

## **Regional economic growth through advanced supporting system on parenting and childcare<sup>1</sup>**

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**Abstract** This paper investigates a self-sustaining regional economic growth through internal cooperation among local economic agents within a region. In particular, the primary focus is given to a support for parenting and childcare in Japan. The first part of the paper studies a current situation of the relevant topic of this subject to clarify what sorts of fact can be problematic issues. The second part introduces a regional economic model, which demonstrates its validity by quantitative analysis based on our original survey in a specific region. The final part of the paper addresses policy implications in a regional level, and present the impact of changes in regional system with cooperative coordination on the benefit of the self-sustaining regional economic growth.

**Keywords:** Regional economy, spatial policy, social welfare, labour economics, agglomeration economies

**JEL Classifications:** D62, I31, J24, R15

### **1 Introduction**

The establishment of self-sustaining regional economy has been a majority concern on the field of Social Sciences. Regarding this topic, we aim to clarify the mechanism of a self-sustaining regional system by means of internal cooperative coordination among different local economic agents within a region. The primary focus is given to a case study of a support for parenting and childcare in Japan. For a constant population decline with

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<sup>1</sup> *This is a draft and please do not quote.*

ageing and lower birth rate in Japan, the central government attempts to improve working environment in order to relief these particular problems across the country. One of improvements is to reduce the absolute time on work (Gender Equality Bureau (2017)). In our paper, we consult a role played by each region to enhance the solution against those problematic issues. Such attempt of the region may accelerate a sustainable regional economic growth with respect to a sufficient economies of scale and scope as a result of a development of the attractiveness of a region (see Nakamura, 2018).

Relating established studies of this subject should refer to Sakanishi (2015) for female labour force participation as regional differences in Japan, and to Kawabata and Abe (2018) for female labour participation as commuting time and spatial pattern in Tokyo, for instance. Here, our focus is more given to the socio-economic system which may interfere an efficient working environment in Japan. Such issue of the country is characterised as a heavy dependence on the economic system including extensional services in addition to obtaining physical commodities (see MLIT, 2018). Hence, it may be important to consider supporting families by cooperative coordination in a regional unit. In Section 2, a simplified household economy model is introduced. There, the model presumes that a support for local families can be provided by means of saving time to keep spare time for doing various activities. Hence, the model includes variables which explain the extent of support by the regional cooperative coordination which is argued in detail in Section 3. Then, the hypothesis is tested its validity by quantitative analysis based on our original survey in a specific region in Section 4.

The final part of the paper addresses policy implications in a regional level to the region be a sustainable in the long run as presented in Section 5. There, an impact of changes in regional system with cooperative coordination on the benefit of the self-

sustaining regional economic growth is revealed. Also, shortcomings of regional economic growth is argued in Section 6 before concluding comments in Section 7.

## 2 Household economy model

A simple household economic model is presented by illustrating a representative individual's utility function under her budget constraint.

$$\max \quad U = U(x, g, y) \quad (1)$$

$$\text{s.t} \quad M = p_x x + \delta p_g g + (1 - \delta) p_y y + B \quad \left( \frac{\partial \delta}{\partial B} < 0 \right) \quad (2)$$

Each symbol represents  $x$  ( $x > 0$ ) = a composite good,  $g$  ( $g > 0$ ) = quantity demanded of safety and security related services for every economic agent,  $p_x$  ( $p_x > 0$ ) = unit price of  $x$ ,  $p_g$  ( $p_g > 0$ ) = unit price of  $g$ ,  $p_y$  ( $p_y > 0$ ) = unit price of  $y$ ,  $y$  ( $y > 0$ ) = quantity demanded of safety and security related services which can be exclusively available for the local residents,  $\delta$  ( $0 < \delta < 1$ ) = weight to rely on local services, and  $B$  ( $B > 0$ ) = local charge to supply services to local residents. For instance,  $\delta \rightarrow 0$  when the individual prefers  $y$  to  $g$ , and vice versa. Also, the parameter  $M$  can be composed by two separate elements as follows.

$$M = M_0 + wh \quad (3)$$

where  $M_0$  ( $M_0 > 0$ ) = initial condition such as education level, family income, relatives' incomes, and other exogenous pecuniary factors, which can be advantageous to achieve higher value of  $M$ ,  $w$  ( $w > 0$ ) = unit wage, and  $h$  ( $h \geq 0$ ) = time for work.

Further, the parameter  $h$  can be interpreted as:

$$h = T - l_1 - l_2 \quad (4)$$

where  $T$  ( $T > 0$ ) = entire time,  $l_i$  ( $l_i > 0$ ,  $i = 1, 2$ ) = time for leisure that may be

expressed as  $(\sigma l_1 + (1 - \sigma)l_2)$  where  $l_1 =$  time for family,  $l_2 =$  time for herself, and  $\sigma$  ( $0 < \sigma < 1$ ) indicates  $\sigma \rightarrow 0$  as the individual's circumstance approaches to be a single, and  $\sigma \rightarrow 1$  as the individual's situation approaches to be a family with childcare.

By setting a ratio between  $h$  and  $l_i$ ,

$$T = \mu h + (1 - \mu)(l_1 + l_2) \quad (5)$$

where  $\mu$  ( $0 < \mu < 1$ ) = a weight on spending her time on work. Hence, it can be said that  $\mu \rightarrow 1$  for high-skilled full-time worker,  $\mu \rightarrow 0$  for non worker, and somewhere between these values for part-time worker, for instance. Now, Eq. (3) becomes

$$M = M_0 + w \left( \frac{T}{\mu} - \frac{(1-\mu)(l_1+l_2)}{\mu} \right). \quad (6)$$

By combining with Eq. (2),

$$M_0 + w \left( \frac{T}{\mu} - \frac{(1-\mu)(l_1+l_2)}{\mu} \right) = p_x x + \delta p_g g + (1 - \delta) p_y y + B. \quad (7)$$

Hitherto, a representative household's utility function with additional elements to conduct parenting and childcare has been expressed. The following section examines case studies under a hypothetical framework.

### 3 Hypothetical analysis

This section studies how each factor in the previous section affects the utility level on the representative household. First, the local charge,  $B$ , may increase by means of a charge from local residents and of a charge  $p_g$  ( $p_g > p_y$ ) from other regional residents when they use locally exclusive services,  $y$ , as guest users. When the individual's behaviour, which faces childcare, exceeds her limit of time, an increased level of  $g$  or  $y$  reduces the quantity demanded of  $x$ . Since  $x > y > g$ , this may become worse off the utility level  $U$ .

$$g \uparrow \text{ or } y \uparrow \rightarrow x \downarrow \rightarrow (x > y > g) \rightarrow U \downarrow \quad (8)$$

If regional supporting services are further advanced by the cooperative atmosphere of the region, the price,  $p_y$ , declines (to i.e.,  $p'_y$ ) that increases aggregate volume of  $y$ ,  $x$ , and  $g$ , and the utility level improves. However, the utility level declines, if the reduction of  $p_y$  remarkably increases the local charge,  $B$ , that reduces aggregate volume of  $y$ ,  $x$ , and  $g$ .

Hence, the condition to satisfy the improvement of the utility level is,

$$(B' - B)N \leq [(p_y - p'_y)\beta N + p_g\beta N^E]. \quad (9)$$

where additional symbols represent  $B'$  ( $B' > 0$ ) = increased amount of  $B$ ,  $p'_y$  = price of  $y$  after reduced,  $N$  ( $N > 0$ ) = local population,  $N^E$  ( $N^E > 0$ ) = other regions' local population, and  $\beta$  ( $0 < \beta < 1$ ) is the rate of parenting population which is assumed to be a constant across different regions. More simply, this can be re-expressed as

$$B'N \leq [p'_y\beta N + p_g\beta N^E]. \quad \beta N = y \quad (10)$$

The parameter  $B'$  can be affected by the local atmosphere of cooperative behaviour as  $RS$  (Regional Strength).

$$RS = A\alpha N \quad (11)$$

where  $A$  ( $A > 0$ ) = given regional economic advantage, and  $\alpha$  ( $0 < \alpha < 1$ ) = cooperative behavioural indicator. When the indicator  $RS$  sufficiently works, the reduced level of  $l_1$  may increase the quantity demanded of  $x$  which leads to the improvement of the individual's utility level.

It has revealed that time release of individuals those who engage on childcare may have certain effectiveness as a contribution of the region in a theoretical term. The following section attempts to demonstrate its validity by quantitative methods.

#### 4 Quantitative analysis

In order to show how the illustrative framework in previous sections can be plausible in our actual economic behaviour, this section conducts some tests by quantitative analysis. The analysis uses summarised data of our original regional survey “Parenting and Childcare” (collected answer-sheet of female = 566 and as male = 435) under a commissioned project of the City of Fukuoka 2017. See further details on the annual report: Nakamura (2017). We collected complete data on 394 parents (39.3% of the total population), of whom 200 (50.8%) were fathers and 194 (49.2%) were mothers. The examination in this section presumes individual’s time per week is set as 168 hours (24 hours times 7 days). Here, the actual physical time management those who have a partner is 48 hours per day as a result of 24 hours times two individuals. Descriptive statistics and correlation matrix of variable is shown in Table 1.

We used a moderated hierarchical regression to test our hypotheses. In the first step, the control variable, “gender”, was entered. In the second step, the main effects for “(partner) full-time work” and “working hours per week” were entered. In the third step, the product term (interaction) were added. Table 2 presents the results of hierarchical regression. Regarding time spend for childcare, the result can be summarised as follows. First, there is a gender gap, and time of female for spending on childcare is much longer than male. Second, time is less for long-time workers than short-time workers. Third, more time is spend those whose partner (female) is a full-time worker.

Table 1. Descriptive statistics and correlation matrix

Variables	Means	s.d.	min	max	a.	b.	c.	d.	e.	f.	g.
a. (Partner) Full time	0.731	0.444	0.000	1.000	1.000						
b. Working hours per week	41.879	18.292	0.000	120.000	-.637 **	1.000					
c. Leisure time per week	126.121	18.292	48.000	168.000	.637 **	-1.000	1.000				
d. Weekdays childcare time	3.939	3.382	0.000	16.000	.632 **	-.586 **	.586 **	1.000			
e. Weekends childcare time	10.412	4.522	0.000	20.000	.407 **	-.258 **	.258 **	.433 **	1.000		
f. Childcare time per week	40.522	22.362	0.000	112.000	.643 **	-.547 **	.547 **	.931 **	.732 **	1.000	
g. Leisure time except childcare	88.876	34.644	3.000	166.000	-.714 **	.446 **	-.446 **	-.781 **	-.603 **	-.835 **	1.000

\*\*  $p < .01$ , \*  $p < .05$ , +  $p < .10$

Table 2. Hierarchical multi-regression analysis

	Child care hours per week		
	Step1	Step2	Step3
a. gender	0.643 **	.475 **	.300 **
c. (Partner) Full-time worker		.041	.204 *
d. Working hours per week		-.229 **	-.203 **
gender * (Partner) Full-Time worker			.180 *
gender * Working hours per week			-.033
(Partner) Full-time worker * Working hours per week			-.023
Adjust $R^2$	.412 **	.442 **	.449 **
$R^2$	.413 **	.446 **	.457 **
$\Delta R^2$		.033	.011

\*\*  $p < .01$ , \*  $p < .05$ , +  $p < .10$

Notes: Figures shown are standardised coefficients.

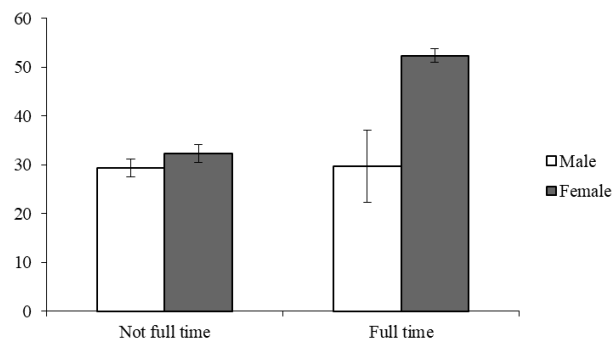


Fig. 1 Gender gap on job contract type

## 5 Policy implications

In our society under the market mechanism, parenting and childcare can be supported either by economic system or local cooperation. The former (economic system) is more profitable (larger revenue and cost) than the latter (local cooperation) system (lower revenue and cost) in an economic term. However, in the cost term, the latter (local cooperation) is much better to minimise. A similar indication is given by MLIT (2018). Without an effort of each region, the safety net of the society needs to continuously provide, which requires huge expenditures of public finance.

In the previous section, the following facts are revealed regarding time spend for childcare. First, there is a simple gender gap; namely, time on female to engage on childcare is much longer than male. Second, time spend for childcare is less for a long-time worker than a short-time worker. These can support the policy for gender equality by the central government. However, the additional outcome; namely, more time is spend those whose partner (female) is a full-time worker. This specific result is controversial to the intuitive understanding. To be concrete, the theoretical model in previous sections demonstrates that time-saving for childcare family by the regional cooperative coordination improves their wellbeing. However, the factor “time-saving” itself may oppositely affect for the wellbeing indicator.

By combining these criteria, public policy should carefully consider regional contribution as time and cost saving opportunities to the child-caring local residents. To be concrete, a simple replacement of nursery service cannot be effective, and more indirect methods would be useful to apply. For instance, providing education or learning of parenting to male residents may keep their incentive to support family regardless the



fact that the partner has as a full-time job. Otherwise, the reference point in the behavioural economics sense and the prisoner's dilemma in game theory occur. For instance, both full-time family faces a physically tight schedule which generates more cooperative atmosphere. By contrast, one parent full-time working condition brings less release on time and less cooperation, possibly due to the reference-point optical-illusion of human beings. Under such considerations, appropriate policy remedies which relax female exclusive weight on childcare can be acted by supporting system within the region. In the theoretical sense, the parameter  $M_0$  may increase by the region.

## 6 Further avenues

The side effect of policy remedies which relax female exclusive weight on childcare can be attained by supporting system within the region that may be a contribution to enhance the regional economic growth. As expressed in Eq. (7), the more participation to the regional activity, the initial advantageous level  $M_0$  may increase through an increase in  $B$ . The participation depends on the value  $\alpha$  in Eq. (11). In this equation, another parameter, namely,  $A$ , can be connected with the extent of regional export that should refer to Tibout (1956) that the regional economic growth is enhanced by regional export.

Regional export can be not only exporting physical goods and services but also the presence of labours those who engage jobs outside the region. Also, special services on childcare which are exclusively available at the region. If such services are open to non-local residents, service charge can be set at higher pricing level as the guest tariff than the discounted price for the local residents. A more detailed examination using Eq. (9) would be useful to demonstrate this specific system.

## 7 Concluding comments

This paper has studied a method for a self-sustaining regional economic growth through internal cooperation among local economic agents within a region. The examination focused on a support for parenting and childcare in Japan. Followed by a review of a current situation of the socio-economic system of the country, a regional economic model was illustrated. There, its validity was tested by quantitative analysis based on our original survey in a specific region. A remarkable finding of this study was that a regional support for childcare family by proving time- and cost-saving opportunity does not work properly. Instead, additional elements such as educating and learning opportunities to male residents would enhance these remedies for the long-run sustainable regional economic growth.

## References

- Gender Equality Bureau (2017) *The Government White Paper on Gender Equality*. Tokyo: The Cabinet Office
- Kawabata M, Abe Y (2018) “Intra-metropolitan spatial patterns of female labor force participation and commute times in Tokyo”, *Regional Science and Urban Economics*, 68: 291-303
- MLIT (2018) *The White Paper on Land, Infrastructure, Transport and Tourism in Japan*. Tokyo: The Ministry of Land, Infrastructure, Transport and Tourism
- Nakamura D. (2017) *Annual report of the laboratory 2017*. Fukuoka Women’s University Nakamura Economics Application Laboratory
- Nakamura D. (2018) Location economics analysis on attractiveness of a region. *Studies in Regional Science*, 48/1: 71-84
- Sakanishi A. (2015) “Regional differences in female labor force participation in Japan”, *Conference Paper on the 13<sup>th</sup> International Conference of the Japan Economic Policy Association*

Tiebout CM. (1956) Exports and regional economic growth. *Journal of Political Economy*, 64: 160-164