Incorporating Home Production in a Measure of Consumption

BLS Consumption Measure Symposium
September 23, 2021

Jeehoon Han
Zhejiang University

Bruce D. Meyer
University of Chicago, NBER, AEI and U.S. Census Bureau

James X. Sullivan
University of Notre Dame and the Wilson Sheehan Lab for Economic Opportunities

How to Include Home Production in a Measure of Consumption?

- Primary challenges:

A) Measures of home production and consumption are not usually available in the same data

B) No consensus view on how to value time spent on home production

- Imputation method used in Han, Meyer, Sullivan (2020)

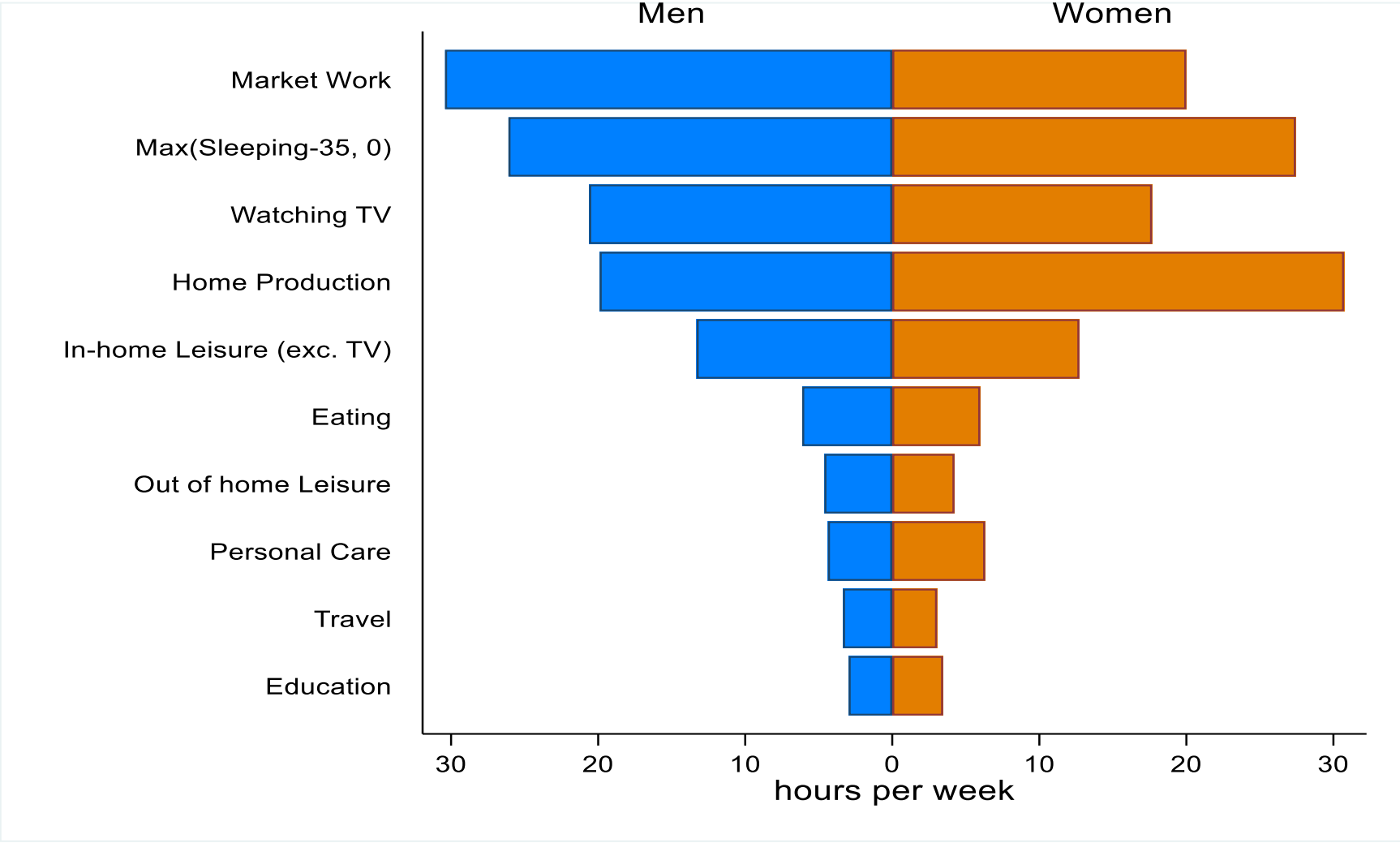
1. Use the American Time Use Surveys (ATUS) to estimate the relationship between home production and observable characteristics that are also available in the Consumer Expenditure Survey (CE)
2. Predict home production in the CE and construct family-level home production
3. Value home production using market wages to incorporate home production in a broad measure of consumption

Defining Home Production

Domestic work	food preparation, cooking, set table, cleaning, laundry, home repairs, maintain vehicle, travel related to domestic work
Shopping	purchase routine goods, consumer durables, personal services, or other services, travel related to shopping
Social Care	general/medical care of children, playing/reading/talking with children, help with homework, care for adults, travel related to social care
Others	gardening, pet care, time looking for work, civic, voluntary and religious activity

- Reid (1934): activity is considered productive if one could pay someone to do it for her

Time Spent in Home Production and Other Activities, 2016 ATUS



Step 1. Estimate the Relationship between Home Production Time and Observable Characteristics in the ATUS data

Estimation equation: $HP_{it}^{T} = \beta_t H_{it}^{T} + \gamma_t{}' Z_{it}^{T} + \epsilon_{it}^{T}$

Where

HP_{it}^{T}: reported daily home production time for individual i in survey year t in the time use data (T)

H_{it}^{T}: usual hours worked

Z_{it}^{T} : demographic characteristics

Two questions:

1) How much variation in the reported daily home production reflects long-term (or day-to-day) variation?

2) What is the share of variation in long-term home production that can be explained by observable characteristics?

Variance Decomposition on Home Production, the 1975-76 Time Use Survey

Challenge: the ATUS collects cross-sectional time use data

Solution: 1975-76 panel time use survey contains up to four responses for the same individual (responses at least 3 months apart)

Decompose the variation in reported home production

$$HP_{it}^{T} = \beta_t H_{it}^{T} + \gamma_t{}' Z_{it}^{T} + \varepsilon_i^{T} + u_{it}^{T}$$

Where

t: wave number (ranges from 1-4)

ε_i : long-term component of residual (across person)

u_{it}: transitory component of residual (within person)

Variance Decomposition on Home Production, the 1975-76 Time Use Survey

	Variance of Home Production in Day *7	Variance of Predicted Home Production	Long-term Variance (σ^2_ε)	Transitory Variance (σ^2_u)	Total Error Variance ($\sigma^2_\varepsilon + \sigma^2_u$)	Explained Share of Long-term Home Production (2)/[(2)+(3)]	Transitory Share of Total Variance (4)/(1)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A. Sample includes Individuals present in all four waves							
Home Production	492.9	140.8	51.3	302.6	353.8	0.73	0.61
Number of Individuals				774			
Number of Observations				3,096			

- Majority (61%) of the variation in home production reported in a day is effectively noise
- Observable characteristics including work hours explain a large share (73%) of the long run variation in home production

Relationship between Observable Characteristics and Home Production

Control for Work Hours	No		Yes	
Year	2003	2016	2003	2016
Age 25-44	4.248	5.734	6.818	8.470
	(0.869)	(1.234)	(0.847)	(1.250)
Age 45-54	5.387	7.493	7.511	9.864
	(0.908)	(1.385)	(0.875)	(1.386)
Age 55-64	8.252	8.809	7.481	8.933
	(0.995)	(1.420)	(0.964)	(1.434)
Age 65+	10.508	12.215	4.194	6.897
	(0.952)	(1.320)	(0.986)	(1.367)
Male	-12.192	-11.556	-9.241	-8.549
	(0.423)	(0.639)	(0.426)	(0.631)

- Association with home production: age (inverted U-shaped), Male (-)

Relationship between Observable Characteristics and Home Production

Control for Work Hours	No		Yes	
Year	2003	2016	2003	2016
Less than HS	-2.301	-0.678	-4.133	-2.325
	(0.648)	(1.069)	(0.632)	(1.048)
Some College	-0.894	-0.637	-0.735	-0.017
	(0.516)	(0.793)	(0.496)	(0.753)
College Grad	-1.072	-2.206	0.143	-0.316
	(0.515)	(0.745)	(0.490)	(0.688)
Married	4.968	5.016	5.339	5.639
	(0.466)	(0.732)	(0.449)	(0.712)
Number of children under 18	3.207	2.646	3.028	2.510
	(0.273)	(0.401)	(0.260)	(0.368)
Usual hours worked per week			-0.287	-0.293
			(0.011)	(0.017)

- Association with home production: marriage and having children (+), Hours worked (-)

Step 2. Predict Home Production in the CE

1. Predict home production for each adult in the family in the CE

Prediction equation: $\widehat{HP}_{it}^{C} = \hat{\beta}_t H_{it}^{C} + \hat{\gamma}_t{}' Z_{it}^{C}$

2. Calculate family level home production as

$$\sum_{k=1}^{n} \widehat{HP}_{k}^{C} / n$$

Where

n : number of adults in the family

Step 3. Place Value on Home Production

- Two main input approaches

A) Opportunity cost (value of time spent on home production)

B) Replacement cost (market substitute price)

- We use three valuation methods that rely on market wage

1. Individual's market wage for workers, and predicted wage for non-workers (using observable characteristics and the reason of non-employment)

2. Average wages for all workers (constant across individuals)

3. 25th percentile of wages for all workers (constant across individuals)

Inequality (90/10 Ratio) for Extended Consumption

Welfare Measure	Consumption	Consumption + Value of Home Production		
Home Production Valuation Method		Actual or predicted wage	Mean of actual wages for workers	25th percentile of actual wages for workers
	(1)	(2)	(3)	(4)
2003	3.52	3.46	3.24	3.41
2016	3.35	3.31	3.09	3.25

- Inequality in extended consumption (consumption + value of home production) < inequality in consumption

Going Forward

1) Extend the sample period to the year 2020

- Home production during the COVID-19 pandemic

2) Refine the definition of home production

- Robustness evaluation using a narrow measure of home production

3) Sophisticated approaches to place value on home production

- Allow the value of home production to vary across activity types and individual/family characteristics