Family labor supply, commuting time, and residential decisions: the case of the Tokyo Metropolitan Area

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Question

- Understand the regional differences in women’s employment pattern in the Tokyo Metropolitan Area as an outcome of endogenous labor supply and residential choice
- Consider the link between women’s work and the housing market
- Incorporate full-time vs. part-time work of women in the model in a way to reflect the realities in Japan: in particular, emphasize the discrete nature of these two choices (i.e., distinctions between the two employment statuses are large and their middle are rare.)
Question (cont.)

- I argue in this paper that the discrete nature of the labor market is reinforced by the housing market.
- In the Tokyo Metropolitan area, women’s work seems more relevant for residential choice: women’s employment status shows larger regional differences than men’s.
Previous research

• Higher concentration of “power couples” in metropolitan areas (over time)?

• Women’s work and housing purchase

• Commuting and women’s wage
  – Iwata and Tamada (2008) and others
Main results

• The model explains:
  • (1) Why full-time work is common among women living in Tokyo, while part-time work is common among women living in suburbs (Saitama, Chiba, Kanagawa);
  • (2) Even though measures to promote women’s employment have been adopted in Japan in recent decades (e.g., the Equal Employment Opportunity Law, the Maternity Leave Law, etc.), the proportion of women working in regular full-time jobs has not increased much.
Stylized facts

• In the Tokyo Metropolitan Area, full-time work is common for women living in Tokyo, while part-time work is common among women living in suburban areas (Saitama, Chiba, Kanagawa).
• Employment status of men has smaller regional variations.
• Highly educated working men & women (power men & women) are more likely to live close to the CBD.
Figure 1.A : Women’s regular employment ratio (RegEmp/Pop)
Figure 1.B: Women’s part-time employment ratio (PartEmp/Pop)
Figure 2: Men’s regular employment ratio (RegEmp/Pop)
Regression results

Table 1: Proportion of power men and women and housing price (within Tokyo, Census data)

<table>
<thead>
<tr>
<th></th>
<th>Education=University or more &amp; working</th>
<th>Education=University or more &amp; wage-salary earner</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>Log(land price)</td>
<td>0.188 **</td>
<td>0.101 **</td>
</tr>
<tr>
<td></td>
<td>(0.038)</td>
<td>(0.018)</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.49</td>
<td>0.72</td>
</tr>
</tbody>
</table>
Model Setup (1)

- Hours choice of the husband & wife, the husband is assumed to work full time, the wife’s choice is one from (1) regular full-time work, (2) part-time work, and (3) no work.
- Wife’s wage rate:
  - Full-time work: $W_F$; Part-time work: $W_P$
  - $W_F > W_P$
  - Full-time work requires at least $\theta$ hours
  - All full-time work opportunities are located in the CBD
Model Setup (2)

• D: Commute time to the CBD, measured in hours. \( D \in [0, \overline{D}] \)
• Incomes of both spouses are pooled.
• Lot size is the same for all households.
• Utility function

\[ U(l_h, l_w, C) \]

where \( l_k \) is the k-th spouse’s leisure

( \( k = h, w \) )
Model Setup (3)

- Wife’s earnings

\[ E_w(h_w) = \begin{cases} 
W_P h_w & \text{if } h_w \leq \theta \\
W_F h_w & \text{if } h_w > \theta 
\end{cases} \]

- Note that there is a jump in \( E_w \) at \( \theta \). This is justified by the part-time/full-time wage gap among women workers in Japan.
Derive the bid-rent curve (1)

• Derive the bid-rent functions for part-time status and full-time status, respectively. Then take the maximum of the two at each $D$.

• For the part-time case:

$$\max_{h_h, h_w, C} w_h h_h + W_P h_w - C$$

subject to

$$U(\bar{L} - h_h - D, \bar{L} - h_w, C) = u,$$

$$0 \leq h_w \leq \theta.$$ 

• The maximand is the bid-rent for part-time case: $\psi^P(D, u)$. 

Derive the bid-rent curve (2)

- Similarly, \( \psi^F(D, u) \) is derived.
- The bid-rent for the overall problem is

\[
\psi(D, u) = \max(\psi^P(D, u), \psi^F(D, u))
\]

- Proposition 1:

\[
\psi^P(0, u) < \psi^F(0, u).
\]

with Assumption 1,

\[
\psi^P(D, u) > \psi^F(D, u)
\] for some households
Properties of household optimization

- [Assumption] Interior solution for the husband’s hours
- Define reservation wages for wife’s part-time work & full-time work, as follows:
  \[ w^*_P : \text{reservation wage for part-time work} \]
  \[ w^*_F : \text{reservation wage for full-time work} \]
Figure 4: Wife’s employment choice with a separable utility function:

\[ U(l_h, l_w, C) = u^h(l_h) + u^w(l_w) + v(C) \]
Discrete nature of the wife’s employment (1)

- Commuting distance is essentially a fixed cost of full-time work for the wife.
- Hours stay at $\theta$ if commuting cost is high for the wife, even though her marginal utility from leisure is not high. At $h_w = \theta$, the wage elasticity of (part-time) hours is zero.
- In contrast, a higher hourly wage rate results in longer full-time hours, both because the household resides closer to the CBD and because of the substitution effect (assuming that the income effect is not large). The wife’s full-time earnings tend to respond more to a higher full-time wage.
Discrete nature of the wife’s employment (2)

• Part-time and full-time work are two distinct employment statuses even though the underlying preferences are not very different. The housing market operates to magnify this discreteness in the labor market.

• **Proposition 2:** A lower $D$ reduces the reservation wage for full-time work ($w^*_F$).
  – Living close to the CBD reduces the fixed cost of full-time work, and thus decreases the reservation wage for full-time employment.
A numerical example

• $W_h$ and $W_F$ follows a uniform distribution and the variance of the full-time wage is larger for men.
• $W_p$ is positively correlated with $W_F$, but $W_p$ does not increase for high $W_F$
• Random matching between the husband & wife
• Utility function:

$$U(L_h, L_w, C) = \alpha \log(L_h) + 0.6 \log(L_w) + C$$

$$\alpha < 0.6$$

• Assume a mapping between D & the bid-rent gradient
• Solve the model by taking discrete approximation
Numerical example: Wife’s employment status
Numerical example: Wife’s wage & Commuting time
Conclusions & a direction for future work

• The model explains the regional variations in women’s employment status and suggests a possible link between women’s work and the housing market. The model is consistent with empirical regularities in the Tokyo Metropolitan Area.

• Although not modeled in this paper, the presence and the number of children are likely to magnify the discrete nature of the labor market.
Conclusion & a direction for future work (cont.)

• The fact that the housing market magnifies the discreteness in the labor market is unique: intertemporal substitution is likely to mitigate the discreteness (Abe 2009).

• A possible direction for future research is to examine the impact of increased women’s participation on the housing market.

Thank you!