
A GENDER-AWARE ANALYSIS OF KREMER'S O-RING THEORY OF DEVELOPMENT

By Ellen McHugh
Junior Sophister

The 35th Edition of the Student Economic Review begins with a sagacious application of Kremer's O-Ring Theory employing a gender-aware analysis by Ellen McHugh. This first-class exploration employs an employment and production matching model within the gender norms that are a mainstay of modern society. McHugh recognizes the failings of the O-Ring theory, extending to unpaid household labour; female's lower return on education and that key assumptions of the theory are not micro-founded. Pre-existing literature extensions to O-Ring Theory are discussed. Such extensions amass to increase investment in production. McHugh argues that without a real gender norm challenge to the status quo, the O-Ring Theory will continue to fall short of explaining the skills and production matching system, which is central to the theory. The critiques proposed in this paper are well-founded and improve the model's descriptive power, a difficult task given the complexity of O-Ring Theory.

I. Introduction

In 2016, the United Nations' High-Level Panel on Women's Economic Empowerment released its first report: Leave No One Behind - A Call to Action for Gender Equality and Women's Economic Empowerment. Its findings illustrated persistent inequalities in economic opportunities and outcomes between

between men and women. This paper aims to compare the findings and recommendations of this report, and those of other writers in the field of feminist economics in particular, to the theoretical explanation of labour and wage inequality encapsulated by Kremer's O-Ring Theory of Economic Development, with particular regard to the assortative matching component of the theory. It seeks to provide a comprehensive, gender-aware analysis of Kremer's theoretical framework, its underlying assumptions, and its implications. The paper will analyse the extent to which O-Ring Theory can account for barriers to female economic empowerment in developing countries, particularly regarding entry into and progression within the labour market.

Gender-aware analysis is economic analysis that seeks to account for the fact that economic and social processes take place within and through gendered relationships (Elson, 1993). It provides a new perspective from which to create and analyse economic models and to understand the impact of economic and social policy. Promoting a more interdisciplinary approach, gender-aware analysis acknowledges the role of "patriarchal norms, traditions, institutions, and values affecting women's lives" (Beneria, 2003, p. x) in order to gain a fuller understanding of their conditions and, often, their subordination. The importance of gender-aware analysis is particularly evident in the case of development. Rather than relegating "gender" to a subsection of development theory and practice, gender-aware analysis promotes the centring of gendered relationships in mainstream development thinking. Additionally, gender-aware analysis helps to mitigate some of the harms caused by socially disembodied economics (Heilbroner, L. & Milberg, W., 1995) and can help bridge the gap between theory and reality that has characterised much of mainstream modern economics. Gender-aware analysis is a valuable tool that can be used to guide economic and social development in a more inclusive manner, through adapting underlying assumptions to be more reflective of the lived experiences of women in both the developed and the developing world.

For the purposes of this paper, gender is treated in accordance with the definition provided by the American Psychological Association, i.e. "the attitudes, feelings, and behaviors that a given culture associates with a person's biological sex... [it] is a social construct and a social identity." (APA, 2020). This paper is limited in its discussion of "men" and "women" as internally homogeneous social categories. Further work incorporating analytical processes such as Gender-Based Analysis Plus (GBA+) is required to capture the complex interaction between gender identity, race, religion, and other factors that influence how people are affected by economic and social processes. The merit of this paper lies in its initial critique of an established model of economic development as a starting point for further research and analysis.

II. Labour Inequality in Developing Countries: Current Trends

The World Economic and Social Outlook (WESO) conducted by the ILO in 2017 illustrates persistent inequalities in economic opportunities for men and women, which are particularly evident in developing countries. Although developing countries are reported as having the lowest participation gap, this is mainly driven by economic necessity, and women in the labour force are less likely to find employment than men. This is most keenly experienced in Northern Africa (where there is a 10% gap in the employment rate), Latin America and the Caribbean (3.4%), and the Arab States (12.9%). Women are less likely than men to be in waged or salaried employment and are more likely to be in vulnerable forms of employment. In developing countries, 13.6% of employed women are in salaried or waged employment, compared with 24.3% of men. The greatest disparity is seen in sub-Saharan Africa, where there is a 13.7% gap, an increase of 0.6% since 2007. 19.4% more women than men work as contributing family workers, an increase of 2.4% since 2007.

These trends “...stand in stark contrast to the major progress on gender gaps in education and health.” (UN, 2016, p. 24) While there has been substantial investment in improving educational and health outcomes for women and girls in the Global South, these outcomes have not translated into economic empowerment and gender equality in labour market opportunities.

The gendered occupational segregation reported by both the ILO and the UN disproportionately harms female workers in terms of income, security, and safety. Women tend to be over-represented in lower-paying sectors and informal work, and those employed in informal work tend to be paid less than men in these settings (UN, 2016, p. 29). As informal work lies outside of formal legal requirements surrounding labour rights, workers lack access to basic infrastructure and social protection and are more likely to be threatened by sexual violence and harassment in the workplace. Additionally, as they are not included in official government statistics on the labour market, the challenges faced by these workers are often unrecorded (UN, 2016, p. 32) While informal

¹ It should be noted here that some Arab States are no longer classified as “developing” countries.

² “A contributing family worker is a person who holds a self employment job in a market-oriented establishment operated by a related person living in the same household, and who cannot be regarded as a partner because of the degree of his or her commitment to the operation of the establishment, in terms of the working time or other factors to be determined by national circumstances, is not at a level comparable with that of the head of the establishment.” (OECD: Principles and Recommendations for Population and Housing Censuses, Revision 1, United Nations, New York, 1998, para. 2.82.)

work does not constitute the typical waged employment often considered by economists in development models, it forms a key part of the economies of developing countries, particularly given the effects of globalisation. Therefore, the question of why women are over-represented in this sector is relevant for questions of development and occupational segregation, both of which are key components of O-Ring Theory.

III. Kremer's O-Ring Theory of Development: An Overview

The O-Ring Theory of Development builds on existing literature in economic theory to create a model of production and employment where workers of similar skill levels are matched together at points along the chain of production that reflect their skill level, q (Kremer, 1993). Where skill is perfectly observable, perfect assortative matching occurs both within and between firms. In equilibrium, therefore, "...small differences in worker skill create large differences in productivity and wages" (Kremer, 1993, p. 557), as firms that face a high marginal product of skill will bid the most for the workers with high q . High-skill workers will therefore be matched in firms with high levels of production, and will be offered correspondingly high wages. When the chain of production is extended internationally, the theory argues that countries with the lowest q workers are allocated to the earliest stages of production. Kremer contends that this is consistent with the wage and productivity differences between rich and poor countries, meaning that the O-Ring Theory has empirical relevance to the study of international economic development.

Kremer also endogenizes skill as the product of investment in education or effort, e , and accounts for the fact that perfect matching of workers is not always possible (Kremer, 1993, p. 564). In this case, workers will "match in rank order of skill, with the division of the firm's output among its heterogeneous workers determined by a complex bargaining problem." (Kremer, 1993, p. 565) Imperfect matching leads a worker to underinvest in their skill, which leads other workers to do the same, due to the strategic complementarity of the investment. Therefore, worker investment in education and effort will not reach the socially optimal level and consequently, neither will q . Additionally, Kremer proposes a model of "self-fulfilling statistical discrimination" under imperfect observability of skill (1993, p. 570) to explain income differences between ethnic groups within the same country. Employers conducting matching and overseeing the bargaining process regarding wages will pay a lower wage for a group of workers assumed to be in a low equilibrium, no matter their actual skill level. As a result of this, workers in this group "will choose a lower e , validating the employers' expectations." (1993, p.570) Kremer points to the differences in return to education between white and black workers in the United States as evidence of this model operating in practice. In this manner, Kremer conceives a model that provides a mechanism by which bias can be concretely translated into negative outcomes. Whether this model is an accurate one, and whether it is applicable to gender bias in particular, will be questioned further in this paper.

IV. Gender Inequality in Investment in Education and Effort: Gendered Educational Disparities in Developing Countries: q and e Effects

Gender disparities in educational attainment are a leading factor in differences in skill levels in a number of developing countries (Chua, 2017). However, O-Ring Theory fails to account for the fact that unequal distribution of the burden of unpaid labour, household labour in particular, constrains women from translating additional education or skill into increased labour force participation or higher-paid work (OECD, 2014). Therefore, increasing women's q or e would not necessarily lead to an increase in the wages that they earn. In a model of unconstrained choice, this could be framed as women facing a lower return to education, and therefore choosing not to invest in it. However, the assumption of unconstrained choice does not hold in actuality, as women often face barriers to accessing education and improving their skill regardless of their preferences. In order for increased female education to address this inequality, it must be accompanied by policies designed to ease the burden of unpaid labour they face and efforts to alter societal norms about the role of women.

New Technologies: A Rising Tide that Lifts Some Boats

Based on O-Ring Theory, analysis by Dalmazzo et al (2007, p. 515) illustrates “why identical workers may receive different wages in equilibrium, and why complex technologies may increase wage inequalities amongst co-workers.” While analysis based on technology may not apply directly to all forms of gendered wage inequality in developing countries, it is useful in certain contexts, particularly as the use of more complex technologies increases as development occurs. The basis for the increased wage inequality is that the use of more complex technologies requires more effort from workers. I would argue that this is most apparent in the short-term: while the technology may increase output and productivity and decrease workload in the long-term, at the point of adoption, workers must adapt their skillset in order to be able to use the technology effectively. This requires an increase in effort, through attending training programmes, concentrating more during the production process, and so on. Workers, therefore, will choose a higher level of e , and thus q , and will therefore earn higher wages. Plants that adopt new technologies will become “high-wage plants” (Dalmazzo et al, 2007) compared with plants that do not. The adoption of new technologies, however, will also lead to greater inequalities within plants between high-skill and low-skill workers. As argued by Lourdes Beneria (2003), women are overwhelmingly likely to be amongst those left behind by the adoption of new technology, as they are less able to upgrade their skill levels through means such as after-work training (OECD, 2014) Therefore, increasing women's q or e would not necessarily lead to an increase in the wages that they earn. In a model of unconstrained choice, this could be framed as women facing a lower return to education, and therefore choosing not to invest in it. However, the assumption of unconstrained choice does not hold in actuality, as women often face barriers to accessing education and improving their skill regardless of their preferences. In order for

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What should be noted from this is that the lack of investment by women towards increasing their q is not shaped by their preferences, but rather by constraints on their mobility enforced by societal norms. As Beneria (2003, p. 119) puts it:

“...women’s primary involvement in domestic work and childcare responsibilities continues to be a source of economic vulnerability for them, not only because this is unpaid work but also because it diminishes women’s mobility and autonomy to design their labour market strategies.”

V. Model extensions

Bias in Assortative Matching

Kremer (1993, p. 570) proposes an adapted model of self-fulfilling statistical discrimination in the case of racialised wage disparities. This may also be applied to gender wage disparities: if women are assumed to be in a lower equilibrium, employers will pay them less than their male counterparts

through assigning them to lower-skill and lower-paying tasks on the chain of production. This can also partially explain why the increase in female education in developing countries has not been matched by similar decreases in gender gaps in economic opportunity and pay. O-Ring Theory offers a mechanism by which sustained gender bias in hiring and allocating practices can be translated into the perpetuation of gender wage differentials: if women face a lower return to education, their incentive to invest in e decreases substantially. Therefore, women are likely to end up in lower equilibrium than their male counterparts. However, this assumes that women are unconstrained in their choice to invest in e . Additionally, this mechanism assumes that decisions on hiring and allocation of tasks between and within firms are based solely on the assumed skill level of the worker. There are, however, numerous other factors that contribute to the gendered occupational segregation in developing countries which O-Ring Theory does not consider.

Non-q Factors Affecting Gendered Occupational Segregation and Wage Disparities Social Norms

Jayachandran (2020) identifies the manner in which social norms in developing countries restrict women's participation in the labour market. In societies that place a large value on "purity", women are restricted from participating in occupational areas that are traditionally dominated by men (Jayachandran, 2020, p. 6). More broadly, Jayachandran illustrates that variation in norms is correlated with variation in female employment, and that certain levels of development will actually lead to less female employment. In this manner, the relationship between economic development and female employment may be seen as a U-shaped curve. As wages grow at the beginning of the development process, households can afford to lower total hours worked, and norms linked to notions of purity or the role of women more broadly mean that those most likely to lower hours worked are women. As development continues, female employment will increase once more with the transition to "cleaner" office-based employment and increased education (Jayachandran, 2020). However, I would argue that a more fundamental shift is necessary to sustain female participation in the labour market and in affording equal opportunities for advancement within the labour market: a shift in societal norms away from those that are restrictive to women. While Jayachandran (2020) analyses a number of policies to work around these societal norms, these are not long-term solutions to the barriers to participation and progression faced by women.

The construction of the globalised economy is such that large and medium multinational corporations increasingly outsource and subcontract to the informal sector, often located in developing countries (Beneria, 2003). The firms to which MNCs outsource disproportionately prefer to hire women as they have less mobility and less bargaining power - they lack alternative options that they can leverage to negotiate higher wages and better working conditions. In these cases, women face lower wages regardless of their skill level, and the

allocation of wages is based not on skill but on a logic of profit maximization grounded in the minimization of wages paid. This relates to what Elson (1993) terms the extraction of women's labour. The structure of the global economy in conjunction with adverse societal norms perpetuates the exclusion of women from formal employment and limits their power to negotiate better working conditions and higher wages. In order to combat this problem, higher regulatory powers and better oversight are needed to lessen the exploitation of female workers.

Limiting Competition for Higher-Paid Employment

Elson (1993, p. 245) argues that “[c]ritical analysis of markets and workplaces reveals that their norms and institutions are related to patterns of entitlement and power.” In limiting the access of women to formal and informal networks of power, the competition among male workers for higher paid positions is decreased. The perpetuation of the status quo is incentivised and the transition of female workers from the periphery to the centre is resisted. This process, however, is not socially optimal: limiting competition decreases productivity and impedes achieving development outcomes. In this manner, O-Ring Theory may be incorporated: in consistently limiting competition through excluding female workers, countries may end up in low-productivity traps that individual workers do not have an incentive to escape from. However, O-Ring Theory cannot account for the emergence of this trap, and does not provide a concrete solution to it (as increasing investment in female education and skill would not lead to an increase in female participation, and may even decrease it in this scenario, as female workers would be perceived as even more of a “threat” to male workers).

VI. Conclusion

While O-Ring Theory is successful in capturing some of the mechanisms that lead to gendered occupational segregation, it fails to account for the restrictions limiting the ability of women in developing countries to freely design and execute labour market strategies. The extent to which e is endogenously chosen by female workers is highly questionable. While solutions to low productivity traps proposed by O-Ring Theory mainly focus on encouraging investment in education and skills, this may not translate into better outcomes for women unless it is accompanied by changing societal norms and greater freedom for women to design their own labour market strategies. Finally, the disproportionate representation of female workers in the informal sector is not primarily the result of skill level, but the result of preferences of firms to hire workers with less mobility in order to obtain higher profits. The global labour market (both across and within countries) is constructed in a way that limits competition for higher-paid work by excluding women from these positions and allows firms to increase profits through exploiting the biases that limit women's mobility and bargaining power. It is in developing countries that the effects of this process are most keenly observed. This is due to the fact that the globalised distribution of the production process already disproportionately disadvantages them, and that the limiting of competition acts as a barrier to achieving development objectives.

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