economic performance. This review finds that, first, it is methodologically difficult to determine reliable effects of gender gaps on economic performance. Second, accounting studies that calculate how much larger GDP would be if gender gaps in employment disappeared, vastly overestimate likely effects. Third, the theoretical literature has generated important insights on mechanisms linking gender gaps to economic performance. Fourth, systematic reviews of the cross-country evidence robustly show that lowering gender gaps in education leads to higher economic performance, while the literature on the impact of other gaps is much more limited. Fifth, there is accumulating micro evidence on how reducing particular gender gaps at the level of households, farms, or firms can improve economic performance in particular contexts, with robust results in some areas, and less clear evidence in others.

Keywords: gender inequality, economic growth, developing countries, systematic reviews

JEL Codes: J16, O4

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1. Introduction

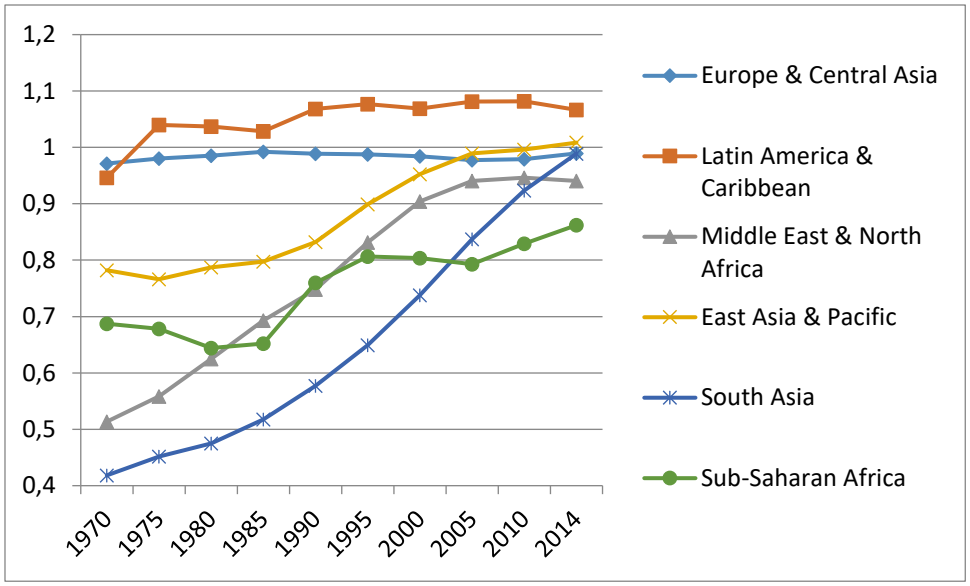
Gender gaps or gender inequality as discussed here refer to gender differences in dimensions such as education, mortality, labor force participation, pay, or access to productive inputs and resources. They also include differential treatment of men and women in laws and differentials in political participation.[2] Despite substantial progress in recent decades, gender gaps in key areas of rights, well-being, opportunities, and economic and political empowerment persist in many developing countries (and in many developed countries as well). In fact, as surveyed in detail in World Bank (2011) and Klasen (2017), progress has been highly uneven both in terms of the particular dimension of gender inequality as well as the region the developing country is located in. The one dimension where progress has been fastest and most widespread has been in education where gender gaps have been closing rapidly, with substantial progress visible everywhere. Figure 1 illustrates this for the case of secondary enrolments. Trends are even more favorable when considering primary or tertiary enrolments, or test scores (Klasen, 2017). Similarly, there has been substantial and widespread progress in reducing gender inequality in rights, although substantial differences persist, particularly in the Middle East and North Africa, South Asia, and parts of Sub-Saharan Africa (Hallward-Driemeier et al. 2013a, b).

In contrast, progress in reducing gender inequality in labor markets has been much slower and more uneven. For example, as shown in Figure 2, labor force participation rates of women in prime age (25-54) has stagnated or fallen slightly in many regions, fallen substantially in South Asia (from low levels), and increased strongly only in Latin America and the Caribbean. Male labor force participation rates in this age group have invariably been above 90% and stable, showing that gender gaps remain sizable here. This is mirrored by time use data showing that women continue to carry most of the care burden for children and elderly in developing countries with very little reallocation of non-market time between men and women (World Bank, 2011). There has been even less progress in reducing occupational and sectoral segregation (World Bank, 2011). In fact, Borrowman and Klasen (2017) show that occupational and sectoral segregation has increased in more developing countries than it has decreased. Closely related to this, unexplained portions of the gender wage gap have remained remarkably persistent (Weichselbäumer and Winter-Ebmer, 2005, Oostendorp, 2009). Lastly, progress in women's political empowerment has been slow and uneven, and many women continue to suffer from high rates of domestic violence, female genital mutilation, gender discrimination in health and survival, and high maternal death rates (Klasen, 2017; World Bank, 2014, Klasen and Vollmer, 2013; Klasen and Wink, 2003).

Given this state of affairs, there continues to be a strong equity case for tackling these gender gaps, particularly those where women are suffering from unequal rights, unequal opportunities, or unequal burdens and constraints (Duflo, 2012, Klasen and Lamanna, 2009). In fact, much policy action on gender has taken such an equity perspective, most notably the Convention on the Elimination of Discrimination against Women (CEDAW) which has been signed and ratified by nearly all countries of the world (albeit with reservations in a number of countries, Cho, 2014). Similarly, the gender goals and targets in the Millennium Development Goals as well as the Sustainable Development Goals explicitly take an equity perspective.

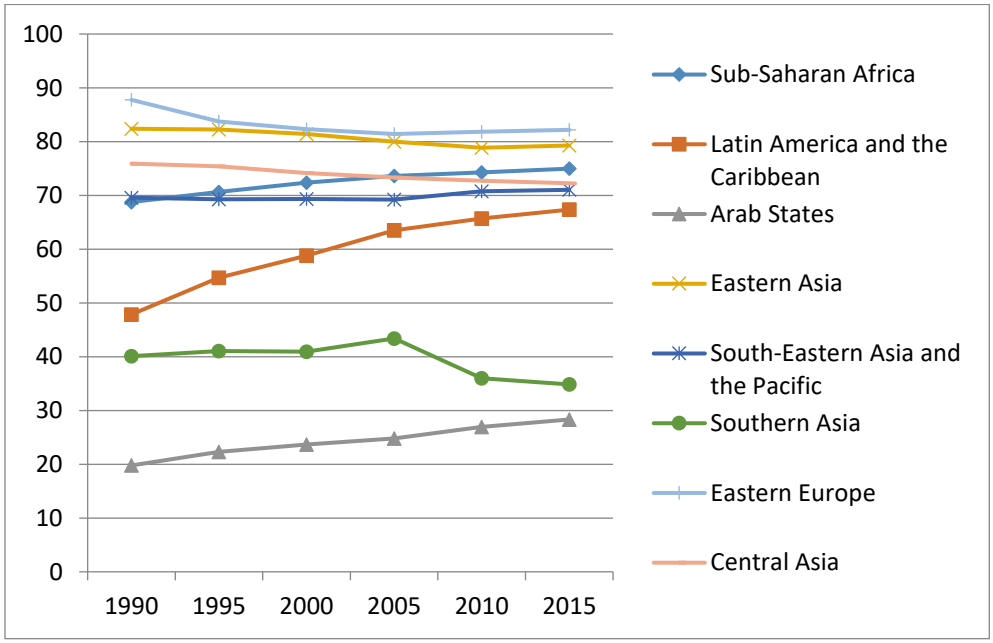
Figure 1: Female-male ratio of gross secondary school enrolment rates, 1970-2014

[2] Not all gender inequality is necessarily the result of discrimination. See Klasen (2007) for a discussion.



Source: World Development Indicators

Figure 2: Female labor force participation rate, age 25-54



Source: ILOSTAT

At the same time, since about 2000 many actors started to emphasize that reducing gender gaps promotes overall economic development, and advanced this as an additional reason to tackle gender gaps. For example, in its gender action plan of 2006, the World Bank stated: "Gains in women's economic opportunities lag behind those in women's capabilities. This is inefficient, since increased women's labor force participation and earnings are associated with reduced poverty and faster growth; women will benefit from their economic empowerment, but so too will men, children and society as a whole. Women's lack of economic empowerment, on the other hand, not only imperils growth and poverty reduction, but also has a host of other negative impacts, including less favorable education and health outcomes for children and a more rapid spread of HIV/AIDS. In sum, the

business case for expanding women's economic opportunities is becoming increasingly evident; this is nothing more than smart economics." (World Bank, 2006: 2)

Similar statements have been made (more recently) by the IMF (e.g. Lagarde, 2016; Hakura et al. 2016), the UN, ILO, or the OECD (e.g. OECD, ILO, IMF, and World Bank, 2014).

These policy statements and claims are based on a growing body of research that first emerged in the 1990s (Hill and King, 1995; Dollar and Gatti, 1999; Klasen, 1999) and has grown tremendously since and has investigated the impact of gender gaps on economic performance. The economic literature now comprises theoretical papers outlining mechanisms linking gender inequality to economic performance; cross-country regressions that investigate the empirical impact of gender gaps on economic growth; simulation studies that estimate the impact of closing gender gaps that can be based on theoretical models, cross-country regressions, or accounting approaches; and micro studies, often based on randomized controlled trials (RCTs) that investigate the impact of a particular gender gap (or its removal) on household incomes or other proximate determinants of economic performance or well-being.

It is probably safe to say that the majority of studies have found that reducing gender gaps is associated with improved economic performance. But there are a number of theoretical as well as empirical studies that have claimed that closing particular gender gaps can hurt economic performance (e.g. Tertilt and Doepcke, 2014, Seguino, 2000a), and some have argued that the existing evidence is weak (e.g. Bandiera and Natraj, 2012). Among those that find that gender inequality hurts economic performance, there are very large disagreements on the size of the effects. While Duflo (2012) finds them to be generally modest, a simulation study by the McKinsey Global Institute recently estimated that the removal of all gender gaps in labor markets (participation, hours, and pay) alone would add a whooping $28 trillion or 26% to world GDP, equivalent to the combined size of the US and Chinese economy (McKinsey, 2015).

In this survey, I will review the burgeoning literature on the impact of gender inequality on economic performance. It will focus largely on studies that focus on developing countries, mainly because gender gaps tend to be larger and therefore possibly more consequential than in developed countries.[3] Also improving economic performance is a particular priority for developing countries as they seek to leave poverty and underdevelopment behind. The review will make several points. First, it is methodologically not easy to come up with reliable estimates of effects of gender gaps on economic performance and each of the methods used have critical shortcomings so that some form of triangulation is required. Second, accounting studies such as the McKinsey (2015) study vastly overestimate likely effects. Third, the theoretical literature has generated important insights on key mechanisms linking gender gaps to economic performance. Fourth, and consistent with some of that theoretical literature, systematic reviews of the cross-country evidence robustly show that lowering gender gaps in education leads to higher economic performance, while the literature on the impact of other gaps is much more limited. Fifth, there is accumulating micro evidence on how reducing particular gender gaps at the level of households, farms, or firms can improve economic performance in some contexts, with robust results in some areas but less clear evidence in others.

The review is organized as follows. The next section discusses methodological challenges. Section 3 will focus on theoretical mechanisms, while section 4 discusses cross-country econometric results, also drawing on recently concluded systematic reviews and meta-analyses. Section 5 will discuss the micro evidence before section 6 concludes.

[3] This is of course not to say that there are no effects in rich countries.

2. Methodological Challenges

Linking gender inequality in dimensions such as education, labor force participation, pay, access to productive inputs or credit, or political representation to aggregate economic output poses a range of challenges. First, while one can measure effects at the micro level, it is unclear that they carry over to the macro level. For example, one can readily estimate how household incomes increase if individual women have higher education or work more using Mincer-type wage regressions. Whether this effect is the same if *all* women increase their education or employment levels, is less clear for several reasons. On the one hand, it might be the case that the macro returns to increasing female education are much smaller than the micro returns calculated in wage regressions. For example, to the extent that education is merely a signal for higher ability rather than representing greater human capital, it would not increase output. Similarly, the higher education might boost female earnings but lead to no growth if they work in sectors that engage in lucrative, but for the aggregate economy unproductive activities (such as adding to a public sector that increases hold-up problems for firms and individuals, Pritchett, 2001).

On the other hand, there can be range of positive spillovers that are difficult to capture at the micro level. In particular, there are the well-known externalities of female education that lead to lower fertility and lower child mortality, which can boost economic performance through demographic effects as well as improved human capital (Klasen, 2002, King, Klasen, and Porter, 2009). But efforts to boost female education and/or employment can lead to wider social change that can, for example, reduce cultural and social barriers to female economic activity that can further boost economic performance. This also suggests that measuring the impact of policies to reduce gender inequality at a micro level using RCTs can at best capture some local spillovers. They can therefore underestimate effects that would be expected if such programs were implemented to scale. This is particularly the case if such effects materialize with some delay. In short, while micro level studies provide important insights into mechanisms and local effects, they may not be a reliable guide to aggregate economic effects. Here aggregate analyses, such as cross-country or cross-regional regressions, have distinct advantages, although they suffer from other problems (see below).

Second, when estimating effects of removing gender inequality, one needs to consider a realistic counterfactual scenario that also takes account, at least in some crude fashion, of general equilibrium effects. This is a major short-coming of accounting studies that estimate simply how much larger GDP would be if more women worked, such as McKinsey (2015), ILO (2017), UNDP (2016), Daly (2007), or World Bank (2004). They simply multiply the number of women that would work in addition in their target scenario[4] with average earnings to generate the effects. It is inconceivable that such changes could happen without any impact on the employment of men and/or the level of earnings. Instead, it is likely that such a boost of female workers would lower earnings, lead to some drop-out of men (and women) so that the aggregate effects are likely to be substantially smaller. Of course, displacement and other general equilibrium effects can also be a problem for micro studies where, for example, an intervention to boost female employment might simply displace non-participating women or men or would lead to much smaller effects if implemented at scale due to saturation or other general equilibrium effects (Fox and Kaul, 2017). Interpreting results from cross-country regressions can also suffer from this problem if they only consider the coefficient on female education or employment when making projections. Klasen

[4] The target scenario is women having the same employment rate as men in Daly (2007), women having the same employment rate in the Middle East as they would elsewhere given education and fertility in World Bank (2004), women increasing employment so that the gender gap in employment is reduced by 25% (according to a target of the G20) in ILO (2017), and women in Africa having the same participation and earnings as men there in UNDP (2016), and women having the same employment, hours, and pay as men in McKinsey (2015).

(2002) tackles this problem directly by providing estimates of the boost to growth due to higher female education if male education stayed the same which provides an upper-bound estimate, as well as an estimate that assumes that male education would decrease by the same amount, which provides a lower bound estimate.[5] Simulation results based on calibrated theoretical models tend to explicitly consider general equilibrium effects and thus suffer the least from this particular problem (e.g. Cavalcanti and Tavares, 2016; Cuberes and Teignier, 2016).

Third, when measuring the impact of gender gaps on economic performance, one has to recognize that a considerable share of women's work is not captured by national accounts and included in GDP or GNI estimates. As is well known, unmarketed services such as care for own children, elderly, or housework which is done overwhelmingly by women is not included in the System of National Accounts (SNA) and would make up a significant share of GNI if it was included (UN, 2008; UNDP, 1995; OECD, 1995, McKinsey, 2015). While the omission itself is a problem, the interaction with gender gaps poses a particular challenge. It may be the case that countries with higher female employment rates have a higher GDP partly because in those countries more of the household service and care work is marketed and thus included in GDP, while the unmeasured service work done by women in their own households is correspondingly smaller (UNDP, 1995). If this is the case, the impact of increasing female employment on GDP might overestimate the impact it has on the total provision of (marketed and unmarketed) services, an important indicator of welfare. I know of no work that has empirically attempted to assess this potential bias.

Fourth, much of the empirical work, at the micro as well as the macro level, estimates reduced form relationships. At the macro level we learn about the impact of aggregate gender gaps on economic performance but cannot be sure of the precise transmission channel. Here it can help to develop empirical models based on theoretical insights and then specify the empirical model accordingly. For example, Klasen (2002) considers a set-up where the direct effect of educational gender gaps (related to distortion arguments) is tested alongside indirect effects that operate via demographic effects. Also at the micro level, RCTs often also test black box relationships, although particular transmission channels are also sometimes considered. This generally points to the need of theoretical models that illustrate particular mechanisms that can then be empirically tested, and structural models that can then be used to test transmission channels. But, of course, theoretical models (and their derived simulated results) tend to focus on few mechanisms and thus are also limited by their set-up.

Lastly, while I have noted some distinct advantages of using aggregate-level analyses such as cross-country regressions, endogeneity is a serious problem. When examining the relationship between gender inequality and economic performance, reverse causality can be an issue and unobserved heterogeneity is bound to be a problem (Bandiera and Natraj, 2012; Dollar and Gatti, 1999). Choosing an appropriate time structure for dependent and independent variables can partly address reverse causality, and using fixed effects in a panel setting can deal with time-invariant unobserved heterogeneity. But these are only partial remedies. Many papers use IV strategies to address endogeneity, but the instruments used are controversially discussed (e.g. Bandiera and Natrajj, 2012).

In short, there is no method that would be the gold standard for this type of assessments. All suffer from various drawbacks that limit their usefulness. Among the different methods, it appears, however, that the above-mentioned accounting studies that simply calculate mechanical GDP effects

[5] This is achieved by including the male education level and the female/male ratio of education in a specification for the upper bound, and the average education level and the female/male ratio for the lower bound. For details, see Klasen (2002).

resulting from more women entering the labor force are particularly problematic and unreliable. They ignore general equilibrium effects, are silent on transmission channels, ignore the current time use of women, and give the erroneous impression that a single labor market intervention can have such effects without the need for complementary policies or investments. In the following, I will no longer consider these studies, but focus on the other methods to estimate effects. Given the problems with each of them, judgments have to be made based on triangulating from different methods and approaches, checking robustness, and performing systematic reviews.

3. Theoretical mechanisms

There have been a number of theoretical and empirical studies examining the impact of gender inequality on economic performance, particularly focusing on the impact of gender inequality in education, employment, and earnings on aggregate economic performance. I will briefly summarize the most important insights here.[6]

There are three arguments that suggest that particular gender gaps could actually promote economic performance. The first goes back to Becker (1981), essentially arguing that there are (static) efficiency gains to a sexual division of labor where each gender specializes on the tasks where they have a comparative advantage. Becker sees a comparative advantage for women in home production (due to the complementarity of child-bearing and child-rearing). Whatever the merits of the argument, it is likely to become less relevant as fertility falls, household production becomes less time-consuming, and falling gender gaps in education and employment reduce the gains from such specialization. A second argument was recently made by Tertilt and Doepke (2014) who argue that higher women's earnings or transfers might actually reduce growth as it might reduce investment in physical capital or land (though this would not hold if human capital was relatively more important). A third argument relates to the role of pay-gaps, in association with low gender gaps in education and earnings. As suggested by Seguino (2000a), high gender pay gaps might become a competitive advantage for countries, particularly in export-oriented manufacturing (and associated FDI to develop the sector). We will return to this argument below.

On the other hand, there are a substantial number of papers arguing the reverse, i.e. that gender gaps reduce economic performance. Regarding gender inequality in education, the theoretical literature suggests that such gender inequality reduces the average amount of human capital in a society and thus harms economic performance. It does so as by artificially restricting the pool of talent from which to draw for education and thereby excluding highly qualified girls (and taking less qualified boys instead, e.g. Dollar and Gatti, 1999). A second way how it can lower aggregate human capital is if males and females are imperfect substitutes in production in a Solow-type growth model (e.g.. Knowles et al. 2002). In such a set-up, there are declining marginal returns to education for boys and girls, and restricting the education of girls to lower levels while taking the education of boys to higher levels means that the marginal return to educating girls is higher than that of boys. Reducing this gender gap would boost overall economic performance.

A second set of arguments relates to externalities of female education. Promoting female education is known to reduce fertility levels, reduce child mortality levels, and promote the education of the next generation. Each factor in turn has a positive impact on economic growth (World Bank 2001; King, Klasen, and Porter 2009).

[6] See, for example, Klasen (2002), Klasen and Lamanna (2009), Stotsky (2006), Duflo (2012), or Kabeer (2017) for more detailed reviews.

Some long-run growth models emphasize these externalities. They argue that there is a potential of vicious cycles with larger gender gaps in education, health, or pay leading to high fertility and low incomes which in turn reproduce these gender gaps (e.g. Galor and Weil 1996; Bloom et al. 2015; Lagerlöf 2003, de la Croix and Vender Donckt, 2010; Prettner and Strulik, 2017). These models are used to explain why historically lower gender gaps in Europe helped promote long-run economic development there (e.g. Lagerlöf, 2003), while others argue that technological change helped countries move out of the poverty traps by providing incentives to promote female education and employment (e.g. Galor and Weil, 1996; Diebold and Perrin, 2013). These models generally also suggest that exogenous (e.g. policy-induced) increases in female education and health would help promote growth and allow countries to escape these poverty traps.

But there is also an important timing issue involved here. Reducing gender gaps in education will lead to reduced fertility levels which will, after some twenty years, lead to a favourable demographic constellation which Bloom and Williamson (1998) refer to as a 'demographic gift'. For a period of several decades, the working age population will grow much faster than overall population, thus lowering dependency rates, leading to higher savings, investments, and a higher worker/population ratio, each with positive repercussions for per capita economic growth.[7]

A third argument relates to international competitiveness and complements the argument made by Seguino (2000a) above. Many East Asian countries have been able to be competitive on world markets through the use of female-intensive export-oriented manufacturing industries, a strategy that is now finding followers in South Asia (particularly Bangladesh) and individual countries across the developing world (e.g. Seguino, 2000a, b). In order for such competitive export industries to emerge and grow, women need to be educated and there must be no barrier to their employment in such sectors. Gender inequality in education (and employment) would reduce the ability of countries to capitalize on these opportunities (World Bank 2001; Busse and Spielmann 2006).

Regarding gender gaps in employment, there are a number of closely related arguments. First, there is a similar argument that it imposes a distortion on the economy as do gender gaps in education. It artificially reduces the pool of talent from which employees are drawn, thereby reducing the average ability of the workforce with negative growth consequences (e.g. Esteve-Volart 2009, Cuberes and Teignier, 2016). Such distortions would not only affect employees, but similar arguments could be made for self-employed in agricultural and non-agricultural sectors where unequal access to critical inputs, technologies, and resources as well as other barriers would reduce female participation there and/or lower the average productivity of these ventures, thereby reducing economic growth (see Udry, 1996; Cuberes and Teignier, 2016; Blackden et al 2007).

A second closely related argument suggests that gender inequality in employment or a wage gap can reduce economic growth via demographic effects. A model by Cavalcanti and Tavares (2016) suggests that gender inequality in wages lead to a gender gap in employment which directly reduces growth through depressing female participation, and indirectly reducing growth through higher fertility and lower investment.

Thirdly, the results by Seguino (2000a, b) on the impact of gender gaps in pay on international competitiveness imply that gender gaps in employment access would also reduce economic growth as it would deprive countries to use (relatively cheap) female labour as a competitive advantage in an export-oriented growth strategy.[8]

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[7] See Bloom and Williamson (1998) and Klasen (2002) for a full exposition of these arguments.

[8] One would expect that strong demand for female labor would erode these pay-gaps and thus this competitive advantage eventually.

A fourth argument relates to the importance of female employment and earnings for their bargaining power within families, and makes the converse claim to Tertilt and Doepke (2014) discussed above. There is a sizable literature that demonstrates that female employment and earnings increase their bargaining power at home (e.g. Sen 1990; Thomas, 1997; Haddad, Hoddinott, and Alderman 1997; World Bank 2001; Klasen and Wink 2003; King, Klasen, and Porter 2009). This not only benefits the women concerned, but their greater bargaining power can have a range of growth-enhancing effects. These could include higher savings as women and men differ in their savings behaviour (e.g. Seguino and Floro 2003), more productive investments and use and repayment of credit (see Stotsky 2006), and higher investments in the health and education of their children, thus promoting human capital of the next generation and therefore economic growth (e.g. Thomas 1997; World Bank 2001).

A fifth argument relates to governance. There is a growing but still rather speculative and suggestive literature that has collated evidence that women, on average, appear to be less prone to corruption and nepotism than men (World Bank 2001; Swamy, Azfar, Knack and Lee 2001; Branisa et al. 2013).[9] If these findings prove to be robust, greater female employment might be beneficial for economic performance in this sense as well.

There is a closely related theoretical literature that examines the impact of gender discrimination in pay on economic performance. Here the theoretical literature is quite divided. On the one hand, studies by Galor and Weil (1996) and Calvalcanti and Tavares (2016) suggest that large gender pay gaps will reduce economic growth. Such gender pay gaps reduce female employment, which in turn increases fertility and lowers economic growth through these participation and demographic effects. In contrast, Blecker and Seguino (2002) highlight a different mechanism, leading to contrasting results. They suggest that high gender pay gaps and associated low female wages increase the competitiveness of export-oriented industrializing economies and thus boost the growth performance of these countries. The most important difference of this study, in contrast to the models considered above, is that it is focusing more on short-term demand-induced growth effects, while the other models are long-term growth models where growth is driven by supply constraints. Clearly both effects can be relevant, depending on the time horizon considered.

It is important to point out that it is theoretically not easy to separate the effects between gender gaps in education, employment, and pay. In fact, in most of the theoretical models considered above, gender gaps in one dimension tend to lead to gender gaps in other dimensions, with the causality running in both directions.[10] For example, gender gaps in education might automatically lead to gender gaps in employment, particularly in the formal sector, where employers will prefer educated workers and will not consider applications of uneducated women. Conversely, if there are large barriers to female employment or gender gaps in pay, rational parents (and girls) might decide that education of girls is not as lucrative which might therefore lead to lower demands for female education and resulting gender gaps in education and employment.[11] Thus gender gaps in education, employment, and pay are closely related to each other.

Gaps in education and employment are not measuring the same thing, however, and thus are important to investigate separately. For one, it might be the case that female education and employment are largely driven by separate institutions and policies, and do not therefore greatly

[9] The 'causes' of these differences in behavior may well be related to different socialization of girls and boys, or that women as outsiders may also not be part of networks that are often conducive for corruption.
[10] The one exception are again the two short-term structuralists models of Blecker and Seguino (2002) where large gender gaps in pay, implicitly combined with no gender gaps in education and employment, can deliver the income-enhancing effects;
[11] On these issues, see discussions in King and Hill (1993), Alderman et al. (1995, 1996), and World Bank (2001)

depend on each other. For example, one might think of an education policy that strives to achieve universal education and thus reduces gender gaps, while there continue to be significant barriers to employment for females in the labour market. This might, for example, be particularly relevant in the Middle East and North Africa but most recently also in South Asia where education gaps have narrowed but employment gaps remain wide (see Gaddis and Klasen, 2014; Klasen and Pieters, 2015). Moreover, the externalities of female education and female employment are not all the same. For example, female education is likely to lead to lower fertility and child mortality of the off-spring, while the effect of female employment (conditional on education) is likely to be much smaller and more indirect (working mainly through greater female bargaining power).There may also be opposite effects including that the absence of women in the home might in some cases negatively impact the quality of child care). Conversely, the governance externality is likely to apply solely to female employment, not to female education.

There is also some literature examining the impact of gender gaps in political empowerment on economic outcomes. That literature is mainly focused on the impact that female politicians, due to their different preferences to men, can have on the provision of public goods with repercussions on development outcomes (e.g. Duflo, 2012; King, Klasen, and Porter, 2008).

In short, there is a range of mechanisms the theoretical literature has defined linking gender gaps to economic performance. While there are some models positing that gender gaps promote growth, they tend to be quite specific highlighting a particular mechanism and appear generally to be less relevant to the setting many developing countries find themselves in. In contrast, there is a much broader set of models and mechanisms suggesting that gender gaps reduce growth. The effects identified can be quite large and be important drivers of long-run growth. But ultimately, it becomes an empirical question which of these models and mechanisms finds most support.

4. Empirical Findings

The last 20 years has seen the emergence of a large empirical literature on the link between gender inequality and growth. We will provide a short overview of that literature by type of gender gap.

a) Gender gap in education

The largest, and arguably most mature, literature has been on the impact of gender inequality in education on economic growth. Most of that literature has been using aggregate data and recently a systematic review of the evidence has been produced by Minasyan et al. (2017), which will now be summarized here. The review includes all publicly available regression analyses using aggregate data that relate a gender-disaggregated education indicator or a gender gap measure to a measure of output or growth of output. An extensive search strategy of studies published in journals as well as working papers yielded 1421 potentially relevant studies. After a first screening for relevance and removal of duplicates, 264 studies remained which were subjected to full-text screening by two independent screeners. After screening and the addition of 5 studies based on expert recommendations, 54 studies were included in the systematic review. Since nearly all of these studies include a number of different regressions, the number of regressions assessed is substantially larger.

Of those 54 studies included in the systematic review, 34 were cross-country studies, three studies are cross-regional studies within a country (Nepal, India, Turkey) while another 18 were time series analyses of single countries. Of those 18, surprisingly, 10 examine the case of Pakistan, another one

Pakistan and Sri Lanka, with Sudan, Nigeria[12], India and Turkey being the topic of one study each. One study does single-country analyses for 18 countries from across the world, including rich and poor countries (Pakistan again included). 16 studies use various time series methods which are appropriate to this context, while two apply OLS to these time series which will lead to biased results in the (likely) case of non-stationarity or autocorrelation. 15 studies find a positive effect of female education and/or on reducing gender gaps on growth, while three find no such effect. Thus a strong preponderance finds that reducing gender gaps in education promotes growth.

Time series analyses, even those using appropriate time series methods, have to be treated with some caution for several reasons. First, they often consider only a small number of covariates, ignoring many other factors that are likely to influence this relationship. Thus omitted variable bias (or unobserved heterogeneity) might be a particularly serious problem. Second, they tend to focus on a contemporaneous relationship between gender inequality and growth which may either be affected by reverse causality and does not link well to the theoretical literature which sees mostly a delayed impact of gender gaps on growth. Third, the analyses are often based on only 20-30 data points, each from a single country, so that the external validity of the findings is unclear. Given the preponderance of studies on Pakistan, and the lack of studies on most other developing countries, we do not know how representative these findings are.

The 34 cross-country studies fall into two categories in terms of the way they treat educational gender gaps. 17 include male and female education as separate covariates, 16 use the ratio of female and male education as the key covariate to assess the impact of gender gaps, and one uses both. Turning first to the studies with male and female education as separate covariates, they would imply that reducing the gender gap improves growth if the coefficient of female education is positive and larger than that of male education. Among those 18 studies, 17 present a total of 168 regressions including male and female education as separate covariates. The 18th study, Abington (2014), uses a Bayesian Model Averaging technique to assess the robustness of growth determinants, including male and female education levels as covariates which I discuss separately below.

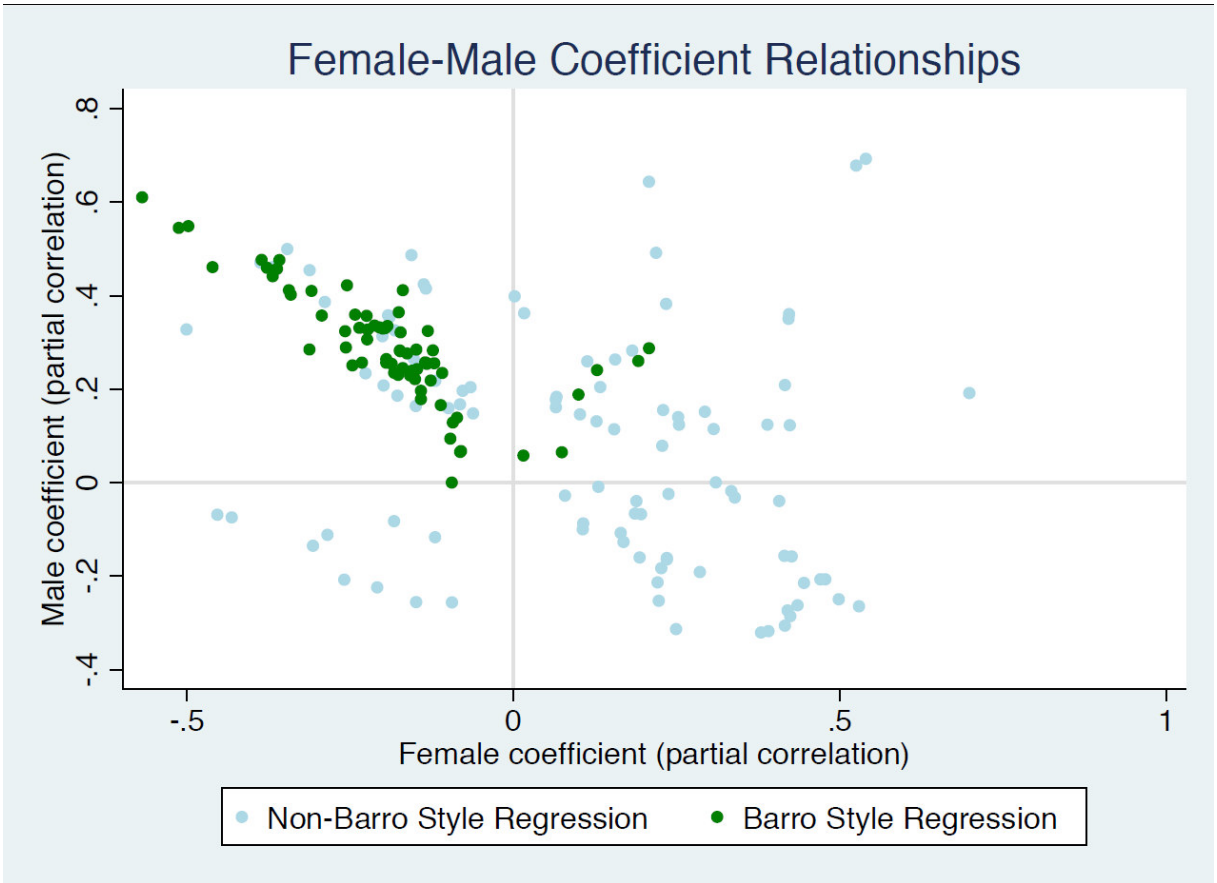
Figure 3 plots the partial correlation coefficients of male and female education of those 168 regressions. While any combination of male and female coefficients appears in the data, there are a large number of regressions where the male coefficient is positive and the female one is negative. Many of these regressions (marked in green) follow a particular type of regression specification pioneered by Barro and Lee (1994) and used by Barro but also others in subsequent analyses. That specification either uses a cross-section of countries without controlling for regional fixed effects or a pooled panel without controlling for country or regional fixed effects. And the Barro-style regressions always use the initial year values of education (rather than period averages). Regardless of what other covariates are used, this particular specification delivers, as shown below, a seemingly robust finding of a positive effect of male education, and a negative effect of female education.[13] This 'Barro result' attracted a lot of commentary and discussion. Lorgelly and Owen (1999) note that these results disappear, and both male and female coefficients turn insignificant, when East Asian countries are excluded from the regression. Dollar and Gatti (1999) point out that the results reverse when one controls for Latin America. Knowles et al. (2002) notes that the results disappear or

[12] There are two Nigeria studies published in two different outlets but containing the identical empirical analysis. So we treat them as one study.

[13] As shown in Figure 3, there are a few Barrow-style regressions that deliver a positive male and female coefficient. This is the case once logged fertility and, additionally, population growth or the dependency rate are included as control variables, as also remarked by Barro and Lee (1994). According to Minasyan et al (2017), a possible explanation for this finding may be single influential observations with high GDP growth, high population growth, and high fertility rates but low initial female education such as Botswana.

reverse once a dummy variable for East Asia is included and Klasen (2002) also finds that the results reverse once regional dummy variables are included. Given that levels of female education were quite high in Latin America already in 1960 and relatively low in most of East Asia at that time, the Barro-specification essentially links Latin America's poor growth record from 1960-90 to high initial female education there, and high growth in East Asia to low initial female education in that region. Clearly, this is a dubious claim as many factors contributed to the East Asian economic miracle (e.g. World Bank, 1994) and Latin America's poor growth record (e.g. Taylor, 1998), other than initial female education. By including regional or country fixed effects, as the non-Barro specifications in Figure 3 do, one controls for these region-specific effects, and now there are many more results with large positive female coefficients. In fact, as shown by Minasyan et al. (2017), when summarizing the non-Barro coefficients and adjusting them for precision, the so-called weighted average of precision effect estimates of non-Barro specifications show a significant positive coefficient for female education that is substantially larger than the (insignificant) male coefficient. To the extent it is, as I would argue, correct to discount the Barro-style estimates, these results suggest that reducing gender gaps in education would lead to higher economic growth.

Figure 3: Relation of male to female education coefficients in growth regressions



Source: Minasyan et al. (2017). Each dot shows the combination of the male and female partial correlation coefficient of a regression. Green dots refer to 'Barro-style' specifications, blue ones to others.

As the Bayesian model averaging study is also using the Barro-specification in a sample of only 50 countries from 1960-1996, it is not surprising that it finds that one of the 'robust' growth

determinants in this particular sample (and given the particular choice of 94 possible growth determinants) is female years of tertiary schooling which has a negative effect (Abington, 2014).[14]

Before turning to the studies using the gender gap in education as covariates in cross-country regressions, let me briefly comment on the three studies that run sub-national regressions using male and female education or the gap as covariates. One study investigates the impact of education gaps in Nepal's 75 districts in 2001 and finds that female education has a larger positive and significant coefficient than male education (which itself is never significant) and that, additionally, a large education gender gap reduces GDP (Dahal, 2011). Another study uses panel fixed effects regressions using annual data for India's 16 states and finds that female literacy leads to significantly higher income in 10 out of 14 specifications while male literacy is never significantly affecting income levels (Esteve-Volart, 2009). A last study for Turkey's 67 provinces using 5 year-averages from 1975-2000 show that both female and male education affect GDP positively and significantly, but that only male education has such an effect in less developed provinces, and female education in more developed provinces (Tansel and Gungor, 2013). To the extent one can generalize from these three countries, the results suggest that female education more often has an effect on growth than male education, and thus would support that reducing gender gaps in education would boost growth.

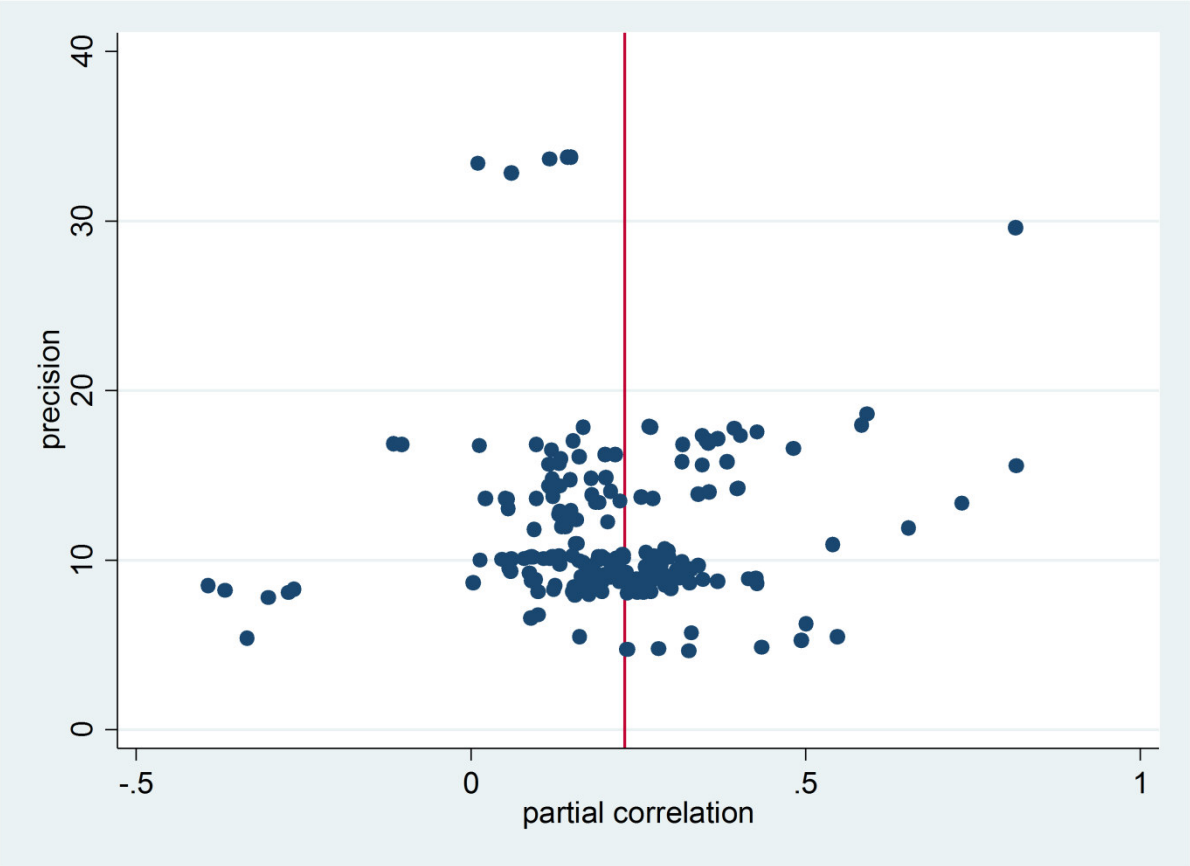
A particular additional problem of the studies using male and female education as separate covariates is multicollinearity. Despite differences in educational gender gaps across time and country, the correlation coefficient between male and female education is usually above 0.9, increasing standard errors and leading to less precise estimates (Klasen, 2002; Lorgelly and Owen, 1999; Knowles et al. 2002). To circumvent this problem, many studies chose to use a covariate for average education and one measuring the gender gap (usually the ratio of female/male education or its inverse), where the correlation between those two covariates is much lower (e.g. Klasen, 2002). We will now turn to these ratio studies.

Here Minasyan et al. (2017) are able to perform a meta-analysis that allows assessments of average effects, possible publication bias, and the dependence of the results on particular specifications, control variables, or methods. 17 studies with 212 regressions use the gender ratio of education as the key covariate. To make them comparable, the beta coefficients are transformed to partial correlation coefficients. Figure 4 depicts a so-called funnel plot which plots the partial correlation coefficient of the female-male ratio of education against the precision of the estimates. Two points are worth noting. First, the vast majority of coefficients are greater than zero, suggesting that the higher the female-male ratio of education is, the higher is growth. Second, the estimates are fairly evenly distributed on both sides of the average effect and also there is no strong asymmetry around 0, which indicates that publication bias does not appear to be a serious issue. Formal tests of publication bias in Minasyan et al. (2017) confirm that there is no evidence of publication bias and that the precision-weighted estimate of the average effect of the female-male ratio of education on growth is significant and positive. Regressions on the determinants of partial correlation coefficient show that the effect of the gender gap on growth is smaller if the model is estimated using fixed effects, when the share of female authors is larger, and when economic controls are included. The effect is significantly larger when the regression controls for average education, includes social or institutional controls, and when it uses enrolment instead of years of schooling. Whether it is published in a peer-reviewed journal or also includes female labor force participation does not

[14] One should also note that the 'robustness' of growth determinants using this method depends greatly on the sample and the covariates considered. For example, Abington (2014), show that their study has little overlap of robust growth determinants with an earlier study by Sala-i-Martin et al. (2004) even though all they do is to add some more human capital variables to the set of growth determinants.

significantly affect the partial correlation coefficient. Based on these results, one can deduce that regression specifications that are arguably the most convincing, i.e. use fixed effects, years of schooling as the gap variable and control for a large number of control variables including average education, will carry a sizable and significant positive correlation coefficient, thus providing robust evidence that reducing the educational gender gap improves economic growth. In terms of quantitative magnitude, the effects are quite large. For example, Klasen (2002) and Klasen and Lamanna (2009) show that, if South Asia had East Asia's gender gaps in education, it would have grown by about 0.8-1% faster per capita per year between 1960-2000 than it actually did.

Figure 4 – Funnel plot of gender gap and growth correlations (n=216)



Source: Minasyan et al. (2017). Each dot represent the partial correlation coefficient of the female/male ratio of education and the precision of that coefficient for a single regression.

b) Gender gaps in the labor market

There are many fewer empirical studies on the impact of gender gaps in employment and pay on economic growth. Cuberes and Teignier (2016) as well as Cavalcanti and Tavares (2016) each calibrate the macro models to specific country circumstances to assess the output costs of gender discrimination in labor markets. Cuberes and Teignier (2016) find that existing restrictions on female employment and entrepreneurship in their model generate an income loss of 27% in MENA, 19% in South Asia and about 10% in Europe. Cavalcanti and Tavares (2016) find that larger gender pay gaps lead to substantial output losses due to the impact they have on female participation and fertility. According to their model, they can explain more than half of the income differences between the USA and countries such as India, Saudi Arabia, or Egypt. While these are instructive calculations, one has to treat the quantitative magnitudes of the effects with some caution as they are based entirely on the specific mechanism of their model.

There are few cross-country econometric studies on this issue, largely due to poor data on employment and wages as well as endogeneity concerns (Gaddis and Klasen, 2014). Klasen (1999) found that increases in female labor force participation are associated with higher growth in a cross-country context. But these findings have to be treated with caution as they may suffer from reverse causality or unobserved heterogeneity. Klasen and Lamanna (2009) study the impact of initial gender gaps in education and labor force participation on subsequent growth using a cross-country fixed effects panel framework which can control for time-invariant unobserved heterogeneity. They find that both gender gaps in education and labor force participation negatively affect growth, although the results are not always significant when both variables are included, presumably due to multicollinearity. In reduced samples that focus on particular regions, however, the results are significant and estimate growth costs of gender gaps that are particularly sizable in South Asia and the Middle East. In the Middle East, the employment gaps are more important for growth than the education gaps while in South Asia the reverse is the case. In this sense as well as in the estimated magnitudes, they are quite similar to the model-based estimates of Cuberes and Teignier (2016).

At the sub-national level, Berta Esteve-Volart has found significant negative effects of gender gaps in employment and managerial positions on economic growth of India's states using panel data and controlling for endogeneity by using instrumental variables (Esteve-Volart, 2009).

There are some papers by Seguino (2000a, b) that support the contention that the combination of low gender gaps in education and employment with large gender gaps in pay (and resulting low female wages) were a contributing factor to the growth experience of export-oriented middle income countries. Supporting this empirical claim is a paper by Busse and Spielman (2006) which finds for a sample of 23 developing countries that a combination of low gender gaps in education and employment and large gender gaps in pay helped promote exports. Unfortunately, Seguino's analysis is based on a small sample of semi-industrialized countries and the measures of gender wage gaps are rather crude.In fact, Schober and Winter-Ebmer (2011) show that the results disappear or even reverse if arguably more robust measures of gender wage gaps are used, so that these findings cannot be considered robust at this stage.[15]

c) Gender gaps in social institutions and laws

A recently emerging (and far from settled) literature analyzes the impact of gender inequality in social institutions and laws on economic performance or its proximate determinants. Branisa et al. (2013, 2014) and Yoon and Klasen (2017) have shown that gender inequalities in social institutions related to gender are indeed important drivers of female education, fertility, and child mortality. Ferrant and Kolev (2016) show that higher gender inequality in social institutions is associated with worse growth outcomes, over and above the effect this has on educational and labor force gaps. Similarly, Hallward-Driemeier et al. (2013b) provide evidence that reducing legal gender gaps is associated with higher rates of female education, employment, as well as higher marriage ages although the effects appear to be smaller in poorer countries.

d) Micro-level assessments of gender gaps and their impacts

Apart from this aggregate literature, a micro literature has emerged on the impact of particular gender gaps on micro level economic performance of households, farms, and firms. It is hard to summarize this disparate literature as it is often very context-specific, uses many different indicators

[15] In the case of these papers, the focus on semi-industrialized, export-oriented countries was intended. But this can therefore not address the question whether there is a more general relationship between pay gaps and growth in developing countries that do not belong to this small group.

of economic performance, and is often linked to particular interventions. I will focus on the areas where there appears to be some robust evidence.

One group of studies, pioneered by Udry (1996), examines the impact of gender gaps in access to land, inputs, and technologies for agricultural production on farm productivity and finds them to be inefficient. In the case of Burkina Faso, an equal allocation of inputs between male and female farmers would boost output by 10-15% (Alderman et al, 1995). Goldstein and Udry (2008) examine the efficiency costs of insecure land rights for women in Ghana, which leads them to shorten the fallow period to maintain a claim on the land. The output costs of inefficiently short fallow periods is estimated to be 25% of output, and aggregated to all of Ghana, 1% of GDP. A review of the accumulating evidence in this field of research is that the output costs of these gender gaps in agriculture can be considerable (Croppenstedt et al. 2013). But the importance of these inequalities will greatly depend by region as they depend on, first, a sizable smallholder agricultural sector, and second, independent management of plots by males and females. These conditions are met in many parts of Africa and are particularly relevant in West Africa. In many Asian countries, however, agriculture is less important and most plots are managed jointly by families so that the described inefficiencies can only apply to a minority of plots managed by women (e.g. widows, de facto female-headed households due to male migration).[16] In Latin America or the MENA region, agriculture is much less important and small-holders often not the dominant organizational unit.

There is much less clear evidence whether gender inequalities in access to inputs, credit, and labor also lead to inefficiencies among firms managed by males and females. The impact evaluation literature has generally shown that many interventions to promote small firms appear to have smaller effect for female than for male entrepreneurs (McKenzie and Woodruff, 2014)[17]; whether these smaller effects for women are due to other (inefficient) gender gaps, is an area of active research (e.g. Field et al., 2010; de Mel et al. 2014). .

Lastly, there are robust findings from many contexts suggesting that greater female control and decision-making power within households promotes health and education of children, with positive repercussions for growth, closely related to the externality arguments of female education and employment mentioned above. The overwhelming finding of many studies is that the effect on household expenditures, health, and education outcomes for children of unearned incomes, credit, assets brought into marriage, or targeted transfers brought in by women is larger than the effect of such resources brought in by men (e.g. Pitt and Kandkher, 1998; Pitt et al., 2006, Thomas, 1990, 1997; Quisumbing er al., 2003; World Bank 2001, 2011). Simulations by King, Klasen and Porter (2009) show that the effect of such interventions to increase women's incomes on economic performance, as well as reduced mortality, can be sizeable.

Political decision-making power also matters. In particular, papers by Chatthopadyai and Duflo (2004), Bhalotra and Clots-Figueras (2014) and Duflo (2012), have found evidence that women's political empowerment promotes the provision of public goods, better human capital, and lower child mortality. These outcomes are, of course, valuable in and of themselves, but also have an indirect impact on growth. In fact, Baskaran et al.(2017) show that electing female state-level leaders has a sizable positive impact on growth in their constituencies. Similarly, King, Klasen, and

[16] In fact, Croppenstedt et al. (2013) focus on documenting sizable differences between male and female-headed households in all developing regions. The incidence of female-headed households differs substantially across regions and is again particularly high in Africa.

[17] Exceptions are Bulte et al. (2017) and McKenzie and Puerto (2017) who find positive effects for training programs for female entrepreneurs in Vietnam and Kenya, respectively. Both do not, however, compare results with training for males as the programs were targeted at females.

Porter (2009) who produce simulation results that women's political empowerment can have sizable development impacts through its effect on income growth as well as mortality reduction. One should note that most of these findings are based on quasi-experimental results from India. Whether they will carry over to other contexts, is an open question.

In sum, the micro evidence has shown that there are a range of contexts where gender gaps also produce inefficiencies and lower economic performance. The findings are, by nature, more context-specific and depend on the particular constraint faced by women in a specific local context. While one can readily assess the micro impact of these constraints, it is harder to assess their aggregate impact on economic performance due to the role of spillovers and general equilibrium effects.

Conclusions

This review has shown that analyzing the impact of gender inequality on economic performance is not trivial, and all methods to do so have advantages but also short-comings. As a result, it is critical to consider several methods when examining this question, ranging from theoretical modelling via cross-country econometrics to well-identified micro assessments.

Based on this approach, a wealth of theoretical literature and most empirical literature shows that gender gaps in education reduce economic growth, with the effects being sizable and robust. There is much less literature on employment gaps. It also suggests that employment gaps reduce growth. Here there is scope for much more careful econometric analyses of this link, using improved data, methods, and testing particular mechanisms. Similarly, there is a wealth of micro evidence suggesting that gender gaps reduce efficiency of farms and firms and reduce household investment in human capital. The relevance and scope of these findings for different country contexts is not always clear and should be an important focus of future research.

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