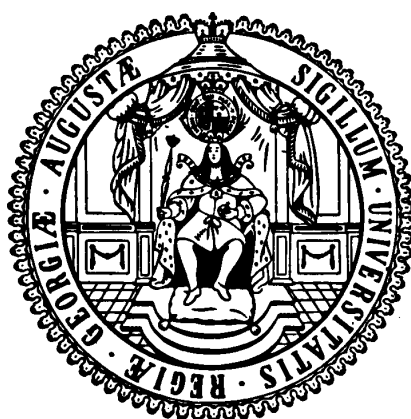


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Gender Inequality as a Barrier to Economic Growth: a Review of the Theoretical Literature

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Abstract

In this article, we survey the theoretical literature investigating the role of gender inequality in economic development. The vast majority of theories reviewed suggest that gender inequality is a barrier to development, particularly over the long run. Among the many plausible mechanisms through which inequality between men and women affects the aggregate economy, the role of women for fertility decisions and human capital investments is particularly important. Yet, we believe the body of theories could be expanded in several directions.

JEL-Classification: E20, J13, J16, J24, O11, O41.

Keywords: Gender equality, Economic growth, Fertility, Human capital, Comparative development

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1 Introduction

Theories of long-run economic development have increasingly relied on two central forces: population growth and human capital accumulation. Both forces depend on decisions made primarily within households: population growth is determined by households' fertility choices (e.g., Becker and Barro, 1988), while human capital accumulation is partially dependent on parental investments in child education and health (e.g., Lucas, 1988).

In an earlier survey of the literature linking family decisions to economic growth, Grimm (2003) laments that “[m]ost models ignore the two-sex issue. Parents are modeled as a fictive asexual human being” (p. 154).¹ Since then, however, economists are increasingly recognizing that gender plays a fundamental role in how households reproduce and care for their children. As a result, many models of economic growth are now populated with men and women. The “fictive asexual human being” is a dying species. In this article, we survey this rich new landscape in theoretical macroeconomics, reviewing, in particular, theories where gender inequality affects economic development.

Many articles review the literature on gender inequality and economic growth.² Typically, both the theoretical and empirical literature are discussed, but, in almost all cases, the vast empirical literature receives most of the attention. In addition, some of the surveys examine both sides of the two-way relationship between gender inequality and economic growth: gender equality as a cause of economic growth *and* economic growth as a cause gender equality. As a result, most surveys end up only scratching the surface of each of these distinct strands of literature.

There is, by now, a large and insightful body of theories exploring how gender equality affects economic growth. In our view, these theories merit a separate review.³ Moreover, they have not received sufficient attention in empirical work, which has largely developed independently (see also Cuberes and Teignier, 2014). By reviewing the theoretical literature, we hope to motivate empirical economists in finding new ways of putting these theories to test.

Although the incorporation of gender in macroeconomic models of economic growth is a recent development, the main “gendered”-ingredients of those models are not new. They were developed in at least two strands of literature. First, since the 1960s, the

¹See Echevarria and Moe (2000) for a similar complaint that “theories of economic growth and development have consistently neglected to include gender as a variable” (p. 77).

²A non-exhaustive list includes World Bank (2001, 2011); Stotsky (2006); Sinha *et al.* (2007); Duflo (2012); Bandiera and Does (2013); Kabeer and Natali (2013); Cuberes and Teignier (2014); Kabeer (2016); Klasen (2018).

³Doepke and Tertilt (2016) review the theoretical literature that incorporates families on macroeconomic models, without focusing exclusively on models that include gender inequality, as we do. Greenwood *et al.* (2017), in turn, review the theoretical literature from the opposite direction; they study how macroeconomic models can explain changes in family outcomes. Finally, Doepke *et al.* (2012) survey the political economy of women's rights, but without focusing explicitly on their impact on economic development.

“new home economics” has applied the analytical toolbox of rational choice theory to decisions being made within the boundaries of the family (see, e.g., Becker, 1960, 1981). A second literature strand, mostly based on empirical work at the micro level in developing countries, described clear patterns of gender-specific behavior within households that differed across regions of the developing world (see, e.g., Boserup, 1970). As we shall see, most of the (micro-founded) macroeconomic models reviewed in this article use several analytical mechanisms from the “new home economics”; these mechanisms can typically rationalize several of the gender-specific regularities observed in early studies of developing countries. The growth theorist is then left to explore the aggregate implications for economic development.

The first models that incorporated gender in a theory of economic growth did so at a very aggregated level. The main concern was that men and women were imperfect substitutes in aggregate production, and, as a consequence, gender inequality (as long as determined by non-market processes) would misallocate production factors (e.g., Knowles *et al.*, 2002; Esteve-Volart, 2004). We review these arguments in section 2.

Over time, the household became the unit of analysis. The first articles in this tradition modeled the household as a unitary entity with joint preferences and interests, and with an efficient and centralized decision making process.⁴ These theories posited how men and women specialize into different activities and how parents interact with their children. Section 3 reviews this literature.

From there, the literature has moved to intra-household dynamics. Now, family members are allowed to have different preferences and interests; they bargain, either cooperatively or not, over family decisions.⁵ Now, the theorist recognizes power asymmetries between family members and analyzes how spouses bargain over decisions. These articles are surveyed in section 4.

A few articles explore how households are formed (Edlund and Lagerlöf, 2006; Tertilt, 2005, 2006). They show how different marriage market institutions and family formation patterns influence gender outcomes and long-run development. We review these theories in section 5.

In addition to this descent—from aggregate production factors to households, and then to household members—, the analysis has also expanded horizontally, by considering new arenas in which gender inequality has relevant consequences for economic development. Examples are international trade (Seguino, 2000; Blecker and Seguino, 2002), foreign direct investment (Rees and Riezman, 2012), and politics (Besley *et al.*, 2017). Section 6 discusses this literature.

⁴Examples of this unitary household approach are Galor and Weil (1996); Zhang *et al.* (1999); Lagerlöf (2003).

⁵Examples of models with non-unitary households are De la Croix and Vander Donckt (2010); Diebolt and Perrin (2013); Doepke and Tertilt (2014); Prettner and Strulik (2017); Strulik (2018).

The vast majority of theories reviewed suggest that gender inequality is a barrier to economic development, particularly over the long run. In most models, irrespectively of the underlying source of differences between the genders (e.g., biology, socialization, discrimination), the opportunity cost of women's time is lower than that of men. This gender gap in the value of time affects economic growth through two main mechanisms. First, when women's time is relatively low, women will be in charge of childrearing and domestic work in the family. A low value of female time means that children are cheap. Fertility will be high, and economic growth will be low, both because population growth has a direct negative impact on long-run economic performance and because human capital accumulates at a slower pace (through the quantity-quality trade-off). Second, if parents expect low returns to female education, due to women specializing in domestic activities, they will invest relatively less in the education of girls. In the words of Harriet Martineau, one of the first to describe this mechanism, "as women have none of the objects in life for which an enlarged education is considered requisite, the education is not given" (Martineau, 1837, p. 107). In the long run, lower human capital investments (on girls) retard economic development.

We conclude, in section 7, by examining the limitations of the current literature and pointing ways forward.

2 A simple efficiency argument: men and women

In this section, we review three prominent arguments making the case that gender inequality in productive capabilities generates aggregate inefficiencies. According to this view, more equality between men and women leads to static efficiency gains in the short run. Yet, other authors warn that gender gaps in different dimensions interrelate, and addressing a gap in isolation may have ambiguous short term effects on economic performance.

The simplest argument for why gender inequality harms economic growth rests on two premises: (1) men and women are separate inputs in the economy-wide production of goods and services, and (2) each input has positive and diminishing marginal products.

An example of this setup is the Solow-type neoclassical growth model of Knowles *et al.* (2002), where male and female education are imperfect substitutes in production. A gender gap emerges in the *level* of the education input if men are more educated than women (or vice-versa). A gender gap emerges in the *returns* to the education input if its output elasticity differs between genders, such that, at any education level, the marginal products of education are also different.

In the following, by a reduction of the gender gap, we typically have in mind some sort of re-distribution between the genders to a more egalitarian outcome. Of course, if men are more educated than women, another way of reducing the gender gap would be to increase

female education, keeping male education constant. Because average education in society goes up, there is an obvious positive *level* effect on per capita output. But the interesting question is whether, keeping average education constant, smaller gender gaps in education are more conducive to growth than bigger gaps, i.e., whether there is a *distribution* effect.

In the case where output elasticities are the same for both genders, an economy where men and women contribute equally to aggregate production will maximize real output. Because men and women are imperfect substitutes, gender inequalities in how productive capacities are distributed are inefficient. Simply put, if men contribute more than women, the marginal product to the male input will be lower than the marginal product to the female input. Closing these gender gaps (in education, health, capital access, etc) would boost economic growth.

On top of this argument, Knowles *et al.* (2002) hypothesize that women's output elasticity of education is larger than men's. Although they do not explicitly model why this is the case, they justify the hypothesis with positive externalities of female education in reducing fertility and infant mortality, and improving the quantity and quality of children's education. If the output elasticity of female education is relatively large, a gender gap unfavorable to women reduces per capita output in the long run. In fact, the most efficient outcome would be a gender gap in the opposite direction, i.e., unfavorable to men.

The reasoning of Knowles *et al.* (2002) can easily be extended to other productive capabilities beyond education, such as health and access to capital. Often, female output elasticities are assumed to be larger than male elasticities, due to intergenerational externalities linked to woman's role as the primary caretaker in the family.

A second related argument for why gender inequality leads to aggregate inefficiency concerns the allocation of talent. Assume that talent is randomly distributed in the population. Then, an economy that curbs women's access to education, market employment, or certain occupations draws talent from a smaller pool than an economy without such restrictions (Klasen, 2002). Gender inequality can thus be viewed as a distortionary tax on talent (Dollar and Gatti, 1999). Indeed, occupational choice models with heterogeneous talent show that exogenous barriers to women's participation in the labor market and entrepreneurial occupations reduce aggregate productivity and per capita output (Esteve-Volart, 2004; Cuberes and Teignier, 2016, 2018).

Thus, if women have lower education, their marginal return to education would be higher than men's. Similarly, if women are more credit-constrained than men, female returns to capital should be higher than male returns, and so on. The problem with this type of reasoning is that it considers inequalities in separate dimensions as being independent from each other. In many cases, however, these inequalities are complementary (Duffo, 2012; Bandiera and Does, 2013; Kabeer, 2016). For example, if credit-constrained women face weak property rights, are unable to access certain markets, and have mobility

and time constraints, then the marginal return to capital may nevertheless be larger for men. Similarly, the return to male education may well be above the female return if demand for female labor is low or concentrated in sectors with low productivity. In sum, “the fact that women face multiple constraints means that relaxing just one may not improve outcomes” (Duflo, 2012, p. 1076). When applied to a particular productive endowment in isolation, the efficiency argument for gender equality may not hold.

A third important economic distortion is discrimination against women in the form of lower wages, holding male and female productivity constant. Cavalcanti and Tavares (2016) estimate the aggregate effects of wage discrimination using a model-based general equilibrium representation of the US economy. In their model, households are unitary and, within the household, women are assumed to be more productive in childrearing than men, so they pay the full time cost of this activity. In the labor market, even though men and women are equally productive, women receive only a fraction of the male wage rate—this is the wage discrimination assumption. Wage discrimination works as a tax on female labor supply. Because women work less than they would without discrimination, there is a negative level effect on per capita output. In addition, there is a second negative effect of wage discrimination operating through endogenous fertility. Since lower wages reduce women’s opportunity costs of childrearing, fertility is relatively high, and output per capita is relatively low. The authors calibrate the model to US steady state parameters and estimate large negative output costs of the gender wage gap. Reducing wage discrimination against women by 50 percent would raise per capita income by 35 percent, in the long run.

To sum up, when men and women are imperfect substitutes in production and women’s output elasticity is not smaller than men’s, male-bias in production factors causes an efficiency loss for the economy. Likewise, when talent is randomly distributed in the population, barriers to women’s education, employment, or occupational choice effectively reduce the pool of talent. And when men and women are equally productive, wage discrimination against women acts as a tax on their labor supply, which, once again, depresses aggregate economic activity. All these channels suggest that more gender equality can have an immediate positive effect on economic growth. However, policies should recognize that gender gaps in separate dimensions complement and reinforce one another. A naïve policy targeting a single gap in isolation is unlikely to have substantial growth effects in the short-run.

3 Unitary households: parents and children

In this section, we review models built upon unitary households. A unitary household maximizes a joint utility function subject to pooled household resources. Decisions are efficient by construction; the household is effectively a black-box. In this class of models,

gender inequality stems from a variety of sources. It is rooted in differences in physical strength (Galor and Weil, 1996; Kimura and Yasui, 2010; Hiller, 2014) or health (Bloom *et al.*, 2015); it is embedded in social norms (Lagerlöf, 2003; Hiller, 2014) or son preference (Zhang *et al.*, 1999). In all of the models, gender inequality is a barrier to long-run economic development.

Galor and Weil (1996) model an economy with three factors of production: capital, physical labor (“brawn”), and mental labor (“brain”). Men and women are equally endowed with brains, but men have more brawn. In economies starting with very low levels of capital per worker, women fully specialize in childrearing because their opportunity cost is lower than men’s. Over time, the stock of capital per worker builds up due to exogenous technological progress. The degree of complementarity between capital and mental labor is higher than that between capital and physical labor; as the economy accumulates capital per worker, the returns to brain rise relative to the returns to brawn. As a result, the relative wages of women rise, increasing the opportunity cost of childrearing. This negative substitution effect dominates the positive income effect on the demand for children and fertility falls.⁶ As fertility falls, capital per worker accumulates faster creating a positive feedback loop that generates a fertility transition and kick starts a process of sustained economic growth.

The model has multiple stable equilibria. An economy starting from a low level of capital per worker is caught in a Malthusian poverty trap of high fertility, low income per capita, and low relative wages for women. In contrast, an economy starting from a sufficiently high level of capital per worker will converge to a virtuous equilibrium of low fertility, high income per capita, and high relative wages for women. Through exogenous technological progress, the economy can move from the low to the high equilibrium.

Gender inequality in labor market access or returns to brain can slow down or even prevent the escape from the Malthusian equilibrium. Wage discrimination or barriers to employment would work against the rise of relative female wages and, therefore, slow down the takeoff to modern economic growth.

The Galor and Weil model predicts how female labor supply and fertility evolve in the course of development. First, (married) women start participating in market work and only afterwards does fertility start declining. Historically, however, in the US and Western Europe, the decline in fertility occurred *before* women’s participation rates in the labor market started their dramatic increase. In addition, these regions experienced a mid-twentieth century baby boom which seems at odds with Galor and Weil’s theory.

Both stylized facts can be generated by adding home production to the model, as do Kimura and Yasui (2010). In their article, as capital per worker accumulates, the

⁶This is not the classic Beckerian quantity-quality trade-off because parents cannot invest in the quality of their children. Instead, the mechanism is built by assumption in the household’s utility function. When women’s wages increase relative to male wages, the substitution effect dominates the income effect.

market wage for brains rises and the economy moves through four stages of development. In the first stage, with a sufficiently low market wage, both husband and wife are fully dedicated to home production and childrearing. The household does not supply labor to the market; fertility is high and constant. In the second stage, as the wage rate increases, men enter the labor market (supplying both brawn and brain), whereas women remain fully engaged in home production and childrearing. But as men partially withdraw from home production, women have to replace them. As a result, their time cost of childrearing goes up. At this stage of development, the negative substitution effect of rising wages on fertility dominates the positive income effect. Fertility starts declining, even though women have not yet entered the labor market. The third stage arrives when men stop working in home production. There is complete specialization of labor by gender; men only do market work, and women only do home production and childrearing. As the market wage rises for men, the positive income effect becomes dominant and fertility increases; this mimics the baby-boom period of the mid-twentieth century. In the fourth and final stage, once sufficient capital is accumulated, women enter the market sector as wage-earners. The negative substitution effect of rising female opportunity costs dominates once again, and fertility declines. The economy moves from a “breadwinner model” to a “dual-earnings model”.

Human capital accumulation plays no role in Galor and Weil (1996) and Kimura and Yasui (2010). Each person is exogenously endowed with a unit of brains. The fundamental trade-off in the two models is between the income and substitution effects of rising wages on the demand for children. When Lagerlöf (2003) adds education investments to a gender-based model, an additional trade-off emerges: that between the quantity and the quality of children.

Lagerlöf (2003) models gender inequality as a social norm: on average, men have higher human capital than women. Confronted with this fact, parents play a coordination game in which it is optimal for them to reproduce the inequality in the next generation. The reason is that parents expect the future husbands of their daughters to be, on average, relatively more educated than the future wives of their sons. Because, in the model, parents care for the total income of their children’s future households, they respond by investing relatively less on daughters’ human capital. Here, gender inequality does not arise from some intrinsic difference between men and women. It is instead the result of a coordination failure: “[i]f everyone else behaves in a discriminatory manner, it is optimal for the atomistic player to do the same” (Lagerlöf, 2003, p. 404).

With lower human capital, women earn lower wages than men and are therefore solely responsible for the time cost of childrearing. But if, exogenously, the social norm becomes more gender egalitarian over time, the gender gap in parental educational investment decreases. As better educated girls grow up and become mothers, their opportunity costs

of childrearing are higher. Parents trade-off the quantity of children by their quality; fertility falls and human capital accumulates. However, rising wages have an offsetting positive income effect on fertility because parents pay a (fixed) “goods cost” per child. The goods cost is proportionally more important in poor societies than in richer ones. As a result, in poor economies, growth takes off slowly because the positive income effect offsets a large chunk of the negative substitution effect. As economies grow richer, the positive income effect vanishes (as a share of total income), and fertility declines faster. That is, growth accelerates over time even if gender equality increases only linearly.

The natural next step is to model how the social norm on gender roles evolves endogenously during the course of development. Hiller (2014) develops such a model by combining two main ingredients: a gender gap in the endowments of brawn (as in Galor and Weil, 1996) generates a social norm, which each parental couple takes as given (as in Lagerlöf, 2003). The social norm evolves endogenously, but slowly; it tracks the gender ratio of labor supply in the market, but with a small elasticity. When the male-female ratio in labor supply decreases, stereotypes adjust and the norm becomes less discriminatory against women.

The model generates a U-shaped relationship between economic development and female labor force participation.⁷ In the preindustrial stage, there is no education and all labor activities are unskilled, i.e., produced with brawn. Because men have a comparative advantage in brawn, they supply more labor to the market than women, who specialize in home production. This gender gap in labor supply creates a social norm that favors boys over girls. Over time, exogenous skill-biased technological progress raises the relative returns to brains, inducing parents to invest in their children’s education. At the beginning, however, because of the social norm, only boys become educated. The economy accumulates human capital and grows, generating a positive income effect that, in isolation, would eventually drive up parental investments in girls’ education.⁸ But endogenous social norms move in the opposite direction. When only boys receive education, the gender gap in returns to market work increases, and women withdraw to home production. As female relative labor supply in the market drops, the social norm becomes more discriminatory against women. As a result, parents want to invest relatively less in their daughters’ education.

In the end, initial conditions determine which of the forces dominates, thereby shaping long-term outcomes. If, initially, the social norm is very discriminatory, its effect is stronger than the income effect; the economy becomes trapped in an equilibrium with high gender

⁷The hypothesis that female labor force participation and economic development have a U-shaped relationship—known as the feminization-U hypothesis—goes back to Boserup (1970). See also Goldin (1995). Recently, Gaddis and Klasen (2014) find only limited empirical support for the feminization-U.

⁸The model does not consider fertility decisions. Parents derive utility from their children’s human capital (social status utility). When household income increases, parents want to “consume” more social status by investing in their children’s education—this is the positive income effect.

inequality and low per capita income. If, on the other hand, social norms are relatively egalitarian to begin with, then the income effect dominates, and the economy converges to an equilibrium with gender equality and high income per capita.

In the models reviewed so far, human capital or brain endowments can be understood as combining both education and health. Bloom *et al.* (2015) explicitly distinguish these two dimensions. Health affects labor market earnings because sick people are out of work more often (participation effect) and are less productive per hour of work (productivity effect). Female health is assumed to be worse than male health, implying that women's effective wages are lower than men's. As a result, women are solely responsible for childrearing.⁹

The model produces two growth regimes: a Malthusian trap with high fertility and no educational investments; and a regime of sustained growth, declining fertility, and rising educational investments. Once wages reach a certain threshold, the economy goes through a fertility transition and education expansion, taking off from the Malthusian regime to the sustained growth regime.

Female health promotes growth in both regimes, and it affects the timing of the takeoff. The healthier women are, the earlier the economy takes off. The reason is that a healthier woman earns a higher effective wage and, consequently, faces higher opportunity costs of raising children. When female health improves, the rising opportunity costs of children reduce the wage threshold at which educational investments become attractive; the fertility transition and mass education periods occur earlier.

In contrast, improved male health slows down economic growth and delays the fertility transition. When men become healthier, there is only a income effect on the demand for children, without the negative substitution effect (because male childrearing time is already zero). The policy conclusion would be to redistribute health from men to women. However, the policy would impose a static utility cost on the household. Because women's time allocation to market work is constrained by childrearing responsibilities (whereas men work full-time), the marginal effect of health on household income is larger for men than for women. From the household's point of view, reducing the gender gap in health produces a trade-off between short-term income maximization and long-term economic development.

In an extension of the model, the authors endogeneize health investments, while keeping the assumption that women pay the full time cost of childrearing. Because women participate less in the labor market (due to childrearing duties), it is optimal for households to invest more in male health. A health gender gap emerges from rational household behavior that takes into account how time-constraints differ by gender; assuming taste-based discrimination against girls or gender-specific preferences is not necessary.

⁹Bloom *et al.* (2015) build their main model with unitary households, but show that the key conclusions are robust to a collective representation of the household.

Until now, parents invest in their children's human capital for purely altruistic reasons. This is captured in the models by assuming that parents derive utility directly from the quantity and quality of children. This is the classical representation of children as durable consumption goods (e.g., Becker, 1960). In reality, of course, parents may also have egoistic motivations for investing in child quantity and quality. A typical example is that, when parents get old and retire, they receive support from their children. The quantity and quality of children will affect the size of old-age transfers and parents internalize this in their fertility and childcare behavior. According to this view, children are best understood as investment goods.

Zhang *et al.* (1999) build an endogenous growth model that incorporates the old-age support mechanism in parental decisions. Another innovative element of their model is that parents can choose the gender of their children. The implicit assumption is that sex selection technologies are freely available to all parents.

At birth, there is a gender gap in human capital endowment, favoring boys over girls.¹⁰ In adulthood, a child's human capital depends on the initial endowment and on the parents' human capital. In addition, the probability that a child survives to adulthood is exogenous and can differ by gender.

Parents receive old-age support from children that survive until adulthood. The more human capital children have, the more old-age support they provide to their parents. Beyond this egoistic motive, parents also enjoy the quantity and the quality of children (altruistic motive). Son preference is modeled by boys having a higher relative weight in the altruistic-component of the parental utility function. In other words, in their enjoyment of children as consumer goods, parents enjoy "consuming" a son more than "consuming" a girl. Parents who prefer sons want more boys than girls. A larger preference for sons, a higher relative survival probability of boys, and a higher human capital endowment of boys positively affect the sex ratio, because, in the parents' perspective, all these forces increase the marginal utility of boys relative to girls.

Zhang *et al.* (1999) show that, if human capital transmission from parents to children is efficient enough, the economy grows endogenously. When boys have a higher human capital endowment than girls, and the survival probability of sons is not smaller than the survival probability of daughters, then only sons provide old-age support. Anticipating this, parents invest more on the human capital of their sons than on the human capital of their daughters. As a result, the gender gap in human capital at birth widens endogenously.

When only boys provide old-age support, an exogenous increase in son preference harms long-run economic growth. The reason is that, when son preference increases, parents enjoy each son relatively more and demand less old-age support from him. Other things

¹⁰This assumption does not necessarily mean that boys are more talented than girls. It can be also interpreted as a reduced-form way of capturing labor market discrimination against women.

equal, parents want to “consume” more sons now and less old-age support later. Because parents want more sons, the sex ratio increases; but because each son provides less old-age support, human capital investments per son decrease (such that the gender gap in human capital narrows). At the aggregate level, the pace of human capital accumulation slows down and, in the long run, economic growth is lower. Thus, an exogenous increase in son preference increases the sex ratio, and reduces human capital accumulation and long-run growth (although it narrows the gender gap in education).

In summary, in growth models with unitary households, gender inequality is closely linked to the division of labor between family members. If women’s time is less valued, they specialize in childrearing and home production, while men specialize in market work. And precisely due to this division of labor, the returns to female educational investments are relatively low. These household behaviors translate into higher fertility and lower human capital and thus pose a barrier to long-run development.

4 Intra-household bargaining: husbands and wives

In this section, we review models populated with non-unitary households, where decisions are the result of bargaining between the spouses. There are two broad types of bargaining processes: non-cooperative, where spouses interact in a non-cooperative game that often leads to inefficient outcomes (e.g., Doepke and Tertilt, 2014); and cooperative, where the spouses are assumed to achieve an efficient outcome. In a cooperative model, bargaining is either explicitly modeled as a function of an individual’s outside option (namely divorce), or proxied by bargaining weights, taken as exogenous by the spouses (known as collective household models; see Chiappori, 1988, 1992).¹¹

When preferences differ by gender, bargaining between the spouses matters for economic growth. If women care more about child quality than men do and human capital accumulation is the main engine of growth, then empowering women leads to faster economic growth (Prettner and Strulik, 2017). If, however, men and women have similar preferences but are imperfect substitutes in the production of household public goods, then empowering women has an ambiguous effect on economic growth (Doepke and Tertilt, 2014).

A separate channel concerns the intergenerational transmission of human capital and woman’s role as the main caregiver of children. If the education of the mother matters more than the education of the father in the production of children’s human capital, then empowering women will be conducive to growth (Diebolt and Perrin, 2013).

The idea that women might have stronger preferences for child-related expenditures

¹¹See also Echevarria and Moe (2000), who discuss the advantages of modeling households as non-unitary entities for two-sex models of fertility and human capital accumulation.

than men can be easily incorporated in a Beckerian model of fertility. The necessary assumption is that women place a higher weight on child quality (relative to child quantity) than men do. Prettner and Strulik (2017) build a unified growth theory model with collective households. Men and women have different preferences, but they achieve efficient cooperation based on (reduced-form) bargaining parameters. The authors study the effect of two types of preferences: (i) women are assumed to have a relative preference for child quality, while men have a relative preference for child quantity; and (ii) parents are assumed to have a relative preference for the education of sons over the education of daughters. In addition, it is assumed that the time cost of childcare borne by men cannot be above that borne by women (but it could be the same).

When women have a relative preference for child quality, increasing female empowerment speeds up the economy's escape from a Malthusian trap of high fertility, low education, and low income per capita. When female empowerment increases (exogenously), a woman's relative preference for child quality has a higher impact on household's decisions. As a consequence, fertility falls, human capital accumulates, and the economy starts growing. The model also predicts that the more preferences for child quality differ between husband and wife, the more effective is female empowerment in raising long-run per capita income, because the sooner the economy escapes the Malthusian trap. This effect is not affected by whether parents have a preference for the education of boys relative to that of girls. If, however, men and women have similar preferences with respect to the quantity and quality of their children, then female empowerment does not affect the timing of the transition to the sustained growth regime.

Strulik (2018) goes one step further and endogeneizes why men seem to prefer having more children than women. The reason is a different preference for sexual activity: other things equal, men enjoy having sex more than women.¹² When cheap and effective contraception is not available, a higher male desire for sexual activity explains why men also prefer to have more children than women. In a traditional economy, where no contraception is available, fertility is high, while human capital and economic growth are low. When female bargaining power increases, couples reduce their sexual activity, fertility declines, and human capital accumulates faster. Faster human capital accumulation increases household income and, as a consequence, the demand for contraception goes up. As contraception use increases, fertility declines further. Eventually, the economy undergoes a fertility transition and moves to a modern regime with low fertility, widespread use of contraception, high human capital, and high economic growth. In the modern regime, because contraception is widely used, men's desire for sex is decoupled from fertility. Both

¹²There are lots of empirical studies in line with this assumption, which is rooted in evolutionary psychology. See Strulik (2018) for references. There are several other evolutionary arguments for men wanting more children (including with different women). See, among others, Penn and Smith (2007); Mulder and Rauch (2009); von Rueden and Jaeggi (2016).

sex and children cost time and money. When the two are decoupled, men prefer to have more sex at the expense of the number of children. There is a reversal in the gender gap in desired fertility. When contraceptives are not available, men desire more children than women; once contraceptives are widely used, men desire fewer children than women. If women are more empowered, the transition from the traditional equilibrium to the modern equilibrium occurs faster.

Both Prettner and Strulik (2017) and Strulik (2018) rely on gender-specific preferences. In contrast, Doepke and Tertilt (2014) are able to explain gender-specific expenditure patterns *without* having to assume that men and women have different preferences. They set up a non-cooperative model of household decision making and ask whether more female control of household resources leads to higher child expenditures and, thus, to economic development.¹³

In their model, household public goods are produced with two inputs: time and goods. Instead of a single home-produced good (as in most models), there is a continuum of household public goods whose production technologies differ. Some public goods are more time-intensive to produce, while others are more goods-intensive. Each specific public good can only be produced by one spouse—i.e., time and good inputs are not separable. Women face wage discrimination in the labor market, so their opportunity cost of time is lower than men’s. As a result, women specialize in the production of the most time-intensive household public goods (e.g., childrearing activities), while men specialize in the production of goods-intensive household public goods (e.g., housing infrastructure). Notice that, because the household is non-cooperative, there is not only a division of labor between husband and wife, but also a division of decision making, since ultimately each spouse decides how much to provide of his or her public goods.

When household resources are redistributed from men to women (i.e., from the high-wage spouse to the low-wage spouse), women provide more public goods, in relative terms. It is ambiguous, however, whether the *total* provision of public goods increases with the re-distributive transfer. In a classic model of gender-specific preferences, a wife increases child expenditures and her own private consumption at the expense of the husband’s private consumption. In Doepke and Tertilt (2014), however, the rise in child expenditures (and time-intensive public goods in general) comes at the expense of male consumption *and* male-provided public goods.

Parents contribute to the welfare of the next generation in two ways: via human capital investments (time-intensive, typically done by the mother) and bequests of physical capital (goods-intensive, typically done by the father). Transferring resources to women increases human capital, but reduces the stock of physical capital. The effect of such transfers on economic growth depends on whether the aggregate production function is relatively

¹³They do not model fertility decisions. So there is no quantity-quality trade-off.

intensive in human capital or in physical capital. If aggregate production is relatively human capital intensive, then transfers to women boost economic growth; if it is relatively intensive in physical capital, then transfers to women may reduce economic growth.

There is an interesting paradox here. On the one hand, transfers to women will be growth-enhancing in economies where production is intensive in human capital. These would be more developed, knowledge intensive, service economies. On the other hand, the positive growth effect of transfers to women increases with the size of the gender wage gap, that is, *decreases* with female empowerment. But the more advanced, human capital intensive economies are also the ones with more female empowerment (i.e., lower gender wage gaps). In other words, in settings where human capital investments are relatively beneficial, the contribution of female empowerment to human capital accumulation is reduced. Overall, Doepke and Tertilt's (2014) model predicts that female empowerment has at best a limited positive effect and at worst a negative effect on economic growth.

Diebolt and Perrin (2013) assume cooperative bargaining between husband and wife, but do not rely on sex-specific preferences or differences in ability. Men and women are only distinguished by different uses of their time endowments, with females in charge of all childrearing activities. In line with this labor division, the authors further assume that only the mother's human capital is inherited by the child at birth. On top of the inherited maternal endowment, individuals can accumulate human capital during adulthood, through schooling. The higher the initial human capital endowment, the more effective is the accumulation of human capital via schooling.

A woman's bargaining power in marriage determines her share in total household consumption and is a function of the relative female human capital of the previous generation. An increase in the human capital of mothers relative to that of fathers has two effects. First, it raises the incentives for human capital accumulation of the next generation, because inherited maternal human capital makes schooling more effective. Second, it raises the bargaining power of the next generation of women and, because women's consumption share increases, boosts the returns on women's education. The second effect is not internalized in women's time allocation decisions; it is an intergenerational externality. Thus, an exogenous increase in women's bargaining power would promote economic growth by speeding up the accumulation of human capital across overlapping generations.

De la Croix and Vander Donckt (2010) contribute to the literature by clearly distinguishing between different gender gaps: a gap in the probability of survival, a wage gap, a social and institutional gap, and a gender education gap. The first three are exogenously given, while the fourth is determined within the model.

By assumption, men and women have identical preferences and ability, but women pay the full time cost of childrearing. As in a typical collective household model, bargaining power is partially determined by the spouses' earnings potential (i.e., their levels of human

capital and their wage rates). But there is also a component of bargaining power that is exogenous and captures social norms that discriminate against women—this is the social and institutional gender gap.

Husbands and wives bargain over fertility and human capital investments for their children. A standard Beckerian result emerges: parents invest relatively less in the education of girls, because girls will be more time-constrained than boys and, therefore, the female returns to education are lower in relative terms.

There are at least two regimes in the economy: a corner regime and an interior regime. The corner regime consists of maximum fertility, full gender specialization (no women in the labor market), and large gender gaps in education (no education for girls). Reducing the wage gap or the social and institutional gap does not help the economy escaping this regime. Women are not in labor force, so the wage gap is meaningless. The social and institutional gap will determine women's share in household consumption, but does not affect fertility and growth. At this stage, the only effective instruments for escaping the corner regime are reducing the gender survival gap or reducing child mortality. Reducing the gender survival gap increases women's lifespan, which increases their time budget and attracts them to the labor market. Reducing child mortality decreases the time costs of kids, therefore drawing women into the labor market. In both cases, fertility decreases.

In the interior regime, fertility is below the maximum, women's labor supply is above zero, and both boys and girls receive education. In this regime, with endogenous bargaining power, reducing all gender gaps will boost economic growth.¹⁴ Thus, depending on the growth regime, some gender gaps affect economic growth, while others do not. Accordingly, the policy-maker should tackle different dimensions of gender inequality at different stages of the development process.

In the bargaining models reviewed so far, men are passive observers of women's empowerment. Doepke and Tertilt (2009) set up an interesting political economy model of women's rights, where men make the decisive choice. Their model is motivated by the fact that, historically, the economic rights of women were expanded *before* their political rights. Because the granting of economic rights empowers women in the household, and this was done before women were allowed to participate in the political process, the relevant question is why did men willingly share their power with their wives?

Doepke and Tertilt (2009) answer this question by arguing that men face a fundamental trade-off. On the one hand, husbands would vote for their wives to have no rights whatsoever, because husbands prefer as much intra-household bargaining power as possible. But, on the other hand, fathers would vote for their daughters to have economic rights in their future households. In addition, fathers want their children to marry highly educated

¹⁴De la Croix and Vander Donckt (2010) show this with numerical simulations, because the interior regime becomes analytically intractable.

spouses, and grandfathers want their grandchildren to be highly educated. By assumption, men and women have different preferences, with women having a relative preference for child quality over quantity. Accordingly, men internalize that, when women become empowered, human capital investments increase, making their children and grandchildren better-off.

Skill-biased (exogenous) technological progress that raises the returns to education over time can shift male incentives along this trade-off. When the returns to education are low, men prefer to make all decisions on their own and deny all rights to women. But once the returns to education are sufficiently high, men voluntarily share their power with women by granting them economic rights. As a result, human capital investments increase and the economy grows faster.

In summary, gender inequality in labor market earnings often implies power asymmetries within the household, with men having more bargaining power than women. If preferences differ by gender and female preferences are more conducive to development, then empowering women is beneficial for growth. When preferences are the same and the bargaining process is non-cooperative, the implications are less clear-cut, and more context-specific. If, in addition, women's empowerment is curtailed by law (e.g., restrictions on women's economic rights), then it is important to understand the political economy of women's rights, in which men are crucial actors.

5 Household formation patterns

Two-sex models of economic growth have largely ignored how households are formed. The marriage market is not explicitly modeled: spouses are matched randomly, marriage is universal and monogamous, and families are nuclear. In reality, however, household formation patterns vary substantially across societies, with some of these differences extending far back in history. For example, Hajnal (1965, 1982) described a distinct household formation pattern in preindustrial Northwestern Europe (usually referred as the “European Marriage Pattern”) characterized by: (i) late ages at first marriage for women, (ii) most marriages done under individual consent, and (iii) neolocality (i.e., upon marriage, the bride and the groom leave their parental households to form a new household). In contrast, marriage systems in China and India consisted of: (i) very early female ages at first marriage, (ii) arranged marriages, and (iii) patrilocality (i.e., the bride joins the parental household of the groom).

Economic historians argue that the “European Marriage Pattern” empowered women, encouraging their participation in market activities and reducing fertility levels. While some view this as one of the deep-rooted factors explaining Northwestern Europe's earlier takeoff to sustained economic growth (e.g., Hartman, 2004; De Moor and Van Zanden,

2010; Carmichael *et al.*, 2016), others have downplayed the long-run significance of this marriage pattern (e.g., Ruggles, 2009; Dennison and Ogilvie, 2014). Despite this lively debate, the topic has been largely ignored by growth theorists. The few exceptions are Edlund and Lagerlöf (2006) and Tertilt (2005, 2006).

Edlund and Lagerlöf (2006) study how rules of consent for marriage influence long-run economic development. In their model, marriages can be formed according to two types of consent rules: individual consent or parental consent. Under individual consent, young people are free to marry whomever they wish, while, under parental consent, their parents are in charge of arranging the marriage. Depending on the prevailing rule, the recipient of the bride-price differs. Under individual consent, a woman receives the bride-price from her husband, whereas, under parental consent, her father receives the bride-price from the father of the groom.¹⁵ In both situations, the father of the groom owns the labor income of his son and, therefore, pays the bride-price, either directly, under parental consent, or indirectly, under individual consent. Under individual consent, the father needs to transfer resources to his son to nudge him into marrying. Thus, individual consent implies a transfer of resources from the old to the young and from men to women, relative to the rule of parental consent. Redistributing resources from the old to the young boosts long-run economic growth. Because the young have a longer timespan to extract income from their children's labor, they invest relatively more in the human capital of the next generation. In addition, under individual consent, the reallocation of resources from men to women can have additional positive effects on growth, by increasing women's bargaining power (see section 4), although this channel is not explicitly modeled in Edlund and Lagerlöf (2006).

Tertilt (2005) explores the effects of polygyny on long-run development through its impact on savings and fertility. In her model, parental consent applies to women, while individual consent applies to men. There is a competitive marriage market where fathers sell their daughters and men buy their wives. As each man is allowed (and wants) to marry several wives, a positive bride-price emerges in equilibrium.¹⁶ Upon marriage, the reproductive rights of the bride are transferred from her father to her husband, who makes all fertility decisions on his own and, in turn, owns the reproductive rights of his daughters. From a father's perspective, daughters are investment goods; they can be sold in the marriage market, at any time. This feature generates additional demand for daughters, which increases overall fertility, and reduces the incentives to save, which decreases the

¹⁵The bride-price under individual consent need not be paid explicitly as a lump-sum transfer. It could, instead, be paid to the bride implicitly in the form of higher lifetime consumption.

¹⁶In Tertilt (2005), all men are similar (except in age). Widespread polygyny is possible because older men marry younger women and population growth is high. This setup reflects stylized facts for Sub-Saharan Africa. It differs from models that assume male heterogeneity in endowments, where polygyny emerges because a rich male elite owns several wives, while poor men remain single (e.g., Lagerlöf, 2005; Gould *et al.*, 2008).

stock of physical capital. Under monogamy, in contrast, the equilibrium bride-price is negative (i.e., a dowry). The reason is that maintaining unmarried daughters is costly for their fathers, so they are better-off paying a (small enough) dowry to their future husbands. In this setting, the economic returns to daughters are lower and, consequently, so is the demand for children. Fertility decreases and savings increase. Thus, moving from polygyny to monogamy lowers population growth and raises the capital stock in the long run, which translates into higher output per capita in the steady state.

Instead of enforcing monogamy in a traditionally polygynous setting, an alternative policy is to transfer marriage consent from fathers to daughters. Tertilt (2006) shows that when individual consent is extended to daughters, such that fathers do not receive the bride-price anymore, the consequences are qualitatively similar to a ban on polygyny. If fathers stop receiving the bride-price, they save more physical capital. In the long run, per capita output is higher when consent is transferred to daughters.

In summary, the rules regulating marriage and household formation carry relevant theoretical consequences for economic development. While the few studies on this topic have focused on consent rules and polygyny, other features of the marriage market remain largely unexplored.

6 Beyond the household: openness, politics, and corruption

In this section, we review theories that explore how gender inequality affects economic growth in three areas: small open economies, politics, and corruption.

Opening to the world All the models reviewed so far considered closed economies. In open economies, however, gender inequality can interact with trade and international capital flows.

Seguino (2000) argues that wage discrimination against women promotes economic growth in countries where exports are the main engine of growth and where the export sector is female-intensive. Higher wage discrimination against women—i.e., an increase in the gender wage gap that is unrelated to productivity differences between the genders—increases the country’s export competitiveness. But for an increase in wage discrimination not to result in women leaving to other sectors, a sufficient degree of job segregation is needed, such that women are effectively “trapped” in the export sector. Blecker and Seguino (2002) formalize this argument in a short-run demand-side model. When the price elasticity of export demand is relatively large, a reduction in the gender wage gap will hurt export-led growth.

Rees and Riezman (2012) model the effect of globalization on economic growth, through the impact of foreign direct investment on gender equality. Men and women differ in their preferences for child quality, which are relatively higher for women. Women are also assumed to bear the full burden of childrearing. Husbands and wives bargain cooperatively, with the bargaining power of each spouse being a positive function of his or her wage rate. Globalization creates job opportunities in a high productivity sector (factory) for either men or women, who otherwise work in a low productivity sector (farm). If globalization creates job opportunities for women, their bargaining power increases and households trade off child quantity by child quality. Fertility falls, human capital accumulates, and long-run per capita output is high. If, on the other hand, globalization creates jobs for men, their intra-household power increases; fertility increases, human capital decreases, and steady-state income per capita is low. Thus, whether global capital flows generate jobs primarily in female or male intensive sectors matters for long-run growth.

Women in politics The extent to which women participate in representative politics can affect economic growth through three different channels: the provision of public goods, role model effects, and politician quality.

The first channel concerning the provision of public goods hinges on the assumption that men and women have different preferences on public expenditures. Women would rather spend on goods that they would otherwise produce within the household. In the case that the public goods preferred by women are more conducive to development, or in the case that they liberate women's time for market activities (relative to male-preferred public goods), then increasing female representation among policy makers would foster economic growth (e.g., Stotsky, 2006; Duflo, 2012).

Besides gender-specific preferences in the *composition* of public expenditures, another common assumption is that women prefer a higher *level* of public spending, as well as a larger role of the government in redistributing income and providing social security. In this case, whether a smaller gender gap in political representation improves economic performance depends on whether a larger government is good or bad for growth, which might be highly context specific. In any case, if these political preferences are driven by women's lower economic status, then more gender equality in the economic domain reduces the importance of gender inequality in politics. If, on the other hand, differences in political behavior between men and women reflect differences in deep-rooted preferences, then the effect of empowering women as political actors is independent of gender equality in other economic and social dimensions.

The insights from Doepke and Tertilt's (2014) household model can be used to explore the effects of different demand for public goods at the political level. Recall that in their model no gender-specific preferences are needed; behavioral differences are driven by the

time allocation of home production. If women provide household public goods that are time intensive, while men provide household public goods that are goods-intensive, then control over resources at the government level may affect the provision of public goods. Female politicians are likely to invest relatively more in female-provided household public goods; the opposite occurring for male politicians. The effects on economic growth of empowering women in the political arena may depend on whether the production function technology is intensive in human capital or physical capital.

Another, more indirect, channel concerns role model or aspiration effects. If female empowerment at the household level is conducive to development, then female politicians might have a positive effect on long-run growth, if they contribute to more gender equality in the next generations—either through role model effects that increase the aspiration of young girls, or through a reduction of social biases against women in general (Beaman *et al.*, 2009).

A third channel concerns exogenous increases in female representation through the use of gender quotas for political positions. One of the most common arguments against gender quotas in politics is that they may decrease the average quality of politicians, if lower quality women replace higher quality men. Besley *et al.* (2017), however, develop a model of local party politics where the opposite occurs. The introduction of a gender quota leads to an increase in average politician quality because, among *male* politicians, lower quality men are replaced by men of higher quality.

According to the model, the leader of a local party faces a fundamental trade-off. The higher the quality (*competence*) of the party's candidates, the more likely the party is to win the election, but the less likely is the leader to survive a contest from the party's candidates. In other words, the higher the quality of the remaining candidates, the tougher is the internal competition faced by the leader. Leaders come in two types, high or low quality, depending on whether their competence is above or below the median competence of party members. Leaders derive utility from ego rents (that is why they want to be leaders) and from the party winning the election (irrespective of being the leader). The result of the trade-off between electoral success and internal survival is that high quality leaders choose higher quality candidates, while low quality leaders choose lower quality candidates.

When gender is added to the model, an additional trade-off emerges. Now, voters care both about candidate quality *and* gender equality. They prefer parties with equal gender representation in their ballots. Then, a male leader who picks a higher share of female candidates increases the electoral outcomes of his party. On the other hand, a higher share of female candidates threatens the survival of male leaders—the assumption here being that female candidates prefer a female leader, because policy preferences are, to a certain extent, gender-specific. As a result, male leaders face a gendered trade-off between

electoral success and internal survival. A higher share of women candidates increases the former but decreases the latter.¹⁷

When a leader is forward-looking, he will resign before the election if he predicts that a new leader has a higher chance of winning. Thus, low quality leaders will have an incentive to resign if they predict that a higher quality leader will replace them. For the high quality leader, this incentive is weaker. Since the high quality leader can pick higher quality candidates (due to a relatively smaller threat from internal competition), he will have a better chance of winning the election.

Against this background, the gender quota exogenously increases the threat to survival of all male leaders. Low quality leaders will be the first to resign, because they face the largest threat in any case. When they resign, they are, on average, replaced by more competent leaders, who then select more competent candidates. Average politician quality goes up.¹⁸

The mechanisms of Besley *et al.* (2017) rest of the assumption of a democratic electoral process with (1) voters deriving utility only from politician competence and gender equality in candidate representation, (2) party leaders facing internal competition from other party candidates (they are all competing for ego rents), (3) more competent candidates posing a greater survival threat to a party leader, and (4) a higher share of women candidates posing a greater survival threat to a male leader. On the other hand, in less democratic electoral processes, in places where gender equality is less valued by society, or when party structures are highly centralized and not really open to internal dispute—in all these contexts—the mechanisms of the model would break down.

Women and corruption Women’s underrepresentation in leadership positions, either in politics or business, may also affect economic performance via its effect on corruption. There is suggestive evidence that women engage in less corruption than men (e.g., Dollar *et al.*, 2001; Swamy *et al.*, 2001; Beaman *et al.*, 2009; Brollo and Troiano, 2016).¹⁹

Swamy *et al.* (2001) review several hypotheses explaining this gender difference in corruption with factors that can be expected to persist over time. Women may avoid corruption because they are more risk-averse than men, or because they are more honest—since honesty is a trait they want to pass on to their children (for whose rearing they are mainly responsible)—, or because they put a greater preference on obeying the law—since

¹⁷A gender gap in political representation emerges endogenously. Because a female candidate threatens the survival of a male leader more than an equally competent male candidate would, the optimal share of female candidates is below one-half. That is why a gender quota is needed.

¹⁸In the model, resignation is voluntary; it comes from the leader trading off ego rents with the utility from the party winning the election. But, in addition, there could be “social pressure” on low quality leaders after the introduction of a quota. Such pressure would reinforce the model’s conclusions.

¹⁹There is a broader debate in economics about the effect of corruption on economic growth. The controversy is on whether corruption “greases” or “sands” the wheels of economic growth. See, among others, Shleifer and Vishny (1993); Bardhan (1997); Méon and Sekkat (2005).

the law disproportionately benefits the physically weak.

But an alternative set of explanations involves factors that result from women's historical underrepresentation in positions of power. Women may have fewer *opportunities* to engage in corruption (Goetz, 2007). For example, they may be excluded from corruption networks or have less knowledge on how these operate. These differences are likely to erode, as female representation increases over time, and powerful women become exposed to (and familiar with) corruption practices. Thus, the underlying cause for the gender-differential in corruption will determine whether increasing women's representation will reduce corruption in the short or in the long run.

In summary, if indeed women engage in less corruption than men, it is important to know the underlying cause for this gender difference. If the difference is driven by evolutionary or socialization forces, then more women in leadership positions will likely reduce corruption in the long run. If, on the other hand, the difference stems from a history of underrepresentation, the positive impact of more female leaders is likely to be short-lived.

7 Conclusion

In this article, we surveyed the theoretical literature linking gender inequality to economic development. This literature offers many plausible mechanisms through which inequality between men and women affects the aggregate economy. Yet, we believe the body of theories could be expanded in several directions. We discuss them below and finish by suggesting ways in which the dialogue between theory and empirics on this topic can be improved.

The first direction for future research concerns control over fertility. In models where fertility is endogenous, households are always able to achieve their preferred number of children (see Strulik, 2018, for an exception). The implicit assumption is that there is a free and infallible method of fertility control available for all households—a view rejected by most demographers. The gap between desired fertility and achieved fertility can be endogeneized at two levels. First, at the societal level, the diffusion of particular contraceptive methods may be influenced by cultural and religious norms. Second, at the household level, fertility control may be object of non-cooperative bargaining between the spouses, in particular, for contraceptive methods that only women perfectly observe (Ashraf *et al.*, 2014; Doepke and Kindermann, 2016). More generally, the role of asymmetric information within the household is not yet explored.

A second direction worth exploring concerns gender inequality in a historical perspective. In models with multiple equilibria, an economy's path is often determined by its initial level of gender equality. Therefore, it would be useful to develop theories explaining why initial

conditions varied across societies. In particular, there is a large literature on economic and demographic history documenting how systems of marriage and household formation differed substantially across preindustrial societies (e.g., Hajnal, 1965, 1982; Hartman, 2004; Ruggles, 2009; De Moor and Van Zanden, 2010). In our view, more theoretical work is needed to explain both the origins and the consequences of these historical systems.

A third avenue for future research concerns the role of technological change. In several models, technological change is the exogenous force that ultimately erodes gender gaps in education or labor supply (e.g., Galor and Weil, 1996; Doepke and Tertilt, 2009; Bloom *et al.*, 2015). For that to happen, technological progress is assumed to be skill-biased, thus raising the returns to education—or, in other words, favoring brain over brawn. As such, new technologies make male advantage in physical strength ever more irrelevant, while making female time spent on childrearing and housework ever more expensive. Moreover, recent technological progress increased the efficiency of domestic activities, thereby relaxing women’s time constraints (e.g., Greenwood *et al.*, 2005; Cavalcanti and Tavares, 2008). These mechanisms are plausible, but other aspects of technological change need not be equally favorable for women. In many countries, for example, the booming science, technology, and engineering sectors tend to be particularly male-intensive.

Even if current technological progress is assumed to weaken gender gaps, historically, technology may have played exactly the opposite role. If technology today is more complementary to brain, in the past it could have been more complementary to brawn. An example is the plow that, relative to alternative technologies for field preparation (e.g., hoe, digging stick), requires upper body strength, on which men have a comparative advantage over women (Boserup, 1970; Alesina *et al.*, 2013). Another, even more striking example, is the invention of agriculture itself—the Neolithic Revolution. The transition from a hunter-gatherer lifestyle to sedentary agriculture involved a relative loss of status for women (Dyble *et al.*, 2015; Hansen *et al.*, 2015). One explanation is that property rights on land were captured by men, who had an advantage on physical strength and, consequently, on physical violence. Thus, in the long view of human history, technological change appears to have shifted from being male-biased towards being female-biased. Endogeneizing technological progress and its interaction with gender inequality is a promising avenue for future research.

A final point concerns the role of men in this literature. In most models, gender inequality is not the result of an active male project that seeks the domination of women. Instead, inequality emerges as a rational best response to some underlying gender gap in endowments or constraints. Then, as the underlying gap becomes less relevant—for example, due to skill-biased technological change—, men passively relinquish their power (see Doepke and Tertilt, 2009, for an exception). There is never a male backlash against the short-term power loss that necessarily comes with female empowerment. In reality,

it is more likely that men actively oppose losing power and resources towards women (Kabeer, 2016). This possibility has not yet been explored in formal models, even though it could threaten the typical virtuous cycle between gender equality and growth. If men are forward-looking, and the short run losses outweigh the dynamic gains from higher growth, they might ensure that women never get empowered to begin with. For example, Eswaran and Malhotra (2011) set up a household decision model where men use domestic violence against their wives as a tool to enhance male bargaining power. Thus, future theories should recognize more often that men have a vested interest on the process of female empowerment.

Turning now to the empirical literature, we notice two main challenges. First, most empirical studies focus on the Solow-model type of efficiency arguments, thus estimating reduced-form aggregate differences in the output elasticities of male and female inputs. At the same time, there is a large gap in the empirical literature for studies testing the type of household-based mechanisms that are at the heart of most theories surveyed in this article. For example, in a recent survey of the deep determinants of long-run economic development, gender inequality is not mentioned (Spolaore and Wacziarg, 2013). Second, the theoretical literature suggests that the timing of effects vastly differs. For some mechanisms, such as talent misallocation or export-competitiveness, the effects of gender inequality are quite short-term. But for other chains of causality, such as fertility and human capital accumulation, some of the effects are intergenerational. Empirical work needs to consider these different timings more explicitly.

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