Macroeconomic Models of Gender Inequality and Economic Development: A Critical Review

David Cuberes
Marc Teignier

Abstract

In this paper we survey the theoretical macroeconomic literature that analyzes the relationship between gender inequality and economic development. We argue that the existing theories provide a wide range of mechanisms through which gender gaps may have a negative effect on economic growth or through which economic development reduces these gaps. However, there is a striking lack of models suitable to calibrate the impact of a given gender gap on aggregate productivity. We sketch a simple model that is able to provide some quantitative estimates of the aggregate productivity effect that gaps in the labor market have in a large sample of countries.

Gender inequality is a fact of life in most parts of the world, particularly in developing countries. Dollar and Gatti (1999), for instance, estimate that in 1990, in the poorest quartile of countries, only 5% of adult women had any secondary education, half the figure for men.[1] While gender gaps in employment and pay are closing much faster in developing countries than they did in industrialized ones, the prevalence of this type of gender inequality is still sizable, especially in South Asia, the Middle East and North Africa (Tzannatos, 1999; Klasen and Lamanna, 2009). In most developing countries the vast majority of family workers are women and their work effort is almost always non-remunerated. Moreover, women are also typically underrepresented in highly-skilled jobs. In high income countries it is estimated that the average incidence of females among managers is less than 30% (World Bank 2001). This figure is presumably much lower in low-income countries, although it is hard to find reliable data to provide estimates of the magnitude of this gap. The data also reveals that in most countries women are typically employed in a small number of industrial sectors. According to Tzannatos (1999), about two-thirds of women working in the manufacturing sector are categorized as laborers, operators and production workers, while only a small minority work in administrative and managerial positions.

These gender inequalities may reflect discrimination against women, but they could also be the outcome of society's preferences towards gender roles. In the latter case the resulting allocation of resources may not be inefficient from a welfare point of view. In the former scenario though, reductions in gender inequality may potentially increase welfare and efficiency. This distinction is important in any empirical application that seeks to explain the origins or effects of gender inequality. We return to this point in Section 6 of the paper. Another conceptual important point that is often missed in the literature is the distinction between inequality of opportunities vs. inequality of outcomes. Gender inequality in wages or earnings clearly refers to the latter, while gender gaps in schooling, labor force participation, occupational choice, political and/or economic rights can be seen as examples of inequality of opportunities. While we acknowledge the fact that these two types of inequalities may have

different implications, in this review we do not distinguish between the two, in line with previous studies.

Surprisingly, the macroeconomic literature on the efficiency effects of gender inequality is much sparser than the microeconomic one.[2] In this paper we survey a few representative models that analyze the relationship between gender inequality and economic development at the macroeconomic level. The structure of the article is the following. First, we discuss several dynamic models that examine the two-directional link between gender inequality and economic growth. We conclude that while these models propose several useful channels that may drive this relationship, they are in most cases not suitable to estimate the productivity gains associated with a reduction in gender inequality. The main reason is that in these theories gender gaps are endogenous variables and therefore one cannot run counterfactual experiments to study the effect of an exogenous change in these gaps. Next, we review the extremely scant literature that analyzes and quantifies the costs of a *given* gender gap in terms of aggregate productivity. While these allocation models do not help understanding how gender gaps originate or evolve, they are useful to answer clear-cut policy questions like what would be the productivity benefit of a policy that makes the labor market more accessible to women at a given point in time. Table 1 in the appendix lists the models reviewed here and identifies which gender gap they analyze and what is the mechanism that can potentially eliminate it. We conclude the paper by sketching a simple theory of talent allocation based on Lucas (1978) that allows us to have quantitative predictions on the aggregate output and income effects of gaps in the labor market, both in labor force participation and in managerial positions.

1. Dynamic Models

In this section we discuss several models that analyze the dynamic effects of different dimensions of gender inequality on economic growth and the feedback from the latter to diminish these gaps. The main two channels through which these theories work are the fertility channel and the human capital or education channel.

The Fertility Channel

Galor and Weil (1996) present a model that studies the causes and effects of gender gaps in wages and labor force participation. In their theory economic growth generates a positive feedback loop by reducing fertility, which leads to a demographic transition - the process by which a country´s fertility undergoes an irreversible decline - and faster output growth. In particular, the production side of the economy is modeled to have two inputs: physical strength and mental capabilities. Men are endowed with more physical strength than women but both sexes have the same endowment of mental input. The latter is assumed to be more complimentary to physical capital than physical strength. As a result, the increase in capital intensity that accompanies economic growth raises the relative wage of women, given that

women have a comparative advantage in the mental labor input. Assuming that the income effect associated with this higher wage is lower than the substitution effect, as in Becker (1981), this rise in women's relative wage lowers the fertility rate since it induces women to switch from childrearing and to participating in the labor market. Finally, higher wages and lower population growth lead to higher levels of capital per worker, and hence faster output growth. Therefore this model offers a rationale for why gender inequality may have a negative impact on economic growth.

The Education Channel

Lagerlof (2003) argues that gender equality in education has a positive impact on economic growth because of its effects on fertility and on the human capital of children. He proposes a model in which families play a coordination game against each other when deciding the human capital level of their offspring. Despite the fact that the two sexes are modeled as being symmetric in terms of talent, gender discrimination arises as a Nash equilibrium. If everybody expects families to behave in a discriminatory manner by educating their sons more than their daughters, it is optimal for a family to do so, since daughters will then marry more educated men who will earn more. As economies re-coordinate towards a more “gender-equal” equilibrium, women’s human capital increases and their time becomes more expensive, which then leads families to substitute quality for quantity in children. This eventually leads to a higher stock of human capital and hence faster economic growth.

2. Static Models

The existing static models of the macroeconomic link between gender inequality and productivity can be classified in two groups. The first set of theories explains how increases in a country’s income may lead to a decline in gender gaps. The three main channels through which this occurs are the income elasticity channel, changes in women’s property rights and technological progress. The second group of models quantifies the aggregate cost – in terms of output per worker or per capita income – of a given gender gap.

2.1. How Economic Development Affects the Gender Gap

The Income Elasticity Channel

Becker and Lewis (1973) and Becker (1981) argue that the income elasticity of the number of children that families choose to have is greater than the income elasticity of the education level received by each child. Therefore, there must exist an income threshold above which fertility in a given country declines and this generates an increase in investment in each child.

According to this analysis rising income is the main trigger of the demographic transition. The main implication of this model is that the associated lower fertility in turn facilitates the incorporation of women into the labor market, hence reducing the gender gap in labor force participation.[3]

The Women's Property Rights Channel

In Doepke and Tertilt (2009) men face a trade-off when choosing women's legal rights. The reason is that husbands want to grant few rights to their wives to maintain their bargaining power in the household. In their model an increase in wife's bargaining power has a negative impact on husbands' utility since they value their own consumption more than their wives' and because they care less than their wives about the well-being of their children. On the other hand, husbands are in favor of an expansion of other women's rights since they are altruistic toward their own children. They want their daughters to have legal rights as this gives them higher welfare and they also prefer their sons to be able to find wives with legal rights – which are associated in the model with a higher human capital - because this positively affects their grandchildren's education. In this model, when the returns to education are low, men vote for a patriarchal political regime, in which all family decisions are made solely by the husband. Eventually though technological progress changes the importance of human capital and leads to a shift in the tradeoff between the rights of a man's wife and those of his daughters. Once returns to education reach a critical threshold, men end up voting for a political regime of empowerment, under which decisions are made jointly by husband and wife. This theory, the authors conclude, can explain why the legal and economic rights of married women improved before their political rights. Fernandez (2011) proposes a similar theory that emphasizes women's property rights rather than economic rights.

The Technology Growth Channel

Greenwood, Seshadri, and Yorukoglu (2005) argue that technological progress leads to the introduction of labor-saving consumer durables such as washing machines, vacuum cleaners or refrigerators, which make it possible for women to start working in the market rather than being confined to home production. In their model, households derive positive utility from the consumption of non-market goods, which are produced using household capital and labor. Technological change in capital goods reduces the relative price of these household durables and encourages their adoption. The use of more productive appliances then frees up time formerly devoted to housework and allows women to increase their participation in the labor market.

2.2. How Gender Inequality Affects Economic Development

To our knowledge there are only two theoretical models that attempt to quantify the aggregate cost of a given gender gap. The first one is Esteve-Volart (2009) who presents a theoretical model in which the gender gap in employment leads to a reduction in the stock of talent available in the economy and to distortions in the allocation of talent across different occupations. In her model agents are born with random endowments of entrepreneurial talent and they choose how much human capital to acquire and whether to become managers or workers. If women are excluded from managerial positions, equilibrium wages and human capital investment for both male and female workers are reduced and the average talent of managers is lower. Lower talent then results in less innovation and slower adoption of technology, both of which reduce aggregate output. On the other hand, if women are completely excluded from the labor force, aggregate productivity and GDP per capita are lower since they can only use their talent to engage in home production. The paper presents some evidence from Indian states which is consistent with the main predictions of the model.

Hsieh, Hurst, Jones, and Klenow (2011) present a model of occupational choice based on comparative advantage. Without frictions, every person chooses the occupation where she earns the highest wages. They distinguish between two models, one in which occupational frictions are generated, for instance, by differences in human capital across different population groups and another one in which these frictions can be interpreted as discrimination taxes on members of a given group. While the former model produces an efficient outcome, in the latter there exists misallocation of talent and so a decrease in the wage gap introduced by discrimination or a reallocation of workers across occupations would improve efficiency. The authors next use U.S Census data to match the different equilibrium conditions generated by their model and estimate the implied occupational wage, frictions and human capital gaps by group. This information is then in turn used to infer the productivity gains associated with changing these frictions. Their results suggest that the changes in the labor force and occupations of black men and women with respect to their white counterparts can explain between 17 to 20 percent of the output growth during the 1960-2008 period.

3. Drawbacks of the Existing Literature

The first drawback we find in the existing literature refers to the fact that most of the existing models do not aim to estimate the aggregate impact of gender gaps on the economy. Dynamic models like Galor and Weil (1996) have the problem that gender gaps in wage – and the subsequent gender gap in labor force participation – are endogenous to economic growth. Therefore it is not possible to alter these gaps in an exogenous way and quantify the effect of this change. The same is true in Lagerlof (2003) where gaps in education between sons and daughters is an equilibrium outcome of the model. With respect to the existing static theories, Becker and Lewis (1973) and Becker (1981) only analyze the causes of gender gaps in labor force participation, but not its consequences. More particularly, they explain why increases in a country's income may make these gaps disappear, but not how they originated. The models by Doepke and Tertilt (2009) and Fernandez (2011) have the goal of analyzing why reducing

inequality may be an optimal choice for husbands but they do not seek to estimate the quantitative effects of an expansion of women's rights. Finally, Greenwood et al. (2005) study the effects of technological change in consumer durables on the labor force participation of women, but not its macroeconomic impact.

A second drawback of the previous literature is more conceptual. Most of the theoretical explanations for the positive effects of gender equality on growth are related to the fertility and children's human capital channels. Namely, an increase the relative wage paid to women increases the cost of raising children, which lowers population growth and raises education levels. This, in turn, leads to a higher labor productivity level and a higher growth rate of income and output per capita in the future. However, there has been very little theoretical work on the female labor productivity channel, i.e. on the negative effects for current aggregate productivity generated by the misallocation of women's talent in the labor market. Intuitively, given that agents' abilities are distributed randomly, one would expect gender inequality in the labor market to distort the allocation of production resources and have a negative impact on aggregate productivity. Esteve-Volart (2009) is a notable exception to this critique. In her model agents are born with different managerial talents and labor market discrimination leads to lower average managerial talent and female human capital accumulation. Economic growth is then also lower because of its effects on technology adoption and innovation. The model, however, is only used to derive qualitative results using data from India but it does not provide numerical exercises to quantify the effects of inequality on labor productivity. On the other hand, her theory is arguably too ambitious in that it incorporates many different margins: occupational choice, human capital accumulation, technological progress, and research and development. This makes the model very complex and may in part be an explanation of its lack of useful quantitative implications.

Hsieh et al. (2011)'s theory of occupational choice is, to our knowledge, the only existing model that is able to generate clean predictions on the impact of talent misallocation on earnings and economic growth in the U.S. In the next section we sketch a new model proposed by Cuberes and Teignier (2012) that is simpler than Hsieh et al.'s but it has the advantage of being able to have predictions on the aggregate impact of gender gaps in labor force participation and managerial occupations for a large set of countries, not just the U.S.

4. Quantification of Gender Gap Effects in a Model of Talent Allocation

The main goal of the paper by Cuberes and Teignier (2011) is to quantify the effects of gender inequality in the labor market. It presents a model of talent allocation based on Lucas (1978) in which agents are endowed with a managerial talent drawn from a fixed distribution. The most talented individuals choose to become firm managers, while the rest are employed as workers. Gender inequality is then introduced as an exogenous restriction to women's access to managerial positions or to their participation in the labor force. The model predicts that gender gaps in managerial positions access lead to a decrease in the average talent of

managers, which reduces aggregate productivity, while gender gaps in the labor force participation lead to a fall in income per capita.

According to the paper's numerical results, if all women were excluded from managerial positions, output per worker would decrease by about 25%, and if all women were excluded from the labor force the loss in income per capita would be 40%.[3] In the country-by-country analysis, the article finds that, on average, the gender gap in managerial access is almost 60% and the gap in labor force participation is above 30%. The average loss in income per capita due to gender inequalities in managerial positions is above 11%, while the average loss due to labor force inequalities is around 11%.

The paper also finds that the total income losses due to gender gaps in the labor market do not differ much across income groups, but there are very important differences across geographical groups of developing countries. The largest income loss is 34% in the Middle East and North Africa, of which more than half is due to gender inequality in labor force participation. The second largest income loss is 28%, in South Asia, while the lowest one is 17%, in Sub-Saharan Africa. Europe and Central Asia region has the lowest income loss due gender gaps in labor force participation (8%) but their loss due to managerial access gaps is slightly above average.

5. Conclusions

This paper surveys the theoretical literature that analyzes the impact of different gender gaps on the macroeconomy, in particular the rate of growth of per capita GDP and aggregate productivity, as measured by output per worker and/or income per capita. The existing dynamic models highlight the main channels that drive the two-directional link between gender inequality and growth, but are not suitable to estimate neither the aggregate impact of a given gender gap, nor the effect of an exogenous change in such gap. Static models, on the other hand, often focus on the reverse question, i.e. how increases in income may help dissipate these gaps. Recently a very small group of static theories have been used to answer more policy-oriented questions like what would be the effect of reducing different gender gaps on aggregate productivity. In particular, the model by Cuberes and Teignier (2012) fills this gap by providing a simple but suitable framework to address such questions. This exercise is a fundamental first step for policymakers and academics who seek to have predictions on the magnitude of the macroeconomic costs associated with the existing gender gaps.

Notes

David Cuberes is a Lecturer at the Department of Economics of the University of Sheffield, United Kingdom. Marc Teignier is an Assistant Professor at the Fundamentos del Analisis Economico I of the University of Alicante, Spain. We thank Emmanuel Jimenez, Ana Revenga and three anonymous referees for their useful comments.

1. In the richest quartile, on the other hand, 51% of adult women had at least some secondary education, while 88% of adult men did so.
2. A review of this literature is out of the scope of the paper.
3. Treating education as a normal consumption good, not simply an investment good, increases in income may also result in increases in education and reductions in schooling gender gaps (see for instance Behrman and Knowles, 1999 and Alderman and King, 1998).
4. As mentioned in the introduction, in order to take the model to the data, it is important to understand whether any given gender gap reflects preferences or discrimination. Given that the key variables in this model are the ratio of women to men in the labor force and in managerial positions, it is not possible to discriminate between these two hypotheses. Instead of making an assumption about what fraction of these gaps represent actual discrimination, their exercise simply addresses the question of how much aggregate productivity in a country would change if a larger percentage of women were working or employed as managers. This is the same qualitative exercise carried out in Hsie et al (2012).

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Appendix

Table 1: A summary of models of gender gap and aggregate productivity

Model	Gender gap	Mechanism
Dynamic models		
Galor and Weil (1996)	Wages and labor force participation	Reductions in fertility
Lagerlof (2003)	Education	Changes in the education of sons and daughters
Static models		
Becker and Lewis (1973), Becker (1981)	Labor force participation	Increases in income
Doepke and Tertilt (2009), Fernandez (2011)	Economic and political rights	Technological progress and increases in the returns to education
Greenwood et al. (2005)	Labor force participation	Technological progress in labor-saving consumer durables
Esteve-Volart (2009)	Labor force participation, managerial occupations	N/A
Hsieh et al. (2011)	Occupational allocation	N/A
Cuberes and Teignier (2011)	Labor force participation, managerial occupations	N/A