

Home Production, Social Norms and Women's Labor Supply in India

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Introduction

- ▶ A dramatic increase in women's labor supply in the US and Europe since the beginning of the 20th century
- ▶ Fastest growth post 1950's as women became more educated, innovations in technology, reduced time spent in domestic work (Goldin 2006)
- ▶ India - low and stagnant women's labor supply in Urban India for decades - despite rising education, falling fertility and high economic growth, and a rise in service sector generally considered conducive to women's employment (IMF 2018)

Changes in Labor Force participation rates (LFPR)

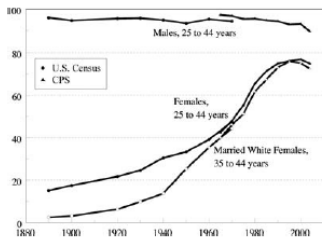


FIGURE 1. LABOR FORCE PARTICIPATION RATES FOR FEMALES AND MALES BY AGE AND MARITAL STATUS: 1890 TO 2004

Goldin (2006)



National Sample Survey rounds

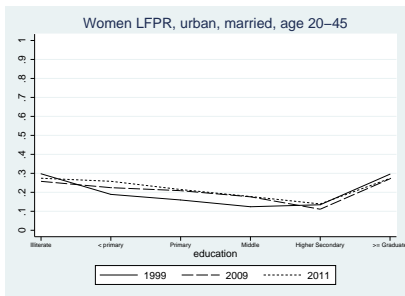
Figure: US (last century), India (last three decades)

Literature for the US

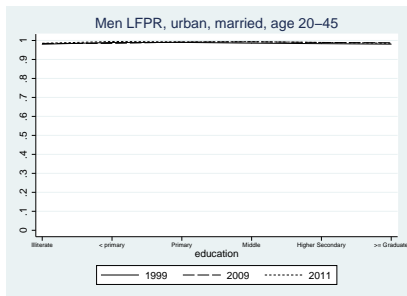
Why women's labour supply has been increasing

- ▶ Reduction in gender wage gap (e.g. Attanasio, Low and Sanchez-Marcos 2008; Knowles 2013; Cardia and Gomme 2013; Jones, McGrattan and Manuelli 2015)
- ▶ Reduction in cost of child care (e.g. Attanasio, Low and Sanchez-Marcos 2008; Knowles 2013)
- ▶ Better and cheaper technology for Home Production (e.g. Greenwood, Seshadri and Yorukoglu 2005)
- ▶ Reduction in fertility (e.g. Erosa, Fuster and Restuccia 2005)
- ▶ Culture (e.g. Fernandez, Fogli and Olivetti 2004; Fernandez 2013)

LFPR by Education: Recent years



Women



Men

Source: National Sample Survey rounds (1999, 2009, 2011)

Returns to Education: Recent years



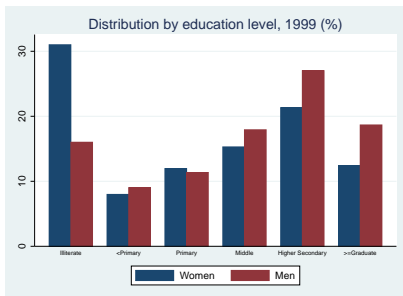
Women



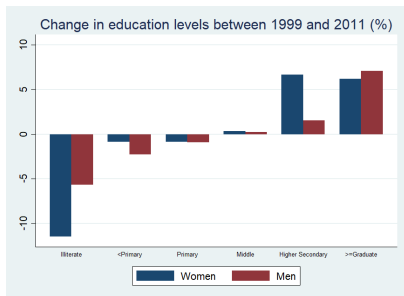
Men

Source: National Sample Survey rounds (1999, 2009, 2011)

Changes in Education



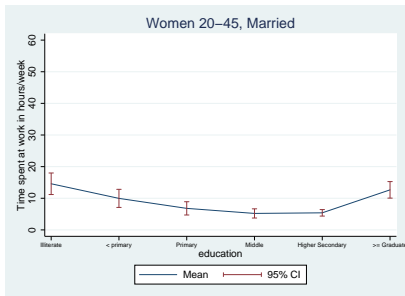
Education 1999



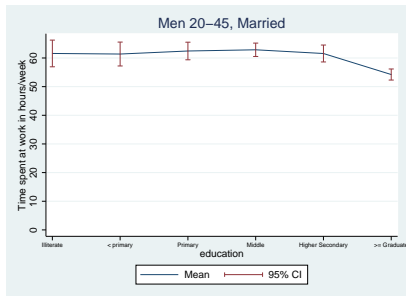
Changes 1999-2011

Source: National Sample Survey rounds (1999, 2011)

LFPR and Education: Time Use



Women

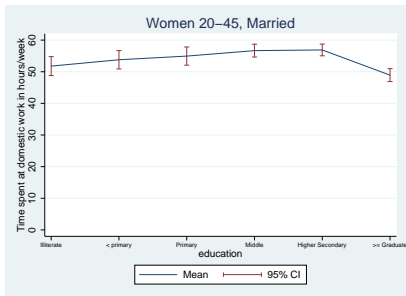


Men

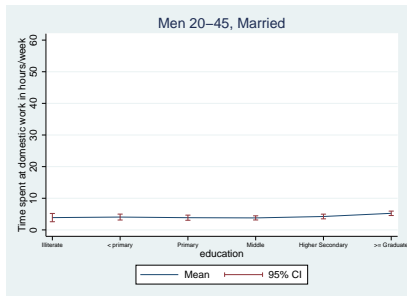
Figure: Weekly work hours of Women and Men by Education

Source: Time Use data 1998-99

Domestic Work and Education: Time Use data



Women

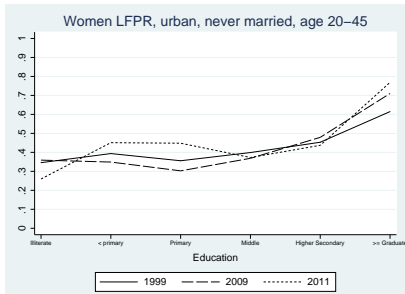


Men

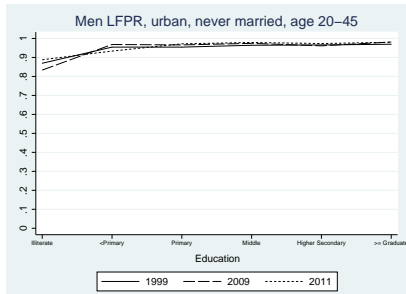
Figure: Weekly domestic work hours of Women and Men by Education

Source: Time Use data 1998-99

LFPR by Education for Single Women/Men: Recent years



Women



Men

Source: National Sample Survey rounds (1999, 2009, 2011)

Main questions

- ▶ Why is women's labour supply at low levels?
- ▶ Why is women's LFPR unresponsive to increase in their own wages?
- ▶ Why men show a stable attachment rate to labour force with their education?

Preview: What we do

- ▶ Model time allocation decisions by a representative collective household comprising of a married couple
- ▶ Allow home productivity to change with education for both men and women
- ▶ Calibrate this model with time use data of matched pairs of husbands and wives in urban India

Preview: Findings

- ▶ For lower education groups, rise in home productivity is greater than returns to labour market and this results in low women's LFPR upto middle schooling
- ▶ Highly educated women should supply greater labor than what is observed in the data even after accounting for changes in home productivity and higher wage of their husbands
- ▶ Social norms on gendered division of labour can explain the observed stagnation at higher levels

Base Model

- ▶ Use a model of collective decision making at the household level
- ▶ Consider two member households, comprising of a husband (m) and a wife (f)
- ▶ Agents derive utility from consumption (c), leisure (l), and from a home good (H) which is enjoyed jointly by the members of the household
- ▶ The total time available to the agents is allocated between time at work (n), time spent in producing the home good (h) and time spent in leisure (l), which sumsto 1.
- ▶ Household maximizes a joint utility, where the relative weights on male and female are given by θ and $1 - \theta$ respectively.

Base Model

- ▶ Agents have some given level of education and they may differ in terms of their education level (E).
- ▶ Level of the education determines the wages that they can earn in the market (w) and their productivity at producing the home good (H).

Base Model: Utility Function

- ▶ Individual's utility function is additively separable in consumption, leisure and the home good:

$$U_g = \log(c_g) + \phi_L \log(1 - n_g - h_g) + \phi_B \log(H)$$

where $g=m,f$

Base Model: Home Production Function

- ▶ Production function for the home good is given by:

$$H = e^{\delta} (z_m (a_m h_m)^{1-\rho} + z_f (a_f h_f)^{1-\rho})^{(1-\delta)/(1-\rho)}$$

- ▶ where, e denotes the market goods used in home production.
- ▶ h_m and h_f are the times spent by male and female member of the household on home production.
- ▶ z_m and z_f are the share factors with $z_m + z_f = 1$.
- ▶ a_m and a_f measure how effective the agents are while spending their time producing the home good.
- ▶ $\rho > 0$ is the inverse of the elasticity of substitution between male and female inputs.

Base Model: Optimization

$$\text{Max} : \theta U_m + (1 - \theta)U_f \quad (1)$$

Subject to,

$$c_m + c_f + e = w_m n_m + w_f n_f \quad (2)$$

$$H = e^\delta (z_m (a_m h_m)^{1-\rho} + z_f (a_f h_f)^{1-\rho})^{(1-\delta)/(1-\rho)} \quad (3)$$

$$n_m + h_m + l_m = 1 \quad (4)$$

$$n_f + h_f + l_f = 1 \quad (5)$$

Wages, Home productivity and Education in the Base Model

- ▶ Functional form for returns to education in labour market

$$w_m = b_m \exp(\phi_{1,m} e_m)$$

$$w_f = b_f \exp(\phi_{1,f} e_f)$$

Here, e_m and e_f are the education levels of male and female agents respectively.

- ▶ Functional form for returns to education in home production

$$a_m = \exp(\phi_{2,m} e_m)$$

$$a_f = \exp(\phi_{2,f} e_f)$$

The above assumes that home productivity is the same for men and women (equals 1) at education level 0 but is allowed to be different at other education levels

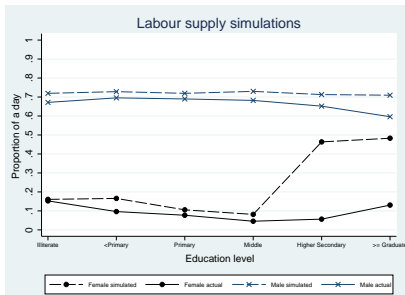
Base Model: Parameters for calibration

Parameter	Description	Men	Women
z	Share in Home Production	0.1789	0.8210
b	Log of daily wage - Illiterate	4.0943	3.4153
ϕ_1^1	Wage returns: Less than Primary	0.1743	0.1601
ϕ_1^2	Wage returns: Primary	0.3053	0.1681
ϕ_1^3	Wage returns: Middle	0.5108	0.2116
ϕ_1^4	Wage returns: Higher Sec	0.9162	1.5464
ϕ_1^5	Wage returns: Graduate and above	1.4663	1.9214
ϕ_2^1	Home Production Returns: Less than Primary	0.4350	0.4126
ϕ_2^2	Home Production Returns: Primary	0.5917	0.4217
ϕ_2^3	Home Production Returns: Middle	0.9862	0.5032
ϕ_2^4	Home Production Returns: Higher Sec	1.7913	2.7871
ϕ_2^5	Home Production Returns: Graduate and above	3.0166	3.0977

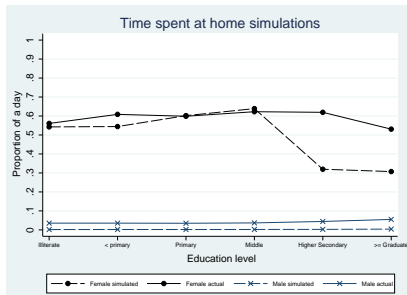
Base Model: Parameters for calibration

Parameter	Description	Value
θ	Bargaining power of men	0.65
ϕ_L	Weight attached to leisure	0.5311
ϕ_B	Weight attached to home production	0.3887
δ	Share of market input in home production (literature)	0.29
ρ	Inverse degree of substitutability men and women (literature)	0.4037

Base Model: Simulations for Time spent in Labour Market, Home Production, Leisure



Labour supply



Domestic work

Base Model: Simulations for Time spent in Labour Market, Home Production, Leisure

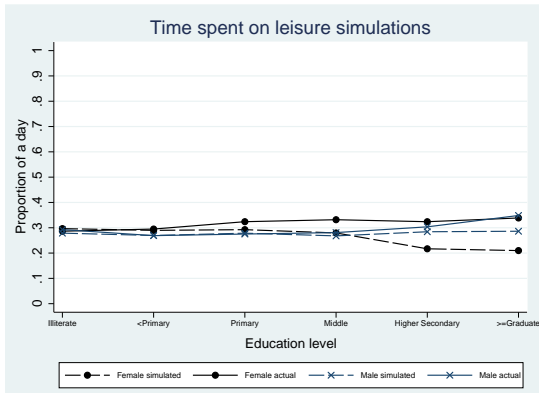


Figure: Leisure

Base Model: Modifications

- ▶ The above model shows that income effect from spousal income and home productivity effect from own education is unable to account for the lower LFPR we see for highly educated women in India
- ▶ What can be alternative explanations?
- ▶ Incorporating social norms around gender division of labour

Alternatives: NSS Evidence

Question: Were you required to spend most of your time on domestic duties?

Table: Proportion of women who respond in affirmative

	1999	2009	2011
Illiterate	93.79	93.04	96.08
Less than primary	93.49	93.42	95.09
Primary	93.83	92.58	96.83
Middle	93.4	91.74	94
Higher Secondary	92.78	90.56	94.6
Graduate and above	91.82	90.74	92.71

Alternatives: NSS Evidence

Question: Out of the women who were 'not required' to spend time in domestic work, what were the reasons of doing so voluntarily?

Table: Reasons for engaging in domestic work when under no compulsion

	1999			2011		
	No work	Preference	Others	No work	Preference	Others
Illiterate	2.02	2.65	1.53	1.16	1.64	1.12
Less than primary	2.07	2.84	1.60	0.79	2.54	1.58
Primary	2.31	2.46	1.40	0.90	1.45	0.81
Middle	2.03	3.05	1.52	1.86	2.51	1.64
Higher Secondary	2.57	2.95	1.71	1.12	2.71	1.57
Graduate and above	2.25	3.68	2.25	2.10	3.89	1.29

Modify the Base Model to incorporate norms around gender division of labour

- ▶ Assumption that men and women spend fixed amounts of time at the production of the home good
- ▶ The modified home production is now given as follows.

$$H = e^{\delta}(a_f h_0)^{(1-\delta)}$$

Where h_0 is the fixed time that women spend on home production. And the time spent by men on home production is assumed to be zero.

- ▶ In other words, men and women are perfect substitutes in home production, and women specialize at h_0

Modify the Base Model to incorporate norms around gender division of labour

$$\text{Max } \theta U_m + (1 - \theta)U_f \quad (6)$$

Subject to,

$$c_m + c_f + e = w_m n_m + w_f n_f \quad (7)$$

$$H = e^\delta (a_f h_0)^{(1-\delta)} \quad (8)$$

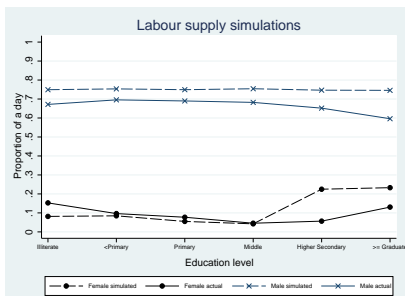
$$n_m + l_m = 1 \quad (9)$$

$$n_f + l_f = 1 - h_0 \quad (10)$$

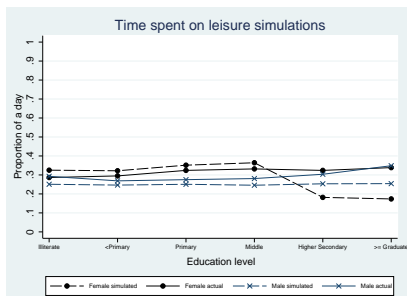
Parameter Calibration

- ▶ We only require the values of $(\frac{1+\phi_B\delta}{\phi_L})$
- ▶ $\frac{1+\phi_B\delta}{\phi_L} = 2.1709$

Model with Norms: Simulations for Time spent in Labour Market, Leisure



Labour supply



Leisure

Results

- ▶ A model with home production, where agents are making labour supply decisions based on opportunity costs of working outside vs returns at home is able to explain the low participation rates at low education level by Indian women
- ▶ Rising home productivity and higher spousal income, however, are unable to completely explain low participation levels by highly educated women
- ▶ Explore the channel of social norms by fixing the time spent at home by women and men, as being socially determined by gender division of labour

Other channels

- ▶ Demand Side
 - ▶ From the descriptive analyses seem to play a small role - preference for job type?
- ▶ Other Possible Supply Side factors:
 - ▶ Fertility: It is reducing with education. Unlikely to explain the trends in female labour supply observed with education. Unless, quality per child is increasing which is implicitly happening with H increasing with education.
 - ▶ Marketization of Home Production: Suppose there is no e available to be used in home production, this is effectively obtained by $\delta = 0$. We get almost the same values for labour supply, only value of Home Production (H) falls down relative to the level in the model with e . However, H is still rising with education.

Thank You

Base Model: Solutions for labour supply and time in home production

$$1 - n_f = \frac{(1-\theta)(w_m + w_f)}{\left(1 + \frac{(1+\phi_B)}{\phi_L}\right)w_f} + \frac{(1-\delta)\left(1 + \frac{w_m}{w_f}\right)}{\left(1 + \frac{(1+\phi_L)}{\phi_B}\right)\left(\left(\frac{z_m}{z_f}\right)^{1/\rho}\left(\frac{w_f a_m}{w_m a_f}\right)^{\frac{1-\rho}{\rho}} + 1\right)} \quad (11)$$

$$1 - n_m = \frac{\theta(w_m + w_f)}{\left(1 + \frac{(1+\phi_B)}{\phi_L}\right)w_m} + \frac{(1-\delta)\left(1 + \frac{w_f}{w_m}\right)}{\left(1 + \frac{(1+\phi_L)}{\phi_B}\right)\left(\left(\frac{z_f}{z_m}\right)^{1/\rho}\left(\frac{w_m a_f}{w_f a_m}\right)^{\frac{1-\rho}{\rho}} + 1\right)} \quad (12)$$

$$h_f = \frac{(1-\delta)\left(1 + \frac{w_m}{w_f}\right)}{\left(1 + \frac{(1+\phi_L)}{\phi_B}\right)\left(\left(\frac{z_m}{z_f}\right)^{1/\rho}\left(\frac{w_f a_m}{w_m a_f}\right)^{\frac{1-\rho}{\rho}} + 1\right)} \quad (13)$$

$$h_m = \frac{(1-\delta)\left(1 + \frac{w_f}{w_m}\right)}{\left(1 + \frac{(1+\phi_L)}{\phi_B}\right)\left(\left(\frac{z_f}{z_m}\right)^{1/\rho}\left(\frac{w_m a_f}{w_f a_m}\right)^{\frac{1-\rho}{\rho}} + 1\right)} \quad (14)$$

Base Model: Parameter Calibration

- ▶ Median wages for men and women at different education levels using data from the National Sample Survey (NSS) 55th round (1999-2000)
- ▶ Returns to labour: wage returns to education at the median are estimated using OLS estimation.

$$\log(w_g) = b_g + \phi_{1,g}^1 E(1, g) + \phi_{1,g}^2 E(2, g) + \phi_{1,g}^3 E(2, g) + \phi_{1,g}^4 E(4, g) + \phi_{1,g}^5 E(5, g) \quad (15)$$

Where the E's are education level dummies. The ϕ 's are the returns to education on wages. The superscript on each ϕ denotes the education level for which it captures the returns.

Base Model: Parameter Calibration

- ▶ Returns to Home Production: Use the below ratio obtained from the First Order Conditions:

$$\frac{h_f}{h_m} = \left(\frac{w_m z_f a_f^{1-\rho}}{z_m w_f a_m^{1-\rho}} \right)^{1/\rho} \quad (16)$$

Taking log:

$$\log\left(\frac{h_f}{h_m}\right) = \frac{1}{\rho} \left[\log\left(\frac{w_m}{w_f}\right) + \log\left(\frac{z_f}{z_m}\right) + (1-\rho)\log\left(\frac{a_f}{a_m}\right) \right] \quad (17)$$

Base Model: Parameter Calibration

- ▶ Returns to Home Production: Assuming $\rho = 0.40$ (existing literature on US), can estimate the other parameters:

$$\log\left(\frac{h_f}{h_m}\right) = \frac{1}{\rho} \left[\log\left(\frac{w_m}{w_f}\right) + \log\left(\frac{z_f}{z_m}\right) + (1 - \rho) \log\left(\frac{a_f}{a_m}\right) \right] \quad (18)$$

- ▶ Recover the home productivity parameters for each education level from the slope coefficients
- ▶ Using the intercept we recover the share parameters for the Home Production function

Base Model: Parameter Calibration

- ▶ Bargaining power: From FOC

$$\frac{l_m}{l_f} = \frac{\theta w_f}{(1 - \theta)w_m}$$

- ▶ Preference parameters (ϕ_L and ϕ_B) : Other preference parameters obtained by by minimising the sum of squared residuals for all households for each member - n_f , n_m , h_f , h_m .

What happens to Home Production?

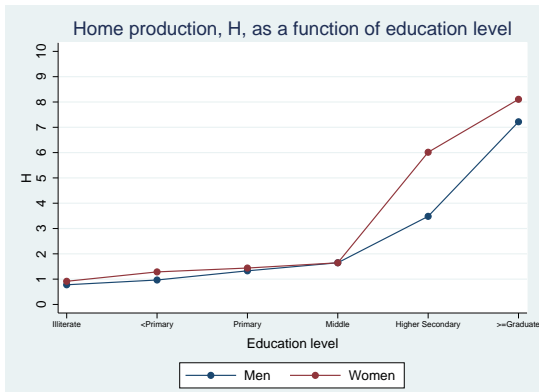


Figure: Base Model: Home Production

Incorporating norms on gender division of labour: Solutions

For interior solutions, we obtain the below solutions for labour supply:

$$n_f = 1 - h_0 - \frac{(1 - \theta)(1 - h_0 + \frac{w_m}{w_f})}{1 + (\frac{1 + \phi_B \delta}{\phi_L})} \quad (19)$$

$$n_m = 1 - \frac{\theta(1 + (1 - h_0)\frac{w_f}{w_m})}{1 + (\frac{1 + \phi_B \delta}{\phi_L})} \quad (20)$$

$$l_f = \frac{(1 - \theta)(1 - h_0 + \frac{w_m}{w_f})}{1 + (\frac{1 + \phi_B \delta}{\phi_L})} \quad (21)$$

$$l_m = \frac{\theta(1 + (1 - h_0)\frac{w_f}{w_m})}{1 + (\frac{1 + \phi_B \delta}{\phi_L})} \quad (22)$$