

## Modelling of women's labour supply decisions in a life-cycle framework

### Executive summary

India's low and stagnant female labour force participation (FLFP), wide gender gap in workforce participation, and non-monotonic relationship of FLFP and women's education, typify concerns regarding women's workforce participation in economies transitioning from low to high economic growth – and stand in contrast to the experience of developed economies such as the United Kingdom, U.K.

This study highlights the role of home productivity in explaining these trends by constructing a model of couples' time allocation decisions allowing for both market and home productivity to improve with own education. The theoretical predictions match the data for India at low levels of women's education but over-predict labour supply at higher levels, unlike the U.K. Incorporating constraints imposed by social norms regarding the gendered division of labour at home shows that norms can act as a binding constraint, producing much smaller increases in women's labour supply to market work at higher education levels in transition economies.

### Introduction – context and rationale

Female labour force participation (FLFP) in India is not only shockingly low (approximately 25%) but has also been stagnant for decades despite rising education, falling fertility, and a prolonged period of high economic growth. Consequently, the gender gap in workforce participation remains wide. Besides India, other middle income or transition economies also demonstrate lower FLFP than expected at their levels of socioeconomic development.

In contrast, there has been a dramatic increase in women's labour supply in the U.S. and several other developed countries since the beginning of the 20<sup>th</sup> century (Goldin 2006). During this period, FLFP increased by almost 70 percentage points, narrowing the gender gap in workforce participation, as women benefited from rising education, together with more favourable gender wage ratio, and technological innovations that allowed them control over child-birth timing and reduced time in home production activities (Goldin and Katz 2000, Greenwood et al. 2005b).

Furthermore, the low levels of FLFP are often accompanied by a non-monotonic relationship between women's workforce participation and education in transition economies, unlike in the OECD (Organisation for Economic Co-operation and Development) countries (OECD, 2012).

On the other hand, men's labour supply is typically high and unchanged across all education levels in both developed and transition economies.

This project highlights these features of FLFP observed in India and several other transition economies by theoretically modelling a married couple's time allocation decisions allowing for both market and home productivity to improve with own education of women and men, and incorporating constraints imposed by social norms regarding the gendered division of labour at home.

The model is calibrated with time-use data from urban India (a transition economy) and the U.K. (a developed economy) and is simulated to match the observed data on married women's and men's time on market work, home production, and leisure.

### **Brief description of the study**

The base model<sup>1</sup> incorporates not just home production, as in standard models of household decision-making, but also allows for home productivity to improve with education in a collective decision-making framework following Chiappori (1988). Thus, agents derive utility from consumption, leisure, and a home good which is enjoyed jointly by the two-member household. Individuals may differ in terms of their education level, which is assumed to be exogenously determined by parental investments.

A crucial feature of the model, therefore, is that the agents' education level not only determines market productivity or the wages that they earn, but also their productivity at home. Hence, there are two possible channels through which couples' labour supply decisions could be affected – market productivity and home productivity as education changes. With an increase in women's education level, the gender wage ratio may also move in their favour (market productivity). But while a favourable relative wage encourages FLFP, the accompanying rise in home productivity due to women's higher education also demands greater participation in the production of the home good. The net effect on FLFP is then determined by the relative strength of these two opposing forces.

Existing theoretical models that incorporate home production – broadly or as child care – focus on the experience of developed countries and suggest that a rise in women's wages (Attanasio et al. 2008, Siegel 2017) and education or human capital (Olivetti 2006, Gobbi 2018), relative to men's, should be accompanied by higher time in the labour market, with ambiguous effects on their home production and leisure time. In contrast, this model allows for education to affect productivity at home of both husbands and wives. The model, where households jointly derive utility from the home good, is backed by micro evidence from developing countries that education makes women (and possibly men) more productive in the home. For instance, Behrman et al. (1999) find that because households with an educated male member earned larger farm profits during the green revolution in India (1968-1982), the returns to investing in male education increased. This, in turn, increased the demand for educated women in the marriage market and women with primary education spent more time at home, relative to less educated mothers.

A relatively small but increasingly relevant literature suggests there can be social factors and norms that affect decision-making of agents in an economy and thereby impact economic development (Bernhardt et al. 2018, Chakraborty et al. 2015). Goldin (1994) indicates that social and cultural factors can play a large role in married women's labour supply decisions. Contextually, social constraints are likely to be even more relevant in a developing country context. Repeated cross-sections of nationally representative survey data for India (National Sample Survey, NSS; 1999-2011) show that across all education categories over 90% of married, urban women report that they are 'required' to spend time on domestic work – largely because they have no help with domestic work (but only 7% say they cannot afford help while about 13% cite social and religious reasons for not working in the labour market). Wives spend over 50 hours per week, on average, on household work while husbands spend no more than 5 hours per week.

The analysis is, therefore, extended by incorporating both home production and social norms into couples' time allocations. The claim made is that the presence of social norms related to the division of labour within the household results in the muted response of FLFP to higher education and wages.

---

<sup>1</sup> To the best of the researchers' knowledge, this is the first framework to be developed for understanding the determinants of women's labour supply in a transition economy at the aggregate level, and contrasted it with a high-income country.

Looking at NSS data from 1999-2011, the following stylised facts emerge on married women's and men's labour supply in urban India: (1) As women's education level increases, FLFP among 20-45 year old married women decreases and then increases marginally. (2) As men's education level increases, the proportion of 20-45 year old married men who are working in the labour market stays very high (95%) and flat. (3) Real mean wages rise both for women and men with their education. Across education categories, the largest increase is for 'graduate and above', and more so for women. (4) On the intensive margin, unconditional on workforce participation status, women's time spent on market work decreases monotonically until higher secondary education and then rises marginally for the highest education level. Men spend almost four times more hours in a day on market work.

Corresponding time-use data from U.K. in 2000 show: (1) As own education rises, the proportion of married women of age 20-45 engaged in the labour market also increases from 49% to 72%. (2) The proportion of married men in this age group in the labour market is around 80% and flat. (3) Real mean wages rise for both women and men with their education. But while the increase is constant for women, it rises steeply for men with degree and higher level of education. (4) On the intensive margin, women with less than secondary education spend 16% of their time in a day on market work while women with a degree education spend 27% of their time on market work. Men's labour supply is greater than women's and more or less constant across education categories leading to a monotonic decline in the gender gap in market work as women's education increases.

For the calibration exercise, two nationally representative datasets from India are used: (a) Time Use Survey, 1998, and (b) NSS, 1999. The sample is restricted to individuals who are currently married and living in urban areas. The focus is on women in the age group of 20-45 years and their husbands in the corresponding age group of 20-60 years. The final sample comprises 3,725 couples. Time-use survey data from U.K. for the same demographic group is used from the year 2000, with a final sample of 1,129 couples.

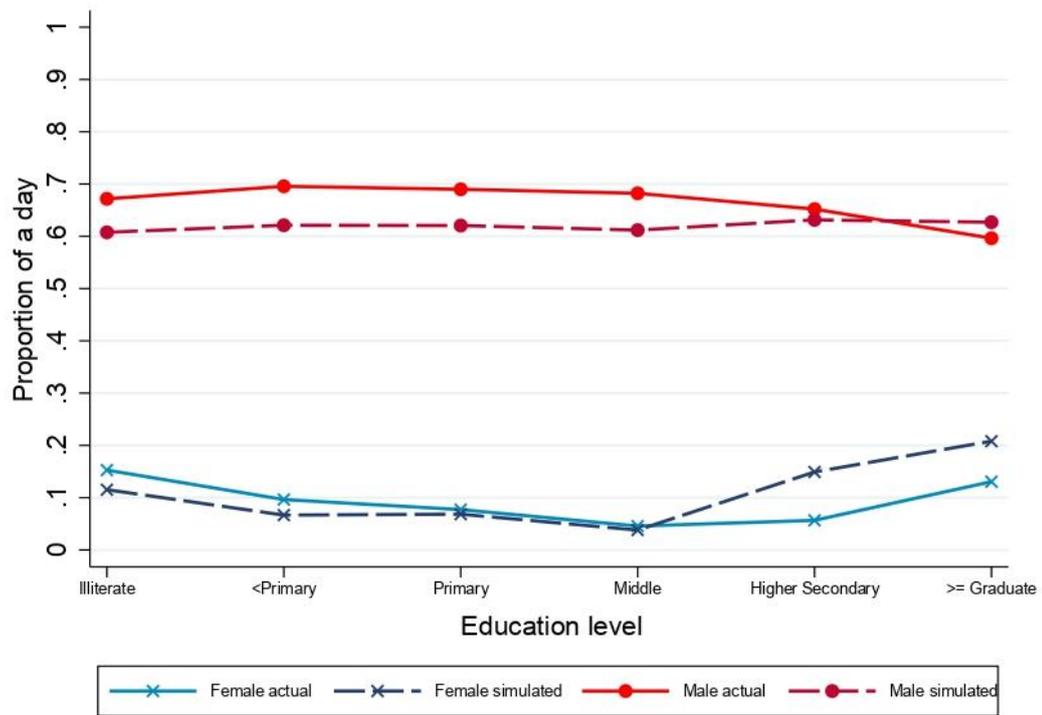
### Major findings

- The base model, with home production and improvements in both market and home productivity with education, is able to replicate the observed non-monotonicity or U-shaped FLFP – fall in women's labour supply to market work at low and moderate levels of education and rise at higher levels of education – in urban India, as well as the monotonic increase in women's labour supply with their education in U.K. However, for the more educated married women the model somewhat over-predicts their time in the labour market relative to the observed data in the case of India. For men, the base model predicts behaviour well for both economies.

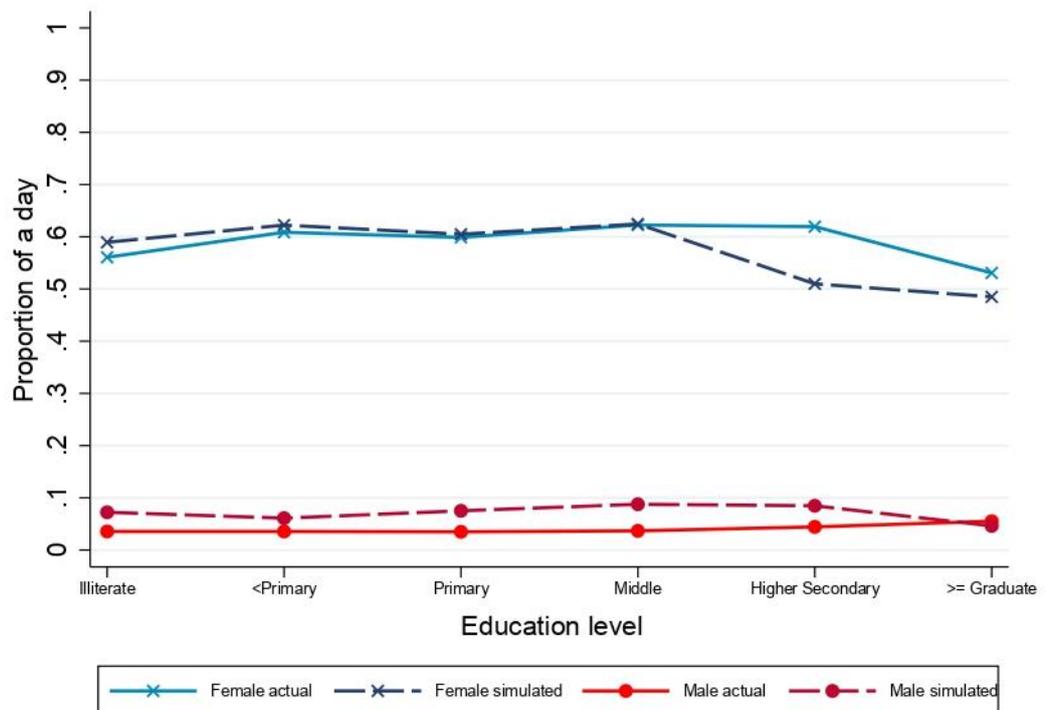
Women's time allocation to market work, generated in the model, falls from 11% for the illiterate to 7% for those with less than primary or primary levels of schooling and further to 4% at middle education level. It then rises to 17% and 21% for the two highest education levels, respectively – over-predicting female labour supply by 11 percentage points at higher secondary and 8 percentage points at graduate and above levels.

**Figure 1. Base model: Simulations for time spent in labour market, home production, and leisure**

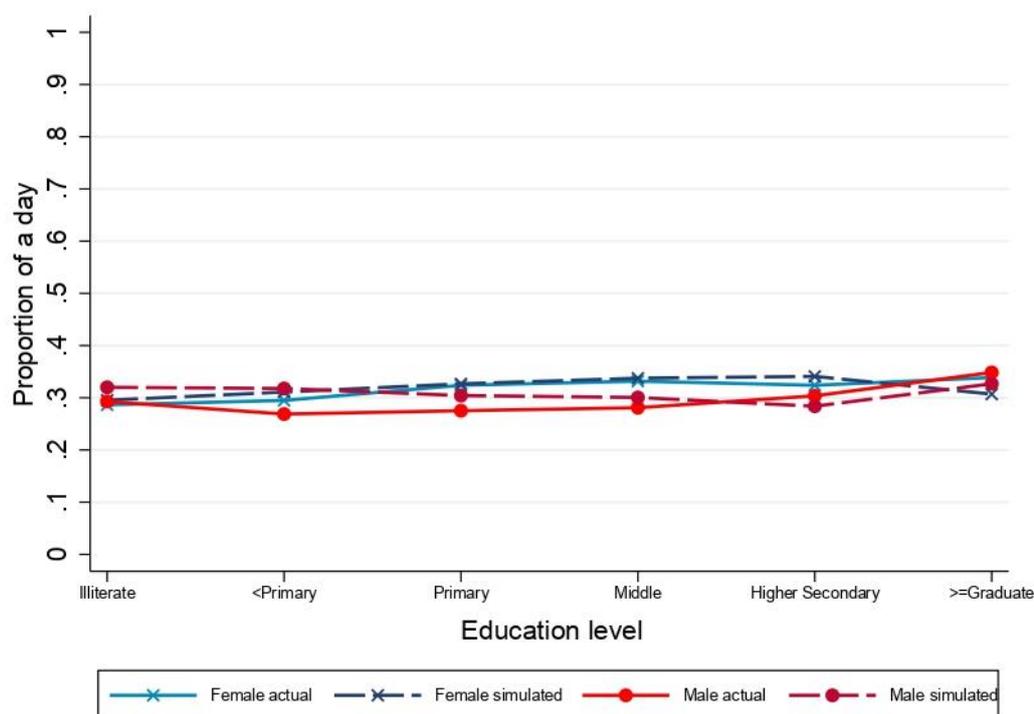
**(a) Labour supply**



**(b) Domestic work**



(c) Leisure

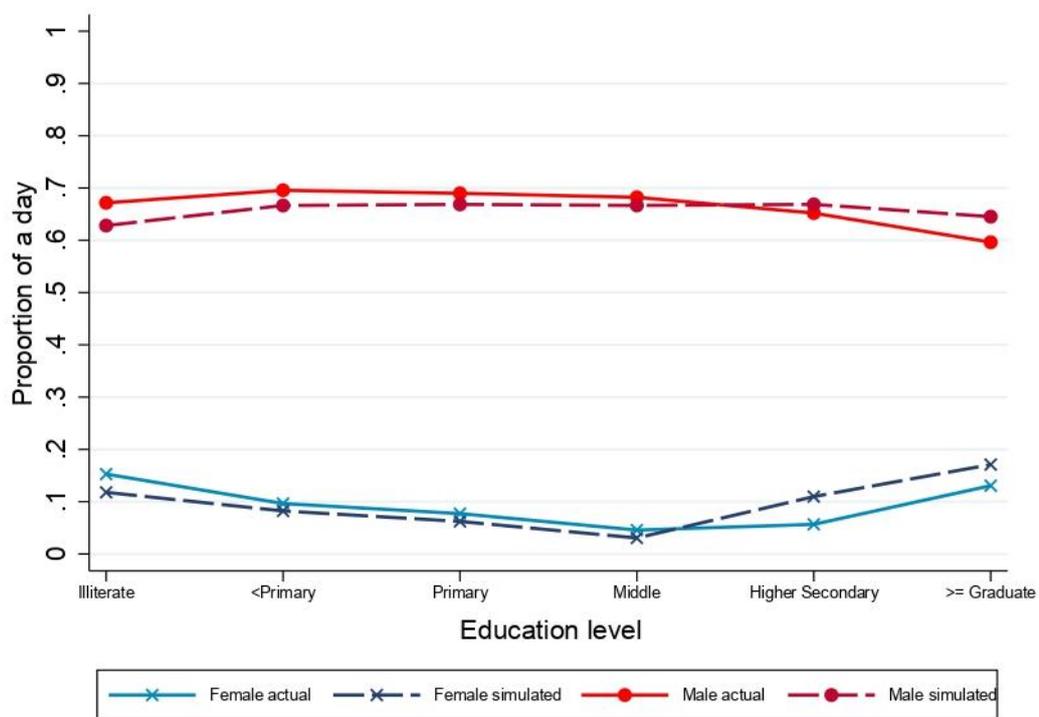


- To explain the mismatch at women’s higher education level in India, the base model is modified to incorporate the social norm that married women spend a significant amount of time on home production while their husbands spend negligible time on household chores – a well-accepted and data validated norm in India and other developing countries. With the social norm constraint, the model approximates more closely the subdued response of women’s labour supply at higher levels of education to more favourable gender wage ratio, while also approximating the low labour supply at lower education levels in India.

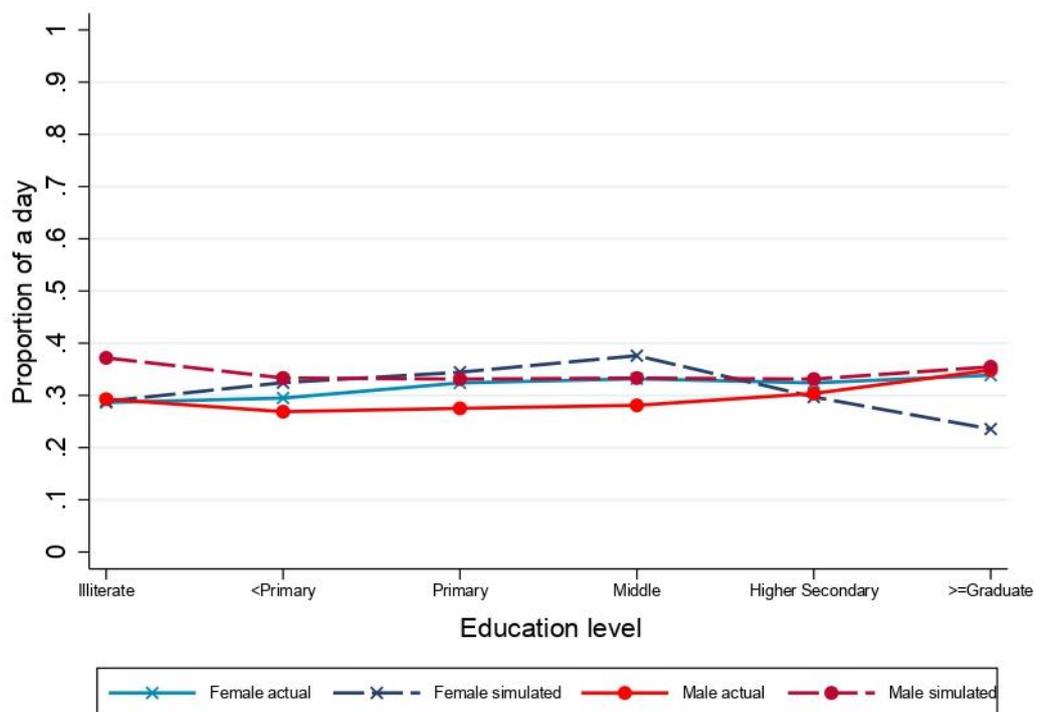
While women’s labour supply at higher secondary and graduate and above levels is over-predicted by 5 and 4 percentage points, respectively, the gap between the stimulated and actual levels is halved relative to the base model. The results, therefore, underline the relevance of home productivity and the norms around the gendered division of labour in explaining women’s market work in transition economies relative to developed countries.

**Figure 2. Base model with norms constraint: Simulations for time spent in labour market and leisure**

**(a) Labour supply**



**(b) Leisure**



- While the gender wage ratio plays an important role in determining both married men's and women's labour supply across the distribution of education, it alone is unable to match women's labour supply at high levels of education in developing countries.

- The analysis tests for alternative mechanisms such as non-availability of modern technology or of market goods for home production and wealth effects to explain the observed patterns in FLFP in transition economies. The more educated women are more likely to belong to higher income households and can afford to purchase market goods for home production. Hence, the lack of or limited supply of market goods and services could explain both low levels of FLFP and the muted response of women with higher levels of education to market wages. Besides, higher education level households are more likely to be wealthier, inducing a wealth effect that could lower FLFP. However, these mechanisms fail to explain the observed regularities in the data.

### **Policy recommendations**

- Various factors and their interplay can explain the persistent gender gap in workforce participation and the non-monotonic relationship between women's market labour supply and their education. An increase in female education and rise in the relative female wage is insufficient for improving FLFP if it is also accompanied by female's higher productivity vis-à-vis the home good.
- As women's education increases, their market wages do not rise as much as for their spouse. This makes spending time in home production more remunerative. Even when the gender wage gap improves for graduate women, their wages still continue to be lower than men. One contributor to the gender wage gap is gender wage discrimination in the labour market. Thus, reducing wage discrimination against women can help boost women's workforce participation.
- Gender norms on the division of labour at home play an important role in determining women's labour supply in the market and hence, policy measures that educate men against gender stereotypes are crucial for raising FLFP in developing countries. As suggested by Dhar et al. (2018), educating young children on gender equality can significantly increase boys' contribution to household chores. Thus, although social norms tend to be sticky, policy measures that address gender biases at a young age and target men can be effective in reducing women's time on home production. This, in turn, could increase women's labour supply to the market.
- Given that women do disproportionately bear the burden of domestic work including child care, provision of reliable, accessible child-care arrangements as well as other amenities such as safe drinking water and clean cooking fuel in all homes, can help alleviate their time poverty and enhance FLFP.
- Flexible working conditions for women as well as creation of more home-based working options that are regulated and fairly compensated, can enable them to balance work and home better.

*IWWAGE is an initiative of LEAD, an action-oriented research centre of IFMR Society (a not-for-profit society registered under the Societies Act). LEAD has strategic oversight and brand support from Krea University (sponsored by IFMR Society) to enable synergies between academia and the research centre. For more information, visit [www.iwwage.org](http://www.iwwage.org).*

*Within the initiative, four projects are being led by Prof. Farzana Afridi at the Indian Statistical Institute. This research has been conducted under one of the projects.*