Online Appendix to The Effects of Offshoring on the Gender Hours Gap in the US

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In this online appendix, I discuss some additional issues related to the calibration and quantitative analysis of the paper.

1 Mapping from BLS Labor Productivity Data to Sector-Specific Productivity in the Model

In this part of the appendix, I derive the mapping from BLS labor productivity data to sector-specific productivity (A_j) in the model. BLS labor productivity is denoted by LP_j. It is defined in terms of output per hour worked. In the model, it is expressed as:

$$LP_j = \frac{Y_j}{\int_0^{K_j}(L_{fj}(k) + L_{mj}(k))dk}. \tag{1.1}$$

Substituting the relationship between female and male hours worked of occupation k in (13) for the domestic labor aggregate in (4), the following relationships are obtained:

$$\frac{L_j^D(k)}{L_{fj}(k)} = [\frac{\alpha_j(k)}{I_j(k,x)}]^{\frac{\varepsilon}{\varepsilon-1}}, \tag{1.2}$$

$$\frac{L_j^D(k)}{L_{mj}(k)} = [\frac{\alpha_j(k)}{I_j(k,x)}]^{\frac{\varepsilon}{\varepsilon-1}} \varphi_j(k)^{\varepsilon} x^{-\varepsilon}, \tag{1.3}$$

where $I_j(k,x) \equiv w_f L_{fj}(k)/(w_f L_{fj}(k) + w_m L_{mj}(k)) = 1/(1 + \varphi_j(k)^{-\varepsilon} x^{\varepsilon-1})$ and $\varphi_j(k) \equiv$

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$\alpha_j(k)/(1-\alpha_j(k))$ as before. Substituting these expressions into (1.1) yields:

$$LP_j = \frac{Y_j}{\int_0^{K_j}(1+\varphi_j(k)^{-\varepsilon}x^{\varepsilon})[\frac{\alpha_j(k)}{I_j(k,x)}]^{\frac{\varepsilon}{1-\varepsilon}}L_j^D(k)dk}. \tag{1.4}$$

A first-order condition from the firm's profit maximization problem is expressed as:

$$p_j A_j L_j^{\frac{1}{\eta}} L_j^D(k)^{-\frac{1}{\eta}}\alpha_j(k)L_j^D(k)^{\frac{1}{\varepsilon}}L_{fj}(k)^{-\frac{1}{\varepsilon}} = w_f. \tag{1.5}$$

By rearranging this condition using (14) and (1.2), I derive the relationship between $L_j^D(k)$ and L_j:

$$\frac{L_j}{L_j^D(k)} = [\frac{w_f}{H(\beta_j,x)}\alpha_j(k)^{\frac{\varepsilon}{1-\varepsilon}}I_j(k,x)^{\frac{1}{\varepsilon-1}}]^{\eta}. \tag{1.6}$$

Considering the facts that $A_j = Y_j/L_j$, L_j is independent of k, and $w_f = x$ because w_m is a numeraire, I obtain the following mapping from A_j to LP_j:

$$LP_j = A_j\frac{[x/H(\beta_j,x)]^{\eta}}{\int_0^{K_j}(1+\varphi_j(k)^{-\varepsilon}x^{\varepsilon})[\alpha_j(k)]^{\frac{\varepsilon(\eta-1)}{\varepsilon-1}}[I_j(k,x)]^{\frac{\varepsilon-\eta}{\varepsilon-1}}dk}. \tag{1.7}$$

Then using the labor productivity data from BLS and the calibrated parameters, I back out A_j of each year and calculate the annual growth rates for each period.

For labor productivity in the goods sector, I take the average of labor productivity in manufacturing, mining, and utilities, using the number of employees in each sector as weights. I use this and labor productivity in the non-farm business sector to obtain labor productivity in the service sector, utilizing the number of employees in total private industry, manufacturing, mining, and utilities as weights.

The BLS does not provide labor productivity data for detailed industries prior to 1987. Fortunately, Cobet and Wilson (2002) provide an estimate of average manufacturing productivity growth for the periods 1950-73 and 1973-90. I impute manufacturing labor productivity in 1970 based on these growth estimates and labor productivity in 1988. I compute labor productivity in the goods sector using the manufacturing figure and the ratios of the two productivity indices in the goods and manufacturing sectors after 1988.

To avoid the problem of a possible link between A_j and K_j, I assume that there was no offshoring from 1970 to 2016 to compute the common A_j for each scenario.

2 Obtaining the Rate of Estimated Female Employment Loss in Services to Goods

The proxy for material offshoring is calculated similarly to (1). For material offshoring, j denotes each good instead of service input. I use the same input-output data as before and obtain industry-level US import and export data from Peter Schott's website.

Based on the offshoring measure, I calculate the employment loss due to material offshoring using compensation per employee and compensation-to-output ratio for manufacturing as in Section 2.2. Applying the female share of employment in both manufacturing and services to these estimated losses, I calculate the estimated female employment loss in services relative to goods in 1990 and 2016.

3 Quantitative Results in the Partial Equilibrium

Table 3.1 presents the model's predictions and contribution in an alternative setting where the gender wage ratio is fixed to the data.[1] This allows us to focus on the model's ability to predict the gender hours ratio. In this exercise, each channel shows a much higher contribution to the flattening of the gender hours ratio between 1990 and 2016 compared to Table 5. The conclusion that the increase in service offshoring is quantitatively important still holds.

References

Cobet, A. E. and Wilson, G. A. (2002). Comparing 50 Years of Labor Productivity in US and Foreign Manufacturing. *Monthly Labor Review*, 125.

[1] Instead of the gender wage ratio, T_f/T_m is estimated from the model, while T_m is taken from the data.

Table 3.1: Quantitative results when the gender wage ratio is fixed

	FM	M_m	M_f	x
Model predictions in 1990 and 2016				
1990	0.644	0.372	0.239	0.733
(Changes from 1970 data, %)	(67.7)	(-10.7)	(49.8)	(16.1)
2016				
- Baseline	0.748	0.349	0.261	0.776
(Changes from 1990 predictions, %)	(16.1)	(-6.0)	(9.2)	(5.9)
- Counterfactual 1: Increase of service offshoring	0.921	0.334	0.308	0.776
(Changes from 1990 predictions, %)	(42.9)	(-10.1)	(28.5)	(5.9)
- Counterfactual 2: Structural transformation into services	0.777	0.348	0.271	0.776
(Changes from 1990 predictions, %)	(20.6)	(-6.3)	(13.0)	(5.9)
- Counterfactual 3: Decrease in gender productivity wedge	0.959	0.331	0.317	0.776
(Changes from 1990 predictions, %)	(48.8)	(-11.0)	(32.4)	(5.9)
Contribution of each counterfactual (%p)				
- Counterfactual 1: Increase of service offshoring	26.7	-4.1	19.3	-
- Counterfactual 2: Structural transformation into services	4.5	-0.4	3.8	-
- Counterfactual 3: Decrease in gender productivity wedge	32.7	-5.1	23.2	-

Notes: See notes of Table 5 for the assumptions imposed on each counterfactual.