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Declining Fertility and Its Related Economic Issues in Japan

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Chapter 1

Introduction[1]

There are many challenges in the Japanese economy which begins to suffer from declining fertility.

In this paper we will focus on the persistent low birthrate in Japan, and its related economic issues.

Chapter 2 analyzes the causes and implications of low birthrate in the long run, examining the Easterlin hypothesis cohort effect, while showing that the feedback mechanism of the economy may not reverse the declining birthrate.

Chapter 3 tries to answer the question "Do Japanese work shorter hours than before?" Using Japanese time-series data from the *Survey on Time Use and Leisure Activities*, it indicates that market work per week increased from the 1970s until mid 1980s and has been relatively stable for the last two decades for both male and female full-time workers. Furthermore, it demonstrates that since the mid 1980s, people shifted their work time from Saturday to weekdays (Monday through Friday). Interestingly, as well, it shows that the average hours of leisure had increased for females, while hours for sleep declined consistently. Lastly, it suggests that Japanese work much longer than their American counterparts; 8.6 hours longer per week for males and 6.5 hours longer for females.

Chapter 4 studies the causal effects of marriage and motherhood on wages of female Japanese workers, through correcting sample-selection bias and taking the endogeneity into account. It implies that in the short term, marriage and motherhood have no effects on wages.

Chapter 5 examines the reasons for the increase in non-routine manual tasks in Japan, taking demand-side aspects into account, using the data from the *National Survey of Family Income and*

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Expenditure and the *Employment Status Survey*. It suggests that the increase in workers performing non-routine manual tasks is due to demographic changes such as the advance in population aging and the decline in household sizes as well as the increase in the employment share of high-skilled workers.

Chapter 6 provides a dynamic microsimulation model (PENMOD) to examine two policy options for reforming public pensions in Japan. The first option is a shift to the VAT finance of the first-tier, flat-rate basic pensions. The model shows that the transitional cost incurred additionally is approximately 3 percentage point in the VAT rate for over 40 years. The claw-back system will relieve the tax burden by 7% at the most. The second option is an introduction of the Swedish-style pensions which are composed of a notional defined contribution plan and a minimum guarantee. The chapter suggests that the Swedish system is feasible in Japan, more cost-effective than a shift to the VAT finance of basic pensions, contributing more to intergenerational equity.

Chapter 7 examines the pattern of top executive turnover among small non-listed businesses in Japan using a unique panel data set of about 25,000 firms for 2001-2007. It found that 1) the likelihood of a change in top executive among non-listed firms is independent of their ex-ante performance, especially when the firms are managed by the owners themselves or by their relatives, and 2) non-listed firms which experienced a top executive turnover saw an improvement in ex-post performance relative to firm without turnover. The extent of the improvement is similar between non-listed firms and listed firms. These results indicate that underperforming non-listed firms do not face disciplinary executive turnover but that their top executives, once they succeed their predecessors, exert high managerial effort and thus significantly improve firms' profitability.

Chapter 8 makes a preliminary approach to examine the EITC in Japan. A US-type EITC is studied, using the Basic Survey of the Living Conditions of People on Health and Welfare.

Chapter 2

On the Persistence of Low Birthrate in Japan

Abstract

We first show that quality of consumption is an important determinant of fertility and labor supply. Taking this observation into account and using a general equilibrium model with vertical quality differentiation and heterogeneous labor, we show how low fertility may persist. This occurs because product quality and skilled labor supply adjust, never realizing the change in labor productivity necessary to reverse declining fertility.

2.1 Introduction

This paper consists of two parts. First, we present a model of consumer choice where children and consumption experience require both goods and time. We demonstrate how change in marginal utility of consumption and change in wages generate different relationship between fertility and labor participation, i.e., possible source of the difference between cross section and time series. In the second half, we embed a simplified version of this consumer into a general equilibrium model with heterogenous labor and vertically differentiated products. Through comparative statics, we analyze the cause and implications of low birthrate in the long run. We show that the feedback mechanism of the economy may not reverse the declining birthrate, contradicting an implication of the Easterlin Hypothesis cohort effect. This is because the labor market structure and product market adjusts to change in birthrate and thus the cohort effect never materializes.

The paper is in the spirit to papers in growth and trade that take into account the reaction of the economy in the long run (Acemoglu (1998), Flam and Helpman (1987), Thoenig and Verdier (2003)). Acemoglu (1998) showed that while in the short run, laborinput is reduced in response to scarcity of skilled labor and high wages, skilled labor supply increase in response triggers technological change that makes skilled labor even more productive, raising skilled labor wage in

the long run. Our analysis suggests that a similar long term adjustment of the economy will prevent a natural feedback mechanism from working. That is, smaller population will increase marginal product of labor more productive in the short run but consumption pattern will change in the long run reducing such an advantage.

2.2 Re-examination of female labor participation - birthrate relationship

Large Time series among many OECD countries show negative relationship between female labor participation and TFR (Figure 2.1) , while cross country in 2005 (average of years 1985-1996 as well as year 2000, Sleebos (2003), d'Addio and d'Ercole (2005), Da Rocha and Fuster (2006)) show a positive relationship. In Japan, although time series relationship has been negative for 1980 - 2000 (Figure 2.1) , cross section among prefectures show positive relationship in 1987 and 2002 (2.2). Obviously conditions that differ across regions in Japan are different from difference between two points in time. We also note that countries with high per capita GDP have low birthrates (Figure 2.3), suggesting low fertility may be correlated with high consumption. In this section we introduce a consumer optimization model to capture differences in income difference and quality of consumption.

We assume that a utility of a household depends on number of children, n, and consumption of a good x. Both child rearing and consumption of a good requires time. Number of children is determined by amount of good x_c, and time devoted, ℓ_c,

$$n = f(x_c, \ell_c), \quad f_x > 0, f_\ell > 0.$$

Subscripts on functions denote partial derivatives. The utility of consumer is actually determined by amount of z, which is consumption experience that depends on amount of the good, x, and time devoted, ℓ,

$$z = g(x, \ell), \quad g_x > 0, g_\ell > 0.$$

Utility function is,

$$u(n, z), u_n > 0, u_z > 0.$$

Budget constraint depends on price of good and wage, and labor endowment, $\bar{\ell}$,

$$px + px_c + w\ell + w\ell_c = w\bar{\ell}.$$

Figure 2.4 demonstrates the optimization problem. The opportunity set is defined as,

$$\left\{(z, n) \mid n = f(x_c, \ell_c), \quad z = g(x, \ell), \quad p(x + x_c) + w(\ell + \ell_c) = w\bar{\ell}\right\}.$$

The frontier is downward sloping (see Appendix). It reflects the budget constraint as well as the technologies, g and f.

We further index consumption (consumption experience) by quality, Q, so that utility function is

$$u(Qz, n)$$

where z measures quantity of consumption. First-order conditions for utility maximization are,

$$\frac{f_x}{f_\ell} = \frac{g_x}{g_\ell} = \frac{p}{w}, \tag{1}$$

$$\frac{u_n}{u_z} = Q\frac{g_x}{f_x}. \tag{2}$$

Equation (1) implies less labor intensive consumption and child rearing method will be used when wage increases. The time series of female wage that has been rising in Japan would lead to less labor intensive methods which means greater labor participation. Equation (2) implies better quality of consumption leads to more consumption and less children.

Higher wage but not significantly higher quality means positive relationship. However the same higher relative wage and higher quality consumption means negative relationship between labor participation and fertility. Availability of consumption goods, such as entertainment and restaurants, is much greater in larger cities. This means higher Q, meaning less children and more consumption in cities.[2]

2.3 General Equilibrium with high quality product and heterogeneous labor

In this section we analyze a general equilibrium model in which consumers have a utility function that reflect the previous analysis, although somewhat simplified. Consumers differ by two attributes, their preference and quality of labor. Consumers choose either to consumer high quality product or standard (low quality) product. Child bearing choices differ according to which product they choose, as well as if they are skilled or not. Skilled workers produce high quality product and the labor supply level determine the level of quality.

[2]For instance, there are 191 Tokyo restaurants listed in the Michelin restaurant guide, compared to 64 in Paris and 42 in New York (Robinson (2007)). Same hours spend at a Tokyo restaurant yields higher Qz on the average compared to other locations in Japan.

Consumers

We simplify the consumer's problem so that she chooses between consumption (x) and childbearing (n). Her preference is represented by the following utility function which also depends on the quality of the good consumed, Q,

$$U_\rho(n,x)=\left(Qx^\rho+n^\rho\right)^{\frac{1}{\rho}},\quad 0<\rho<1. \tag{3}$$

Consumers preference, ρ, is distributed uniformly over [0,1]. Consumption good is either the standard (low quality) $Q=1$ or high quality $Q>1$. Consumer's labor endowment is $\bar{\ell}$ and wage is w which is also the opportunity cost of children. Denoting price of the good by p, consumer chooses consumption and number of children to maximize (3) with respect to the budget constraint,

$$px+wn=w\bar{\ell}.$$

Each consumer's consumption and number of children given quality Q is determined by the utility maximization given the budget constraint,

$$x_\sigma^*(p,w;Q)=\frac{Q^\sigma\bar{\ell}}{(\frac{p}{w})^\sigma\left(Q^\sigma(\frac{p}{w})^{1-\sigma}+1\right)},\quad n_\sigma^*(p,w;Q)=\frac{\bar{\ell}}{Q^\sigma(\frac{p}{w})^{1-\sigma}+1}, \tag{4}$$
$$\text{where}\,\sigma\equiv\frac{1}{1-\rho}>1.$$

Consumption is increasing and number of children is decreasing in quality, as in the previous section. The indirect utility is,

$$v_\sigma(p,w;Q)=\bar{\ell}\left(Q^\sigma(\frac{w}{p})^{\sigma-1}+1\right)^{\frac{1}{\sigma-1}}.$$

The consumer must choose which quality to consume. If her marginal utility from more consumption is relatively large, she devotes less resources to children and has fewer children. If the quality is low and not as beneficial, she derives utility by having many children. She compares the utility levels from consuming each quality and buys whichever yields higher utility. We denote the prices of the goods with different qualities by p_H and p_L. Consumer will buy the high quality good when

$$v_\sigma(p_H, w; Q) > v_\sigma(p_L, w; Q).$$

This condition is equivalent to,

$$\sigma < \hat{\sigma} \equiv \frac{\ln \frac{p_H}{p_L}}{\ln \frac{p_H}{p_L} - \ln Q}. \tag{5}$$

Since $\sigma > 1$, there will be no demand for the low quality good if $\ln \frac{p_H}{p_L} < \ln Q$. This occurs if low quality product is more expensive ($p_L \geq p_H$) since $Q > 1$ and $p_H > p_L$ but the price premium for the high quality is small relative to difference in quality. It does not depend on the level of income.

Consumer's labor supply is the hours not devoted to raising children,

$$\ell_\sigma(p, w; Q) = \bar{\ell} - n^*_\sigma(p, w; Q) = \frac{Q^\sigma}{Q^\sigma + (\frac{p}{w})^{\sigma-1}}. \tag{6}$$

Markets

The labor each consumer supplies is either skilled (s) or unskilled (u). There are total of N consumers, and $\theta \in (0,1)$ of the consumers are skilled. Labor endowment, ℓ, is the same for both types. We denote wages for skilled and unskilled by w_s and w_u. Production technology is constant returns to scale in labor: one unit of skilled labor produces one unit of high quality product and one unit of unskilled labor produces one unit of the standard product. Furthermore we assume both products are supplied competitively, meaning $p_H = w_s$ and $p_L = w_u$.

One skilled worker's demand for high quality product is, denoting relative wage by $\xi = \frac{w_s}{w_u} > 1$ and using (4),

$$x_s^H(\xi) = x^*_\sigma(w_s, w_s; Q) = \frac{Q^\sigma \bar{\ell}}{Q^\sigma + 1}, \quad \sigma < \hat{\sigma} = \frac{\ln \xi}{\ln \xi - \ln Q},$$

and demand for low quality is,

$$x_s^L(\xi) = x_\sigma^*(w_u, w_s; Q) = \frac{\overline{\ell}}{\xi^{-\sigma}(\xi^{\sigma-1}+1)}, \quad \sigma > \hat{\sigma}.$$

There will be positive demand for the low quality only if $\xi > 1$ since $\xi = \frac{p_H}{p_L}$. We make the following observation,

Claim 1. High skilled consumers consume more of both quality, $x_s^H(\xi) > x_u^H(\xi)$ and $x_s^L(\xi) > x_u^L(\xi)$.

Total demand from all the skilled workers for high quality product and low quality product are,

$$\theta N \int_1^{\hat{\sigma}} x_s^H(\xi) d\sigma \text{and} \theta N \int_{\hat{\sigma}}^{\infty} x_s^L d\sigma.$$

Similarly for unskilled workers, we have the individual demands for high quality good,

$$x_u^H(\xi) = x_\sigma^*(w_s, w_u; Q) = \frac{Q^\sigma \overline{\ell}}{\xi^\sigma \left(Q^\sigma \xi^{1-\sigma}+1\right)}, \quad \sigma < \hat{\sigma} = \frac{\ln \xi}{\ln \xi - \ln Q},$$

and demand for low quality good,

$$x_u^L(\xi) = x_\sigma^*(w_u, w_u; Q) = \frac{\overline{\ell}}{2}, \quad \sigma > \hat{\sigma}.$$

Total demands for each quality from all unskilled workers are,

$$(1-\theta) N \int_1^{\hat{\sigma}} x_u^H(\xi) d\sigma \text{and} (1-\theta) N \int_{\hat{\sigma}} x_u^L(\xi) d\sigma.$$

Since production of one unit of good requires one unit of labor, demand for skilled and unskilled labor, L_s^D and L_u^D are,

$$L_s^D(\xi) = \theta N \int_1^{\hat{\sigma}} x_s^H(\xi) d\sigma + \theta N \int_{\hat{\sigma}}^{\infty} x_s^L d\sigma, \tag{7}$$

$$L_u^D(\xi) = \theta N \int_1^{\hat{\sigma}} x_s^L(\xi) + (1-\theta) N \int_{\hat{\sigma}} x_u^L(\xi) d\sigma. \tag{8}$$

Labor supply is constructed in a similar manner from individual supplies. Individual labor supply as function of relative wage is , using (6) ,

$$\ell_s^H(\xi) = \ell_\sigma^*(w_s, w_s; Q) = \frac{Q^\sigma \overline{\ell}}{Q^\sigma + 1}, \quad \sigma < \hat{\sigma},$$

$$\ell_s^L(\xi) = \ell_\sigma^*(w_u, w_s; 1) = \frac{\overline{\ell}}{\xi^{1-\sigma} + 1}, \quad \sigma > \hat{\sigma}$$

$$\ell_u^H(\xi) = \ell_\sigma^*(w_s, w_u; Q) = \frac{Q^\sigma \overline{\ell}}{Q^\sigma + \xi^{\sigma-1}}, \quad \sigma < \hat{\sigma},$$

$$\ell_u^L(\xi) = \ell_\sigma^*(w_u, w_u; 1) = \frac{\overline{\ell}}{2}, \quad \sigma > \hat{\sigma}.$$

Aggregation yields the total labor supply of each type,

$$L_s^S = N\overline{\ell}\int_1^{\hat{\sigma}} \left\{\ell_s^H(\xi) + \ell_s^L(\xi)\right\} d\sigma, \tag{9}$$

$$L_u^S = (1-\theta)N\overline{\ell}\int_{\hat{\sigma}}^{\infty} \left\{\ell_u^H(\xi) + \ell_u^L(\xi)\right\} d\sigma. \tag{10}$$

It is easy to show, from (5), that $\hat{\sigma}$ is decreasing in ξ that L_s^D and L_u^S is decreasing in $\xi = \frac{w_s}{w_u}$ and L_s^S and L_u^D are increasing in ξ. Equilibrium relative wage for a given quality level, $\xi^*(Q)$, is determined by the skilled labor market clearing condition,

$$L_s^D(\xi) = L_s^S(\xi).$$

The unskilled labor market has cleared by Walrus Law.

Comparative statics

We first see how the equilibrium labor supply and relative wage change with quality.

Claim 2.

1. L_s^S, L_u^S and L_u^D are increasing and L_u^D are decreasing in Q.
2. Equilibrium relative wages and level of skilled labor are increasing in quality. That is, $\partial\xi^*(Q)/\partial Q > 0$ and $\partial L_s^*(Q)/\partial Q > 0$.

(See Figures 2.5 and 2.6. Proof is in the Appendix.) Higher quality makes consumption attractive for skilled workers and also increase proportion of all workers that consume the high quality product. Thus both demand and supply of skilled labor is increasing in quality. The same effect

increases the supply of unskilled workers and reduces demand for low quality good. The latter effect implies demand for unskilled workers decreases when quality improves.

Skilled labor supply is increasing in population, $\partial L_s^S / \partial N > 0$, from (9) and demand is also increasing in population, $\partial L_s^D / \partial N > 0$, from (7). (See proof of Claim 2 in the Appendix.) This implies

Claim 3. Both equilibrium skilled and unskilled labor will increase when population increases, $\partial L_s^* / \partial N > 0$ and $\partial L_u^* / \partial N > 0$.

Again, using the proof of Claim 2 in the Appendix, both demand and supply of skilled labor is also increasing in proportion of skilled consumers, $\partial L_s^S / \partial \theta > 0$, from (9) and $\partial L_s^D / \partial \theta > 0$, from (7).

Claim 4. Equilibrium skilled labor and equilibrium relative wage are increasing in the proportion of skilled consumers, $\partial L_s^* / \partial \theta > 0$ and $\partial \xi^* / \partial \theta > 0$.

Birthrate

Individual number of children are,

$$n_s^H(\xi) = n_\sigma^*(w_s, w_s; Q) = \frac{\overline{\ell}}{Q^\sigma + 1}, \quad \sigma < \hat{\sigma},$$

$$n_s^L(\xi) = n_\sigma^*(w_u, w_s; 1) = \frac{\overline{\ell}}{\xi^{\sigma-1} + 1}, \quad \sigma > \hat{\sigma}$$

$$n_u^H(\xi) = n_\sigma^*(w_s, w_u; Q) = \frac{\overline{\ell}}{Q^\sigma \xi^{1-\sigma} + 1}, \quad \sigma < \hat{\sigma},$$

$$n_u^L(\xi) = n_\sigma^*(w_u, w_u; 1) = \frac{\overline{\ell}}{2}, \quad \sigma > \hat{\sigma}.$$

It is clear that for given wage level, those that consume high quality good devoted even more resources for consumption and thus reduce number of children when quality improves. Since the equilibrium relative wage is increasing in quality, we can say the following,

Claim 5.

1. Skilled consumers have less children. That is, $n_s^H < n_u^H$ for $\sigma < \hat{\sigma}$ and $n_s^L < n_u^L$ for $\sigma > \hat{\sigma}$.

2. Skilled consumers have less children when quality of product improves. That is, $dn_s^H / dQ < 0$ for $\sigma < \hat{\sigma}$ and $dn_s^L < dQ < 0$ for $\sigma > \hat{\sigma}$.

3. Unskilled consumers that consume low quality product have the same number of children when quality improves. That is, $dn_u^L / dQ = 0$ for $\sigma > \hat{\sigma}$.

Although there is the income effect, the substitution effect dominates and skilled workers that consume low quality reduce number of children. For unskilled consumers that bought high quality good, improvement makes consumption more attractive (reduce children) but their relative wage becomes lower and the substitution effect works in the opposite direction. The total effect is not clear.

Endogenous quality

Assume that level of quality is increasing in the size of the skilled labor. That is, $Q = Q_T(L_s)$ is an increasing function of Q. Subscript T refers to "technology" which is what this relationship reflects. We will denote the inverse relationship between the market equilibrium supply of skilled labor and quality of $L_s^*(Q)$ by $Q = Q_M(L_s)$, which is an increasing function from Claim 2. The equilibrium level of labor L_s^* and equilibrium level of quality, $Q^* = Q_M(L_s^*) = Q_T(L_s^*)$, is the intersection of the two curves.

When marginal increase in quality from labor is very large, then the equilibrium is unstable. Graphically, this would mean slope of Q_T is steeper than Q_M ($Q_T' > Q_M'$). This is the case around equilibrium E_1 in Figure 7. A perturbation away from E_1 results in either spiral increase in quality and skilled labor supply or decrease of quality and skilled labor supply. When technology is mature so that marginal quality improvement is very small, then equilibrium is stable ($Q^m e_T < Q_M'$).

This is equilibrium E_2 in Figure 2.7. There may be multiple equilibria, some stable and others unstable. A slight perturbation from low quality with small skilled labor force will start a spiral of labor and quality improvement until E_2 is reached.

Now using Claim 3, we analyze the effect of declining population. The claim implies that the $Q_M(L_s)$ function will shift upward in the $L_s - Q$ space (Figure 2.8).

Claim 6.

1. If the technology is in its infancy, then equilibrium quality and skilled labor supply increase when population declines. That is ,

$$Q_T^{'} > Q_M^{'} \quad \Rightarrow \quad \frac{\partial Q^*}{\partial N} < 0, \quad \frac{\partial L_s^*}{\partial N} < 0.$$

2. If the technology is mature, then equilibrium quality and skilled labor supply decrease when the population decreases. That is ,

$$Q_T^{'} < Q_M^{'} \quad \Rightarrow \quad \frac{\partial Q^*}{\partial N} > 0, \quad \frac{\partial L_s^*}{\partial N} > 0.$$

When the technology is mature, then declining population results in "contraction" of the economy. That is, quality and supply of skilled labor are reduced. Claim 5 suggests that lower quality will increase the birthrate. Recall that all but unskilled consumers that consumed high quality product will increase birthrate when quality improves. This situation is consistent with cohort effect.

The situation is different when the technology still has not exhausted increasing marginal returns. The new equilibrium results in more skilled labor and higher quality. Products are more polarized, skilled labor has higher relative wages and work more. Utility is derived from more consumption and there is less children. The cohort effect does not hold because the economy adjusts to the lower level of population according to the available technology.

Now we consider the effect of more skilled workers, using Claim 4. The claim implies that the $Q_M(L_s)$ function will shift downward in the $L_s - Q$ space (Figure 2.9). Immediately we have the following,

Claim 7.

1. If the technology is in its infancy, then equilibrium quality and skilled labor supply decrease when the proportion of skilled workers increase. That is ,

$$Q_T' > Q_M' \quad \Rightarrow \quad \frac{\partial Q^*}{\partial \theta} < 0, \quad \frac{\partial L_s^*}{\partial \theta} < 0.$$

2. If the technology is mature, then equilibrium quality and skilled labor supply increase when the proportion of skilled workers increase. That is ,

$$Q_T' < Q_M' \quad \Rightarrow \quad \frac{\partial Q^*}{\partial \theta} > 0, \quad \frac{\partial L_s^*}{\partial \theta} > 0.$$

Equilibrium quality will decrease (increase) when technology is in its infancy (maturity). When proportion of skilled consumers increase, each skilled worker needs to supply less labor to maintain the same quality. When marginal quality from labor is very large, quality must be lower to accommodate it. Lower quality (and lower wage) is likely to imply higher birthrate. Thus when technology is sufficiently productive, the increasing skilled workers will increase the birthrate. On the other hand when the marginal product of labor is low, then higher labor implies higher quality. This may reduce the birthrate.

Claims 6 and 7 suggest that increasing the proportion of skilled labor can be effective in reversing decline in birthrate whenever the cohort effect may not hold. This was the case when marginal return from increasing skilled labor is large. On the other hand, when the technology is mature, Esterlin Hypothesis is likely to hold and the same policy will prevent the feedback mechanism that otherwise will function.

2.4 Concluding Remarks

We have employed comparative statics of a general equilibrium framework to understand the long term (stationary equilibrium) effect of declining population on the economy, including labor supply and birthrate. We incorporated vertically differentiated goods in the general equilibrium model based on the observation of time series and cross sectional date of birthrate - female labor participation relationship.

Our analysis suggests that if the technology is productive enough, the economy will adjust to smaller population and the cohort effect does not reverse the trend of declining population. We also showed that increasing the proportion of skilled consumers (potential workers) can increase birthrate and reverse the trend precisely when the cohort effect does not hold. We note that the same relationship between population size and proportion of skilled consumers means that changing the proportion can prevent the natural feedback mechanism from functioning when it would have functioned.

The two situations are characterized by whether the technology has high marginal return from skilled labor (infant) or whether this has been exhausted (mature). The economy will correct itself when it is mature, where we also observed the equilibrium to be stable. Therefore, another possible policy is to let the technology mature quickly.

Besides extending the model to a dynamic framework, analysis of an economy such as Japan requires understanding the effect of international trade. Assuming Japan will export high quality products, trade should reduce the substitution effect of high quality product while maintaining or increasing the income effect. This suggests trade by itself could correct the bias towards consumption and less children. On the other hand, existing trade literature (Flam and Helpman (1987), Theonig and Verier (2003)) suggest that trade will lead to greater specialization, particularly in a dynamic framework. This is left for future research.

References for Chapter 2

Acemoglu, Daron, 1998. "Why Do New Technologies Complement Skills? Directed Technical Change and Wage Inequality," The Quarterly Journal of Economics, 113(4):1055-89

Atoh, Makoto, 2006. "International Comparison of Declining Birthrate and Policies in Japan, " in O.Saitao and N.Takayama eds., Economic Analysis of Declining Birthrate, Toyokeizai. (In Japanese, "Kokusaihikaku kara mita nihon-no shoshika to shosika taisaku")

Bloom, David E., David Canning, Gunther Fink, and Jocelyn E. Finlay, 2007. "Fertility, female labor force participation, and the demographic dividend," NBER Working Paper 13583.

Borarini, Romina and d'Ercole, Marco Mira, 2006. "Measures of Material Deprivation in OECD Countries," OECD Social, Employment and Migration Working Papers No.37.

Council for Gender Equality, Special Committee on the Declinign Birthrate and Gender-Equal Participation, 2006a. "International Comparison of the Social Environment regarding the Declining Birthrates and Gender-Equality - Summary Report," Cabinet Office, Government of Japan.

Council for Gender Equality, Special Committee on the Declinign Birthrate and Gender-Equal Participation, 2006b. "Domestic Comparison of the Social Environment regarding the Declining Birthrates and Gender-Equality - Summary Report," Cabinet Office, Government of Japan. (In Japanese, "Soshika to danjosanka ni kansuru shakaikankyo no kokunaibunseki hokokusho - gaiyou")

d'Addio ,Anna Cristina and Marco Mira d'Ercole, 2005. "Trends and Determinants of Fertility Rates in OECD Countries: The Role of Policies," OECD Social, Employment and Migration

Working Paper No.27.

Da Rocha, Jose Maria and Juisa Fuster, 2006. "Why are Fertility Rates and Female Employment Ratios Positively Correlated Across OECD Countries", *International Economic Review* 47(4):1187-1222.

de Laat, Joost, and Sanz, Almudena Sevilla, 2006. "Wokring Women, Men's Home Time and Lowers-Low Fertility," ISER Working Paper 2006-23, Colchester: University of Essex.

Flam, Harry and Helpman, Elhanan, 1987. "Vertical Product Differentiation and North-South Trade," *American Economic Review* 77(5): 810–822.

Funke, Michael and Stuilik, Hoger, 2000. "On Endogenous Growth with Physical Capital, Human Capital and Product Variety," *European Economic Review* 44: 491–515.

Hasset, Michael, 2008. "Seeking a Life in Balance - Government's veiled Attempt to Address Labor Shortage Reeks and Comes at the Expense of Children," The Japan Times (Tuesday, January 1, 2008).

Helpman, Elhana, 1993. "Innovation, Imitation, and intellectual Property Rights," *Econometrica* 61(6):1247–1280.

Kohler, Hans-Peter, Francesco C. Billari and Jose Antonio Ortega, 2006. "Low Fertility in Europe: Causes, Implications and Policy Options," in F.R.Harris ed., *The Baby Bust: Who will do the Work ? Who Will Pay the Taxes ?* Lanham,MD:Rowman & Littlefield Publishers:48-109.

Macunovich, Diane J., 1998. "Fertility and the Easterlin Hypothesis: An Assessment of the Literature," *Journal of Population Economics*, 11:1-59.

National Insitute of Population and Social Security Reserach, 2003. Cild Related Polices in Japan.

Robinson, Gwen, 2007. "Michelin Sprinkles Stars in Tokyo," Financial Times (November 20, 2007).

Sanderson, Warren C., 1976. "On Two Schools of the Economics of Fertility," *Population and Development Review* 2:469-478.

Sleebos, Jolle E., 2003. "Low Fertility Rates in OECD Countries: Facts and Policy Responses," OECD Social, Employment and Migration Working Paper No.15.

Suzuki, Toru, 2006. "Lower-Low Fertility and Geovernmental Actions in Japan," PIE Discusion Paper No. 294. Institute of Economic Research, Hitotsubashi University.

Thoenig, M., and Verdier, T., 2003. "A Theory of Defensive Skill-Biased Innovation and Globalization," *American Economic Review*, 93: 709-728.

Yomogida, M. and Reiko Aoki, 2005. "It Takes a Village - Network Effect of Child-rearing," PIE Discussion Paper No. 275, Institute of Economic Research, Hitotsubashi University.

Appendix

Optimization of $u(Qx, n)$

Denoting the Lagrange multiplier by λ, fist-order conditions are,

$$u_n f_x = \lambda p, \quad u_n f_\ell = \lambda w, \quad u_n g_x = \lambda p, \quad u_n g_\ell = \lambda w,$$

and the budget constraint. This implies

$$\frac{f_x}{f_\ell} = \frac{g_x}{g_\ell} = \frac{p}{w}.$$

When w increases, ℓ_c and ℓ decrease while x and x_c increase.

Proof of Claim 2

The demand and supply functions, (7),(8), (9), and (10), can be rewritten as,

$$L_s^S = \theta N \bar{\ell} \int_1^{\infty} \frac{Q^\sigma}{Q^\sigma + \xi^{1-\sigma}} d\sigma + \theta N \bar{\ell} \int_{\hat{\sigma}}^{\infty} \left\{ \frac{Q^\sigma}{Q^\sigma + \xi^{1-\sigma}} - \frac{Q^\sigma}{Q^\sigma + 1} \right\} d\sigma$$

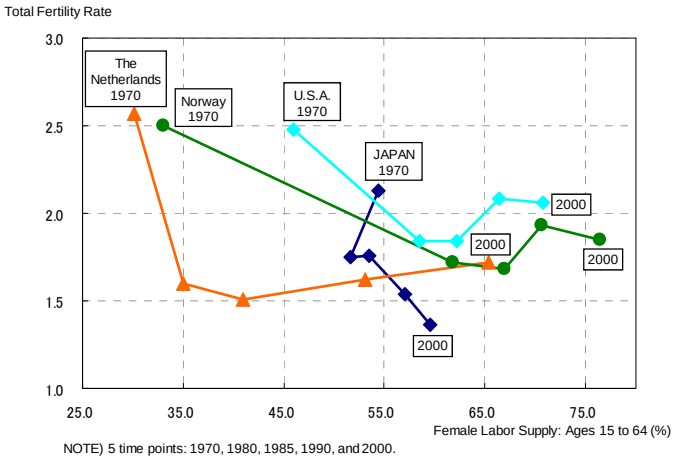
$$L_s^D = \theta N \bar{\ell} \int_1^{\hat{\sigma}} \frac{Q^\sigma}{Q^\sigma + 1} d\sigma + (1-\theta) N \bar{\ell} \int_1^{\hat{\sigma}} \frac{Q^\sigma}{Q^\sigma \xi + \xi^\sigma} d\sigma$$

$$L_u^S = (1-\theta) N \bar{\ell} \int_1^{\infty} \left\{ \frac{Q^\sigma \xi^{1-\sigma}}{Q^\sigma \xi^{1-\sigma} + 1} - \frac{1}{2} \right\} d\sigma + (1-\theta) N \bar{\ell} \int_1^{\infty} \frac{1}{2} d\sigma,$$

$$L_u^D = (1-\theta) N \bar{\ell} \int_{\hat{\sigma}}^{\infty} \frac{1}{2} d\sigma + \theta N \bar{\ell} \int_{\hat{\sigma}}^{\infty} 1\xi^{-1} + \xi^{-\sigma} d\sigma.$$

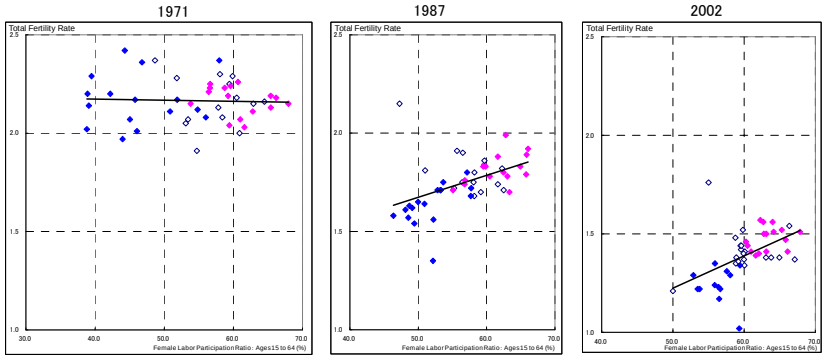
The claim follows from noting that $\hat{\sigma}$ is decreasing in ξ and increasing in Q, and that $Q^\sigma \xi^{1-\sigma} > 1$ for $\sigma < \hat{\sigma}$.

Figures



NOTE) 5 time points: 1970, 1980, 1985, 1990, and 2000.

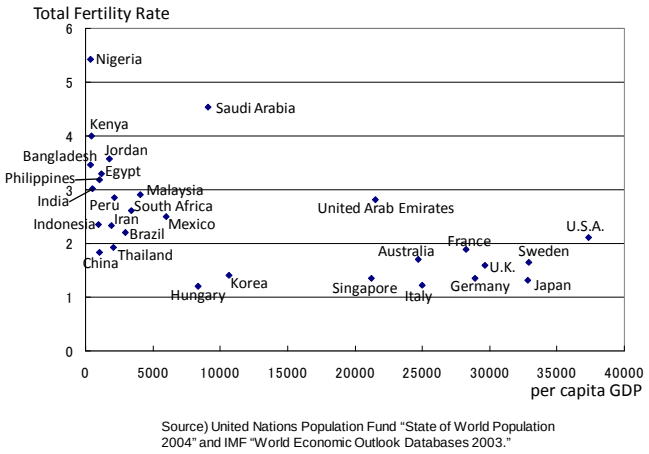
Figure 2.1: TFR and female labor supply 1970,80,85,90,2000
(Council for Gender Equality, Special Committee on the Declining Birthrate and Gender-Equal Participation, 2006a)



NOTE) Pink points are TYPE1(low declining rate in TFR and high level of TFR and female labor supply). Blue points are TYPE7(high declining rate in TFR and low level in TFR and female labor supply).

Sources) Ministry of Internal Affairs and Communications "Employment Status Survey," National Institute of Population and Social Security Research "Indicators of Fertility by Prefecture in 1970-1985," and Health, Labor and Welfare Ministry "Population Survey Report."

Figure 2.2: TFR and female labor participation ratio by prefecture in 1971, 1987, 2002
(Council for Gender Equality, Special Committee on the Decling Birthrate and Gender-Equal Participation, 2006b)



Source) United Nations Population Fund "State of World Population 2004" and IMF "World Economic Outlook Databases 2003."

Figure 2.3: TFR and Per Capita GDP
(Council for Gender Equality, Special Committee on the Declining Birthrate and Gender-Equal Participation, 2006a)

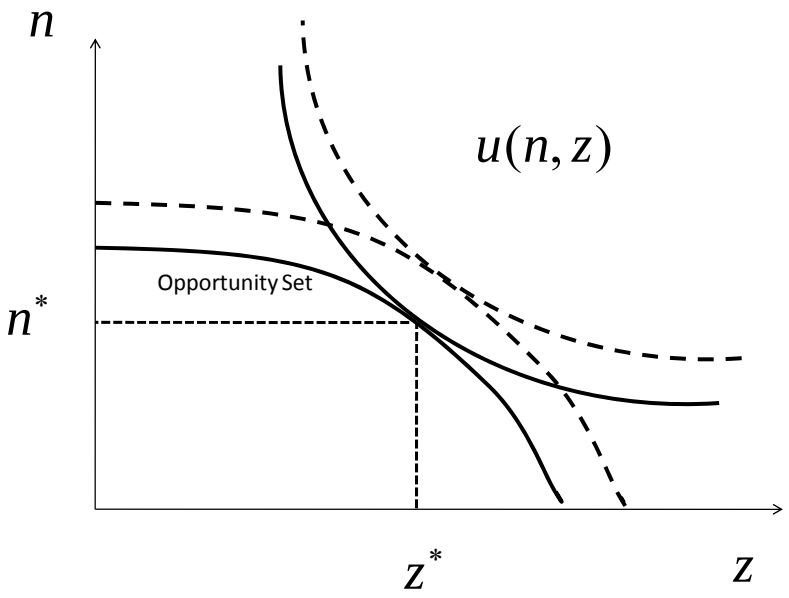


Figure 2.4: Optimization Problem

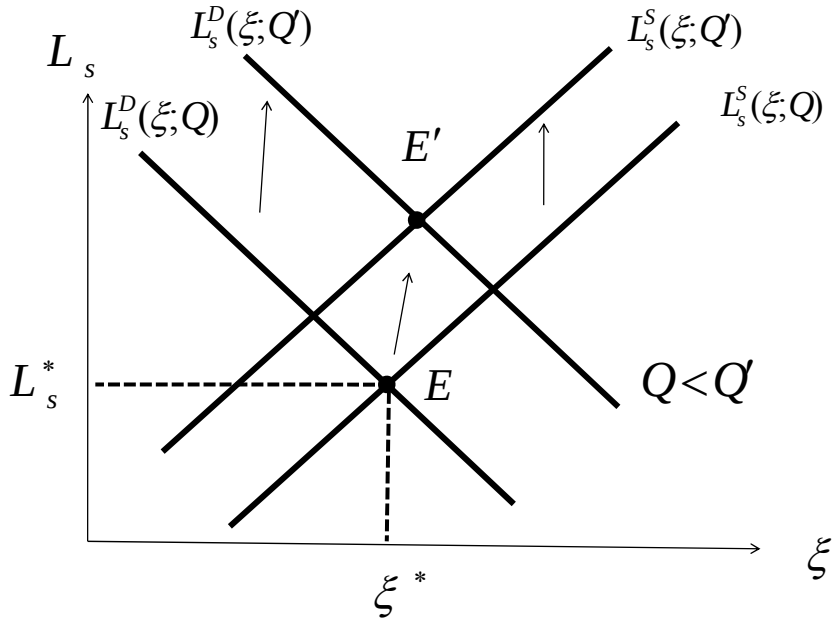


Figure 2.5: Skilled Labor Market

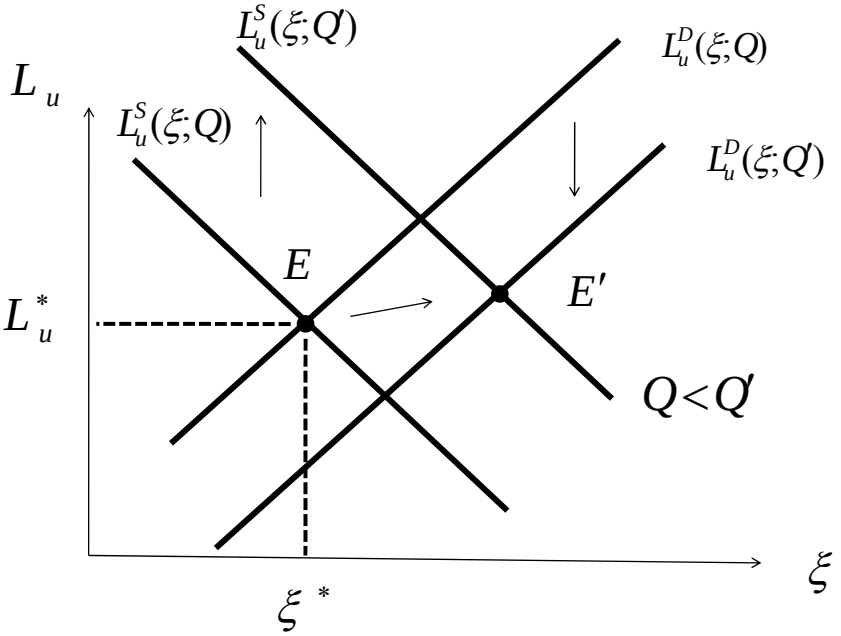


Figure 2.6: Unskilled Labor Market

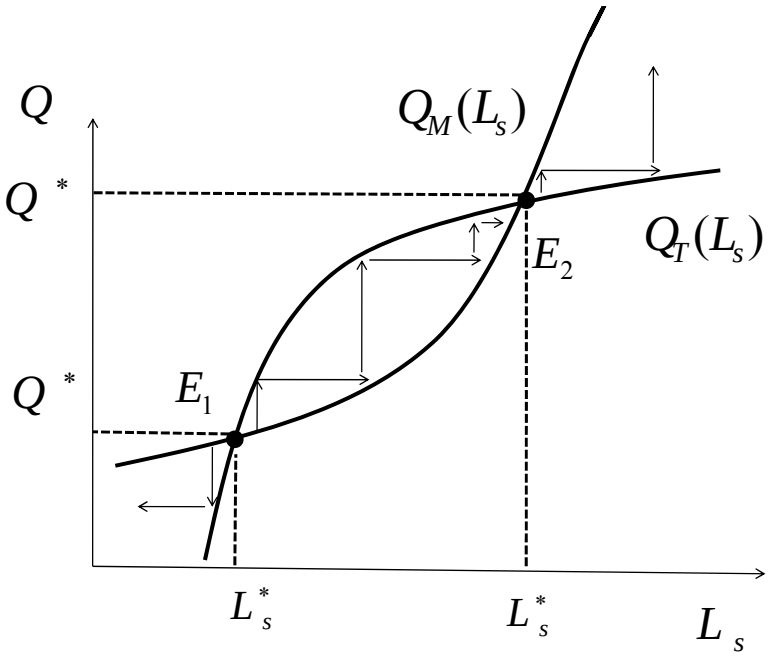


Figure 2.7: Equilibrium Quality and Skilled Labor

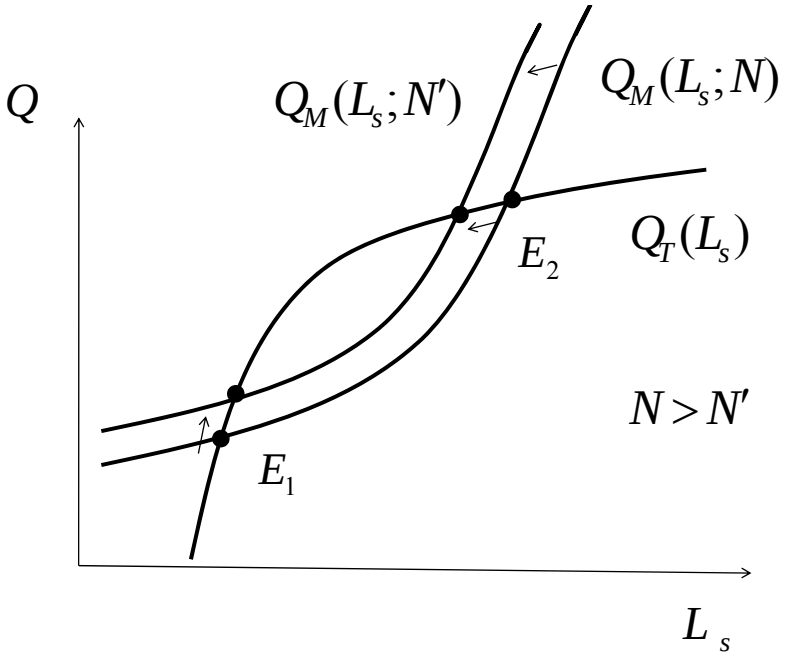


Figure 2.8: Declining Population

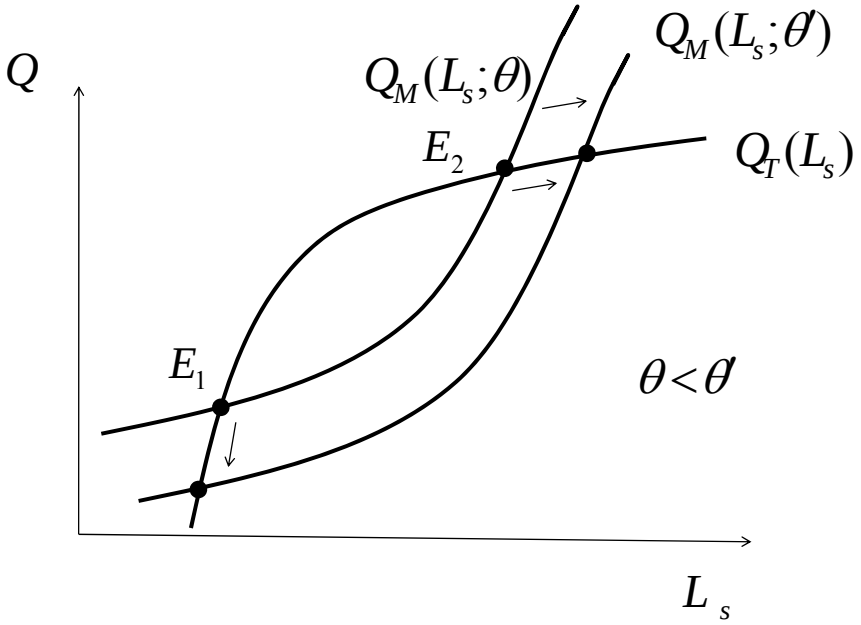


Figure 2.9: Larger Proportion of Skilled Labor

Chapter 3

Do Japanese Work Shorter Hours than before? Measuring Trends in Market Work and Leisure Using 1976-2006 Japanese Time-Use Survey

Abstract

Using Japanese time-use data from the *Survey on Time Use and Leisure Activities* (STULA), this paper measures trends in average hours worked (market work) and leisure for Japanese over the past three decades. OECD reports at least a 15 percent decline in market work for Japan since the 1970s. However, holding demographic changes constant, we found that market work per week increased from the 1970s until mid 1980s, and has been relatively stable for the last two decades for both male and female full-time workers. Furthermore, although the market work per week remained relatively constant since the mid 1980s, we found a significant change in the allocation of time to market work within the week during the period. Specifically, when dividing samples into weekdays (Monday through Friday) and weekends (Saturday and Sunday), average hours spent for market work per weekday among full-time males increased by 0.4 hour since the mid 1980s, whereas a significant decline in market work on Saturday was observed. This suggests that people shifted their work time from Saturday to weekdays in response to the reduced work week introduced by the amendment of the Labour Standards Act at the end of 1980s. In the meantime, commuting time and home production had decreased by 3 hours since the mid-1980s for full-time female workers, indicating that the average hours of leisure had increased for females even though market work remained the same. Interestingly, however, hours for sleep declined consistently over the last three decades, resulting in a 3-4 hour reduction per week for both male and female workers. Lastly, a comparison of Japanese and US time use data suggests that Japanese work much longer than their American counterparts. On average, Japanese males work 8.6 hours longer per week, and Japanese females 6.5 hours longer, than Americans, even after adjusting for demographic differences between

the countries.

Microdata used in this paper are data from the *Survey of Time Use and Leisure Activities* (Statistics Bureau, Ministry of Internal Affairs and Communications; MIAC) and the *American Time Use Survey* used in Aguiar and Hurst [2007]. The author deeply appreciates the MIAC and Professor Aguiar for providing valuable data. The author would also like to thank Naohito Abe, Reiko Aoki, Akira Kawaguchi, Daiji Kawaguchi, Ryo Kambayashi, Yukinobu Kitamura, Kazuo Koike, Yoko Konishi, Toshiyuki Matsuura, Yuichi Mizumachi, Sadao Nagaoka, Hiroyuki Odagiri, Fumio Ohtake, Yosuke Okada, Hiroyuki Okamuro, Kunio Okina, Hiroko Okudaira, Noriyuki Takayama, Kotaro Tsuru, Yasushi Tsuru, Iichiro Uesugi, Kengo Yasui, Kouzo Yamaguchi, Isamu Yamamoto, Shinji Yamashige and Hiroshi Yokouchi for their valuable comments. Tomiko Noguchi provided excellent research assistance. The remaining errors are solely of my own. This research is supported by the Japanese government's *Grants in aid for young scientists* (Japan Society for the Promotion of Science; Research No.19730167).

3.1 Introduction

Using Japanese time-use data from the *Survey on Time Use and Leisure Activities* (hereafter, STULA), this paper aims at measuring trends in hours worked (market work) and leisure for Japanese over the past three decades. STULA is a rich time-use survey that has been taken by the Japanese government (the Ministry of Internal Affairs and Communications; MIAC) every five years since 1976.

According to OECD statistics, there are large differences across countries in trends of hours worked over the past forty years[3]. For example, hours worked since 1970 has declined notably in Germany and France, but has been roughly flat in the US (see Figure 3.1). For Japan, annual average hours worked fluctuated around 2,100 hours per year from 1970 to the mid 1980s, then began declining rapidly at the end of the 1980s, and stood at about 1,784 in 2006. Japan had long been categorized in the group of OECD countries with the longest hours worked, but in 1998 was overtaken by the US.

Some suggest that this decline in Japan's hours worked is due to the reduction of the (straight-hour) work week, from 48 hours to 40 hours, mandated by the 1988 amendment to the Labor Standards Act. Due to this amendment, many firms introduced a five-day work week (instead of six days) beginning in the late 1980s. Hayashi and Prescott (2002) suggest that Japan's period of low growth in the 1990s, often referred to as Japan's "lost decade," can be explained by two main factors; (1) the more than 10 percent reduction in work hours caused by the Act's amendment and (2) the decline in total factor productivity.[4]

In contrast with the decreasing trend observed in these long-term official statistics, however, an increase in "overworking" by full-time employees (especially males) has recently become a serious issue in Japan. Some claim that hours worked of full-time workers is higher than ever because of

[3] There is a considerable body of research attempting to explain these cross-country differences in hours worked, including Prescott (2004), who argues that the length of hours worked can be explained by country differences in marginal tax rates through a substitution effect, Blanchard (2004), who finds difference among countries in the preference for leisure, and Alesina, Glaesaer, and Sacerdote (2006), who suggest institutional differences such as unions and pension systems, as well as social norms.

[4] See Motonoshi and Yoshikawa (1999) and Kobayashi and Inaba (2006) for other explanations for the Japan's prolonged recession during the 1990s. Regarding empirical literature that examines the effect of work hour regulation on the actual work hours for other countries, see Hunt (1999) for Germany, Hamermesh and Trejo (2000) for the United States, and Crepon and Kramarz (2002) for France.

globalization, internet usage, the decline in the number of regular employees due to dismissals caused by the lost decade[5]. The Japanese term *karoshi*, often translated as death from overwork (overwork and excessive stress can cause health problems, such as cerebral/heart diseases, mental disorders, and, eventually, death) has been widely used throughout the media, especially since the 1990s.

To our knowledge, however, there has been no analysis that closely examines how average hours worked has evolved in Japan from a relatively long-term perspective. The Japanese data used by the OECD is originally from the *Monthly Labor Survey* (the Ministry of Health, Labor and Welfare; MHLW), which surveys the work hours of employees in establishments with 30 or more employees (including both full-time and part-time). This survey asks establishments the number of hours worked for which wages were paid. It has long been noted that there is a fairly large discrepancy in Japan between work hours for which establishments pay wages and hours that workers actually work (so called *unpaid work*).[6] Nevertheless, because the data on actual hours worked collected from individuals are believed to contain measurement errors from differences in both memory and perception, it has long been considered difficult to get an accurate picture of how hours worked has evolved over time.

This paper tries to measure trends in hours worked for Japanese over the past three decades using Japanese time-use survey.[7] STULA is a rich survey which collects time diaries of more than 200,000 Japanese citizens aged above 10 over a two-day period. Like other time-use surveys reported in other countries, STULA asks each interviewee to record his/her activities in 15 minutes

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[5] This argument is made in books by Ogura (2007) in his title *Endoress woukazu* (*Endless workers*), and Morioka (2005) in his title Hatarakiguzi no Jidai (*An era of overwork*) (both in Japanese). Those arguments include that because of employment adjustments necessitated by the severe recession, a huge work burden was placed on the employees who remained. Genda (2005) uses the *Employment Status Survey* (the Ministry of Internal Affairs and Communications; MIAC) to point out that the fraction of full-time male workers who work more than 60 hours per week increased from 20% in 1992 to 27.6% by 2002.

[6] *Unpaid work* exists in countries other than Japan, as well. For example, Bell and Hart (1999) found an average of 1.9 hours of unpaid work per week in the UK. There is a possibility, however, that unpaid work is much longer in Japan. For example, surveys of full-time employees conducted by the Japan Institute for Labor Policy and Training and the Japanese Trade Union Confederation both found that approximately 40% of respondents had worked unpaid overtime, and that the amount of that overtime averaged over 30 hours per month (Ogura and Fujimoto [2005] and the Research Institute for Advancement of Living Standards [2007]).

[7] Time-use surveys have been increasingly used in the field of both sociology and economics over the past two decades. Those literature include, for example, Justor and Stafford (1991), Shor (1991), Robinson and Godbey (1999), Hamermesh (1996), Hamermesh and Pfann (2005), and Ramey and Francis (2006) .

increments over a 24-hour period. Therefore it is likely to have less error caused by differences in recollection or perception than those surveys that require individuals to report their hours worked over a period of a week or a month.[8]

In addition, this paper takes into account the two factors noted by Aguiar and Hurst (2007). The first is adjusting changes in average hours worked brought about by demographic and lifestyle changes. There have been a number of changes in Japan's demographics and lifestyles compared with 30 years ago, including a rising share of elderly, lower fertility rates, an increasing number of years in education, a decline in the marriage rate, and a diversification of types of employment, including an increase in part-time workers and a decline in the proportion of self employed. Without controlling for these changes, the trend in average hours worked would paint a different picture. Specifically, if on average, people work long hours while young, and gradually reduce their hours worked as they age, a rising elderly population would create a downward bias in hours worked even though each individual's hours worked had not changed over time. Meanwhile, assuming people who are single or who have less children tend to work somewhat longer hours than those who have a larger family, since they have relatively less need to do nonmarket work (such as home production and child care), the recent trend of more individuals marrying later in life and having less children may produce an upward bias in average hours worked. A measurement of changes in average hours worked without taking account of these compositional changes would generate a change in the trend on the macro level, even without any changes in the distribution of hours on the individual (micro) level. This paper takes this into account by measuring hours while holding the above demographic changes constant.

Second is the measurement of leisure separate from the time spent for market work. In recent years, home production has increasingly been substituted with either capital (from the development and improvement of household appliances) or the growing number of outsourcing services. If these changes have brought about a decline in hours in home production, there is a possibility that leisure increases even when an increase in market work is observed. Aguiar and Hurst (2007) found a

[8] For example, in their analysis of American time-use data, Robinson and Godbey (1999) show that the longer the hours worked, the more it becomes likely for worker's recollection of the actual number of hours worked to generate upward bias.

secular increase in market work by US females since 1965, but also found an increase in leisure during the same period as a result of a decline in home production. This paper also focuses on measuring leisure and its changes over time.

The results of this paper can be summarized as follows. First, holding demographic changes constant, the average hours worked per worker increased from 1976 until 1986 by about two hours, and remained relatively stable over the two decades since then. This implies that the downward trend observed in Figure 3.1 can be explained mainly by demographic/compositional changes. Second, when further dividing samples into weekday respondents (Monday through Friday) and weekend respondents (Saturday and Sunday), hours worked per weekday for full-time male employees increased 0.68 per day from 1976 to 1986, and increased another 0.42 hours per day from 1986 to 2006, which comes to a total increase of 1.1 hours per day over the 30 years ended 2006. In contrast, hours worked on Saturday decreased 1.62 hours from 1986 to 2006. These observations suggest that people shifted their hours worked from Saturday to weekdays after the legal work week was shortened at the end of the 1980s. In other words, even though the total hours worked per week remains unchanged, time allocation within the week has changed drastically over the last two decades. Third, although weekly hours worked remained relatively constant for those two decades, commuting time and home production for female full-time workers had decreased by 3 hours since 1986. This means that the average hours of leisure increased for females even though hours worked remained the same. In the mean time, however, time spent for sleep had declined since 1976, by almost 3 hours per week for full-time female employees, despite the gain in leisure. The decreasing trend in sleep is also observed among full-time male workers, for whom the data shows a decline of more than 4 hours per week over the 30-year period. Lastly, comparison of the Japanese and US time use data suggests that male Japanese full-time workers work about 8.6 hours longer per week, and the females about 6.5 hours longer, than American workers, even after adjusting for demographic differences between the countries.

This paper is organized as follows. We start in the next section by observing trend in hours worked without adjusting for demographic changes, and then compare this with other official data, including those used in OECD statistics. In section III, we measure hours worked after adjusting for

demographic and lifestyle changes. In section IV, we limit the sample to full-time male employees and observe the trend in hours worked by weekday and weekends as well as years of education and age. In Section V we measure trends in leisure, and in Section VI we make some comparisons between Japan and the US using both countries' time-use data. Section VII concludes.

3.2 Hours worked -- unadjusted for demographic changes

We start by observing trends in weekly hours worked per employee (excluding the self-employe d), prior to adjusting for demographic changes. Hereafter, we define time spent on market work to earn income as *market work* to distinguish from time spent on nonmarket work such as home production, which we look at further in another section.

In Figure 3.2, we plot weekly *market work* per employee from three different official statistics: (1) the *Monthly Labor Survey* (MHLW) used in OECD statistics (solid line), (2) the *Labor Force Survey* (MIAC; thick line) and (3) STULA (dots with numbers). [9] In STULA[10], we use the category called *work*, to measure *market work* per week. [11] This excludes break or meals between work hours. The survey covers every day of the week (from Monday through Sunday), such that, assuming a sufficient number of samples, the averages can be interpreted as the hours spent on *market work* per week.

As noted earlier, the *Monthly Labor Survey* asks establishments their paid work hours. The *Labor Force Survey* and STULA both asks individuals actual hours worked. The main difference between the latter two is that the former asks the approximate hours worked during the last week of the previous month, whereas the latter asks the kind of activities done every 15 minutes for 24 hours.

It is interesting to see in Figure 3.2 that the *Labor Force Survey* and STULA almost coincide. It had long been considered difficult to get an accurate assessment of *market work* from data such as

[9] Since STULA is taken during October, we also use the October surveys for other two statistics. As noted earlier, the *Monthly Labor Survey* is a survey of establishments with at least 30 employees, and therefore the data does not include the hours worked by employees at establishments with less than 30 employees. The *Labor Force Survey* and STULA both cover all workers, regardless of firm size. This makes it important to keep in mind the limitations on any strict comparisons among the three.

[10] For details on STULA, see the appendix.

[11] Unless noted otherwise, all analysis from this point forward is based on calculations using weights provided by the Statistics Bureau of the MIAC.

the *Labor Force Survey* due to measurement errors. At the same time, time-use surveys are often criticized as having a downward bias on *market work*, since they require respondents to record their activities every 15 minutes, and this supposedly makes it more difficult to collect answers from busy people. However, on average, Figure 3.2 shows no such bias between the *Labor Force Survey* and STULA[12].

Another characteristic shown in Figure 3.2 is that hours of *market work* reported by individual surveys are considerably longer than paid work hours reported by firms, by approximately six to seven hours per week. It has been said that there is a certain amount of *unpaid work* in Japan – and the discrepancy in the figure corresponds to the unpaid time. If one calculates annual hours worked by simply multiplying the *market work* in STULA by 52 weeks, it becomes 2,262 hours per year in 2006, which is more than 400 hours higher than the data reported in OECD[13]. In this regard, it is also conceivable that the per hour productivity calculated in OECD statistics may be overestimating Japan's productivity.

Overall, the common feature observed in this figure is the downward trend in all three statistics over the past several decades. That is, average *market work* per employee is actually decreasing, regardless of the type of statistics used[14]. In the next section, we look further at whether there is still a downward trend in *market work* after controlling for compositional changes in demography and lifestyle.

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[12] One may think that if the *Labor Force Survey* and STULA almost coincide, there is no need to look at STULA. However, the lack of any detailed information regarding individuals' characteristics as well as other time allocations in the *Labor Force Survey*, make it still worthwhile to use STULA to study allocation of time.

[13] Nickell (2006) showed that the increase in vacation days in European countries was one factor pushing down annual hours of *market work*. According to the *Employment Conditions Survey* (MHLW), however, the average number of vacation days taken annually by Japanese over the past 30 years has been fairly constant at around eight days, which suggests there has been no impact from an increase in vacation days.

[14] In Figure 3. A-1, I decomposed the change in hours worked by employee into (1) change in hours worked by full-time, (2) change in hours worked by part-time and (3) full-time / part-time ratio. As can be seen in the figure, full-time/ part-time ratio is the main cause of pushing down the average hours worked.

3.3 Hours worked -- adjusted for demographic changes

3.3.1 Quick overview of demographic changes

In this section, we measure weekly hours of *market work* after adjusting for demographic changes. Tables 3.1(1) and 3.1(2) show demographic changes for the past three decades for male and female workers aged 22 to 65 (excluding students), based on micro data from STULA. [15] The shares shown in Tables 3.1(1) and 3.1(2) are roughly the same as the values in the *Population Census* (MIAC) taken the year prior to each survey year.

Tables 3.1(1) and 3.1(2) show the following common trends for both males and females over the past 30 years: (1) declines in the marriage ratio, (2) increases in the elderly, (3) increases in individuals with higher education, (4) declines in the ratio of those with a child less than six years old, (5) increases in part-time workers[16], and (6) declines in the percentage of self-employed.

3.3.2 Method for adjusting for demographic changes

We look at per-capita trends in time allocation for three groups: (A) workers (including the self-employed), (B) employees (excluding the self-employed) and, (C) full-time employees (with at least a 35-hour work week). The adjustment for demographic changes is done as follows.

(1) For each survey year, place samples from (A) to (C) into each classification (hereafter, "cell") as shown below.

(A) Sex x Age (10-year increments) x Marital status x Having a child under age six x Education level (college or more, high school, up to junior high) x Work status (full-time or part-time) x Self-employed

[15] From this point forward, we limit the sample to workers aged 22 to 65 (excluding students) in order to omit such factors as rising matriculation rates and changes in the proportion of students working part-time. Nevertheless, the inclusion of persons under age 22 and students in the sample has almost no impact on the results of this paper.

[16] We treat as full-time employees those who answered that they usually work at least 35 hours, and treat as part-time employees those who answered they usually work less than 35 hours per week. .

(B) Sex x Age (10-year increments) x Marital status x Having a child under age six x Education level (college or more, high school, up to junior high) x Work status (full-time or part-time)

(C) Sex x Age (10-year increments) x Marital status x Having a child under age six x Education level (college or more, high school, up to junior high)

(2) Pool the cells from each year and calculate the sum of total samples in each cell for all survey years combined.

(3) Divide the number of samples for each cell found in (2) by the sum of total samples for all survey years to calculate each cell's share. We use these shares as the constant weight from 1976 to 2006.

By using these weights, we observe changes in *market work* over time that would have occurred had there been no demographic change. In case the number of samples was too small, cells were combined. Specifically, since most people with a child less than six years old are married in Japan, that distinction was eliminated for singles. It was also eliminated for the categories of aged 50-59 or 60-64. After these adjustments, the number of cells for each year wound up being 312 for (A), 156 for (B), 78 for (C).

3.3.3 Market work after adjusting for demographic changes

Table 3.2 shows *market work* per week when holding demographic and lifestyle changes constant. The first three rows show *market work* per worker, per employee and per full-time employee by combining male and female samples. We find that without adjusting for demographic and lifestyle changes, a completely different picture can be observed for the evolution of hours spent on *market work* in Japan. The right column of the table tells us that without adjusting demographic changes, *market work* per week has declined by 1.48 hours per worker and 1.75 hours per employee from 1976 to 2006. However, when holding demographics and lifestyles constant (the middle column of

the table), *market work* has increased by 1.39 hours per worker, and 2.51 hours per employee, for the last three decades. The largest differences occurred with employees, suggesting the increase in number of part-time workers has pushed the average *market work* hours down significantly. For full-time employees, the increase in *market work* is revised upward from 1.94 to 3.33 hours when holding demographic changes constant. For all groups, we can see that the largest increase in *market work* for the last three decades occurred in the first decade from 1976 to 1986, and that it has not changed much since 1986. The results of significance tests for the differences in two years are reported in the parenthesis. Although a modest decline in *market work* was observed during the *lost decade* in the 1990s, *market work* had picked up again by 2006 after the economic recovery, close to the 1986 level. This would suggest that the modest decline in the 1990s is due in part to the prolonged recession, rather than a reduction in the work week following the amendment of the Labor Standards Act in the late 1980s.

Similar trends can be observed for males. The fourth to sixth rows show the average *market work* for males. *Market work* increased by 3 to 4 hours for the first decade and then remained constant from 1986. On the other hand, female's *market work* (seventh to ninth rows) has not changed much for the last 30 years when holding demography constant, except for a 1.4 hour increase from 1976 to 1986 for full-time employees. Notable differences can be seen for females, both workers and employees, between the figures with demographic adjustment and those without. This comes from the fact that the fraction of female part-time workers nearly doubled from 1976 to 2006 (see Table 3.1(2)).

In summary, we can conclude that when controlling for demographic changes, *market work* per week in Japan has not decreased, but rather increased significantly from 1976 to 1986 and remained relatively constant for the subsequent 20 years. This trend can be observed even when limiting the samples to full-time male employees (see Figure 3.3).

In Figure 3.4, we plot histograms of weekly *market work* for full-time male employees for 1976, 1986, 2001 and 2006 using 78 cells used to control for demographic changes. This is to check whether there was any observable diversification in the average *market work* among those cells for the past two decades. We can see that the histogram seems to shift to the right from 1976 to 1986

along with a slightly increasing dispersion. The histogram shifted back to the left in 2001, with some widening dispersion, when the Japanese economy hit the bottom of a severe recession. However, following a mild economic recovery after 2002, the histogram shifted back to the right again in 2006, when the distribution's position and shape were quite similar to those observed in 1986. In Table 3.3, we calculate the trend in demography adjusted *market work* by disaggregating the samples into different educational levels or age groups. Table 3.3 shows substantial differences in the change in *market work* depending on educational level and age group. For those with a college degree or higher, *market work* increased almost six hours from 1976 to 1986, and remained unchanged for the subsequent 20 years. On the other hand, the *market work* of those with a high school diploma or less increased two to four hours from 1976 to 1986, followed by a 2 to 2.5 hour decrease from 1986 to 2001 during the recession, and returned to similar level of 1986 in 2006. Our finding is somewhat similar to that of Aguiar and Hurst (2007), which suggests an increasing in leisure among the less educated using the American time-use survey. In Japan, however, the dispersion narrowed again after the recovery[17]. All age groups except those in their sixties have shown an increase in *market work* since 1976, although the level of increase differs across age groups, with the largest increases coming from those in their twenties and thirties. From 1986 to 2001, however, the *market work* of all age groups except those in their thirties decreased about 1.5 to 2.5 hours per week, whereas the *market work* of those in their 30s, after a 4.5 hour increase from 1976 to 1986, remained unchanged for the subsequent 20 years. This suggests the widening discrepancy in the 1990s is due to differences in not only education but also age. In 2006, almost all age groups increased *market work* to near their 1986 level, with the exception being those in their 40s, who increased their market work by an additional 1.69 hours over 1986 by 2006, recording the longest *market work* for this age group in the past 30 years. Overall, while there was a widening gap among educational level and age groups during the *lost decade*, there was no significant change in weekly *market work* between 1986 and 2006 for most groups.

[17] Since Japanese full-time males do not spend much time on home production (their average hours spent on home production <housework + childcare + caring or nursing> was only 1.58 hours per week in 2001), hours worked (*market work*) can be regarded as the mirror image of leisure.

If this is a fact, there remains a puzzle as to why the prevailing sentiment in Japan is that full-time males' *market work* hours are longer now than they used to be, as stated in the Introduction. To find out, we will take a more detailed look at full-time male employees in the next section.

3.4 Market work for full-time male employees -- adjusted for demographic changes

3.4.1 Distribution of weekly hours worked

For a closer look, we divide the samples into three groups: weekday (Monday through Friday), Saturday and Sunday respondents. This is because after the amendment of the Labour Standards Act reduced the legal work week from 48 to 40 hours in the late 1980s, many firms moved from a six-day work week to a five-day work week. The ratio of those in our samples who take two days off every week increased from 14 percent in 1976 to 49 percent in 2006.

Figures 3.4 (1) to (3) show histograms of *market work* per day by weekday, Saturday, and Sunday using raw samples (without adjusting for demographic changes). For weekdays, the histogram shifted to the right from 1976 to 1986. In 2006, the distribution shifted further to the right and became more dispersed, suggesting an increasing discrepancy among hours for weekday *market work*. For Saturday, the histogram shifts to the right somewhat from 1976 to 1986. In 2006, the mean of the histogram declined significantly due to a large spike around zero. This reflects the reduction of the legal work week in the late 1980s. There was also an increasing discrepancy in the 2006 Saturday samples. For Sunday, the shape of the distribution has not changed drastically, although the zero spike increased slightly in 2006.

Taking these observations into account, in Table 3.4, we calculate the fraction of *market work* per day by weekday, Saturday, and Sunday. In 1976, 17.1 percent of workers worked more than 10 hours on weekdays, and this ratio increased consistently over the last 30 years, reaching 42.7 percent in 2006. On the other hand, as suggested in the histograms in Figures 3.4(2), the fraction of zero hours on Saturday increased drastically, especially after 1986. These observations suggest that even though weekly *market work* remained relatively constant for the last two decades, time

allocation within the week may have changed significantly. We will see whether such implication remains robust after controlling for demographic changes.

In Tables 3.5(1) to (3), we calculate *market work* per weekday, Saturday and Sunday by holding demographic changes constant. These tables show that *market work* per weekday increased 0.68 per day from 1976 to 1986, and increased additional 0.42 hours per day from 1986 to 2006, a total increase of 1.1 hours per day over 30 years. In contrast, *market work* on Saturday increased 0.54 hours from 1976 to 1986, but decreased 1.62 hoursfrom 1986 to 2006. This suggests that people may have shifted their hours worked from Saturday to weekdays after the legal work week was reduced at the end of 1980s. Concentrating *market work* into shorter work week may have generated a feeling of exhaustion and the misperception of hours worked having increased in total.

In the same tables, we also calculated *market work* by education and age group. It is interesting to note that while the increase in weekday *market work* was large in the most educated group, that group's decrease in Saturday *market work* was also large.

3.4.2 The relationship between market work and income for full-time male employees

In the previous section, we observed that although there was a notable change in time allocation within the week, total time spent on *market work* per week has not changed in the last 20 years. We check below whether the relationship between *market work* and income may also not have changed since 1986.[18]

STULA only had a single question related to income, a discrete choice question on total annual income for the household, and thus provides no information on the annual incomes of individuals.[19] Because of this, we first narrow the sample to full-time male employees who answered that their wives do not work, and then look at whether average hours worked systematically correlates with annual income level. To address the possibility of the sample being biased by a tendency for males whose wife is a homemaker to work longer hours, we first divide our full-time male samples into

[18] For the Unites States, Aguiar and Hurst (2007) suggest the trend that individuals with higher incomes become to work longer hours.
[19] It is also important to note the annual income in STULA also includes income other than wage income.

groups based on whether their wives are working or not, and then test to see if there is a significant difference between the two groups in the husbands' average *market work*. We focus on the thirties age group, since that is the only group for which weekly *market work* has not changed since 1986, as noted in the previous section. Test results are shown in Table 3.6. The left column for each sample year is the simple difference in average *market work* between husbands whose wives are not working (treatment group) and husbands whose wives are working (control group). The table shows that in the 1986, 1991, and 1996 surveys, it was actually the husbands whose wives were working who worked longer hours. When calculating a matching function, however, by matching each worker's characteristics (educational attainment, having a child less than 6 years old, prefecture of residence, and number of employees at workplace) between the treatment and control groups, the difference between the two groups becomes insignificant for most survey years (except the 2001 survey).

Figures 3.6(1) to (4) show average *market work* by annual income divided into quartiles for each year from 1986 through 2006, using thirties samples whose wives are not working.[20] Figure 3.6(1) shows significant decreases in *market work* in the two highest income quartiles in 2006, and large increases in *market work* for the two lowest income quartiles. In 1986, there was a tendency for those who earn higher incomes to work longer hours, but this casual observation suggests a reversal in that tendency in 2006. A similar trend can be also observed for weekday samples (Figure 3.6(2)). Until 2001, there was a positive relation between weekday *market work* and annual income. In 2006, however, it was the bottom two income quartiles who increased their *market work* significantly. Both the Saturday and Sunday samples showed a negative correlation between hours worked and annual income. This negative correlation seems to become slightly stronger in 2006, since the decrease in hours from 1986 to 2006 was largest in the top income quartile.

To summarize, the correlation between income and *market work* among full-time male employees in their thirties used to be positive in 1986, but turned negative in 2006, even though the average hours of *market work* did not change over those 20 years. This suggests that wage rate

[20] The 1981 survey does not have detailed information on annual income, therefore we limit this analysis from 1986 to 2006. Since information of annual income is given in discrete choices (a million yen increments), we take mean values of annual incomes.

inequality may have become greater since 2001 in Japan, once hourly wages are calculated based on actual hours worked.

3.5 Trends in Leisure -- adjusted for demographic changes

3.5.1 Definition of home production and leisure

In this section, we measure trends in leisure over the three decades ending 2006. We classify time as either home production or leisure based on the categories in Table 3.A-1. Although it is difficult to distinguish between home production and leisure, the recent literature using time-use surveys (including Aguiar and Hurst [2007] and Burda, Hamermesh and Weil [2007]) has followed Reid (1934), which defines time that is substitutable with capital or a third party's time as home production, and this paper basically does too. We define *home production*, as the total of time spent on *housework*, *child care*, and *caring and nursing*.[21] We define *total work* as sum of *market work* which we have looked upon in the previous sections, plus *commuting time to and from work* and *home production*.

For leisure, we consider here three types of leisure. *Leisure A* is leisure time narrowly defined, and the total of time spent *watching TV, listening to the radio, reading newspapers or magazines*, *rest and relaxation*, *hobbies and amusements*, *sports*, and *social life*. *Leisure B* is *Leisure A* plus time spent for *sleep*, *meals*, and *personal care*. These three items are regarded as activities generating direct utility as well as necessary inputs to produce other activities (Hamermesh [1993]). *Leisure C* is a broader definition that adds to those items in *Leisure B* time spent on *shopping*, *volunteer and social activities*, *moving to different places* (other than commuting time), *studies and researches*, and *other activities*. Although much of the recent literature classifies time spent *shopping* as *home production*, STULA classifies all shopping, including window shopping and

[21] Recognizing that some components of childcare may have utility, it would be worthwhile to also try a definition of home production that excludes childcare. However, in STULA, child care was included in house work until 1981, which makes it difficult to exclude when using long time series. We note, however, that enjoyable time spent with the family is categorized within "rest and relaxation," and thus some of the time spent with children that directly produces utility would be included in those items and not in childcare.

shopping for clothing, entertainment items, and other merchandise besides groceries, in a single shopping category. Based on this, we include *shopping* under *Leisure C* in this paper.

3.5.2 Trends in total work and leisure

Table 3.7 shows *market work*, *total work*, and *Leisure A*, *B* and *C* per full-time employee by sex, holding constant the demographic change over the past 30 years.

This shows that the *total work* of males increased 4.44 hours from 1976 to 1986, and has remained unchanged since 1986. On the other hand, the *total work* of females increased 2.38 hours from 1976 to 1986, followed by a 3 hours decline from 1986 to 2006. Comparing full-time females' *market work* and *total work*, it is apparent that one should look not only at trends in *market work,* but also at *home production* or *leisure*, in order to measure welfare. From 1986 to 2006, full-time females' *market work* did not change, whereas *total work* decreased considerably. It is interesting to note that female workers' hours spent on *total work* used to be much longer than that of males, but the gap between the sexes has narrowed as a result of the large reduction in *total work* for females in recent years.[22]

The third to fifth row of each case shows the trends in *Leisure A*, *B* and *C*. For male employees, even though *total work* has remained unchanged for the past 20 years, *Leisure A* and *B* decreased 1.48 and 1.83 hours, respectively, from 1986 to 2006, and all the losses in *Leisure A* and *B* were offset by gains in *Leisure C*. This suggests that time allocation among leisure pursuits may change even though the total time for leisure remains constant. On the other hand, female full-time employees had an increase of 1.34 hours in *Leisure A*, 1.66 hours in *Leisure B* (albeit with low statistical significance), and 3.09 hours in *Leisure C*.

In Figure 3.7, we decomposed changes in *Leisure A* to *C* into each category for the past 20 years. Looking at these figures, time spent for *rest and relaxing*, *hobbies*, *personal care*, *shopping*, and *moving* have increased since 1986 for both males and females. For males, however, time spent on *watching TV*, *sports*, and *social life* has decreased, offsetting the time increases in other categories.

[22] Using time-diary data from 25 countries, Burda, Hamermesh, and Weil (2007) demonstrate that there is a negative relationship between real GDP per capita and the female-male difference in *total work* per day.

Another notable trend common to both males and females is that time spent on *sleep* has decreased since 1986, even though *market work* and *total work* remained unchanged for males and *total work* for females had decreased by 3 hours, during that period. To examine this more closely, we calculated the trends in hours of *sleep* per week, weekday, Saturday and Sunday in Table 8. The Table shows a continuous decreasing trend in *sleep* for the past 30 years; 4.14 (2.48+1.66) hours reduction for males and 2.86 (1.81+1.05) hours reduction for females, per week. For males, the downward trend in *sleep* on weekdays (0.7 hours reduction per day over the past 30 years) seems somewhat correlated with the consistent upward trend in *market work* observed in Table 3.5 (1) (recall that a 1.1 hour increase in *market work* per weekday was observed). For females, however, *total work* per weekday increased 0.33 hours from 1976 to 1986, and has been unchanged since 1986 (not shown in tables). Therefore, the additional decreases in time for *sleep* from 1986 to 2006 (0.22 hours per weekday) cannot be explained by changes in *total work* per weekday. For Saturday, *sleep* increased by 0.15 hours for males, and 0.21 hours for females from 1986 to 2006. We assume people received the benefit of extra sleep on Saturday from shortening the work week from 6 days to 5 days, but such extra sleep on Saturday is at the most 10 percent of the total extra time gained by the decrease in total work.[23] The decreasing trend in time spent on sleep may have something to do with rising incidence of mental illness currently being observed in Japan. A more thorough examination is needed to explain this downward trend in *sleep*, a topic worth future research.

[23] From 1986 to 2006, *total work* on Saturday declined by 1.71 hours for males and by 2.22 hours for females. This implies that the percentage of the gains in extra time on Saturday used for extra sleep was only 8.58 percent (=0.15/1.71) for males and 9.27 percent (=0.21/2.22) for females.. It is interesting to note that Hamermesh (2002) found, using Dutch time-budget data, that the majority of the windfall hour resulting from the resumption of standard time (from day-light savings time) was used for extra sleep.

3.6 Market work and leisure time for full-time employees: comparison with a US time-use survey (adjusted for demographic changes)

In this last section, we see whether Japanese work longer hours in an international context. As shown in Figure 3.1, according to OECD, Japan was overtaken by the US in *market work* in 1998. In section III, however, we showed that actual time spent on *market work* in Japan is much longer than the hours reported by the *Monthly Labor Survey*, which is the original source for data on Japan used by the OECD for its international comparisons. Similarly, in the US, some groups of workers are exempt from the Fair Labor Standards Act's overtime provisions (the *white collar exemption*), making it difficult to accurately gauge *market work* when these exempted individuals are included (see Mitchell [2005] for an examination of overtime regulations in the United States).

In this regard, we use micro data from the US time-use survey analyzed by Aguiar and Hurst (2007) to compare time allocation between Japan and the US, looking specifically at full-time workers.[24] In a Japan-US comparison, there is also a need to adjust for differences in demographic and lifestyle changes. Taking this into account, we first calculate weights for the US sample and use the same weights for STULA as well to adjust for Japan-US demographic differences.[25] Since STULA uses rough classifications to accommodate the pre-coding method, its data do not match up perfectly in comparisons with US data, which use the after-coding method, although *market work*, *Leisure A* and *B* and *sleep* are very similar to the classifications used in Aguiar and Hurst (2007).

Table 3.9 shows the average weekly *market work*, *market work + commute time*, *Leisure A* and *B*, and *sleep* for Japan and the US. Because of their different business cycles, Japan-US comparisons must be viewed quite broadly, but a simple Japan (2001) - US (2003) comparison shows a gap in *market work* between the two countries of 8.6 hours for males and about 6.5 hours for females. This gap becomes wider when we look at *market work + commute time*. The gap narrows to 3.9 and

[24] Both the Japan and US samples comprise workers aged 22 to 65 years, including self-employees, but excluding students, the unemployed, and retirees. We use samples comprising those who answered "usually work more than 35 hours a week" for Japan and those who answered "usually work more than 30 hours a week" for the US to define full-time workers. One should note that the American Time-use survey is taken throughout year, whereas STULA is only taken in October. Comparisons of the two need to keep this in mind.

[25] To calculate weights, the samples were categorized based on Aguiar and Hurst (2007); Sex X Age (in 10-year increments) X Education level (four levels: less than high school, high school, some college, and college degree or more) X Having a child less than six years old. For samples of people over 60 years old, we ignore the difference of having a child.

3.1 hours for Leisure *A* and *B* for males, however, a difference that can be attributed to US males allotting more time to home production. Regarding time for *sleep*, it is interesting to note that only Japan has a decreasing trend in *sleep*, while the US has a slightly upward trend.

3.7 Conclusion

Recently, a variety of literature has been published to explain differences in hours worked among OECD countries. OECD (2004) categorizes Japan as part of the group of OECD countries that had a significant decline in work hours over the past several decades; annual hours worked for Japan has dropped at least 15 percent since the 1970s, and it dropped below that of the US at the end of 1990s. Some literature suggests that this large decline in hours worked is due to the amendment of Japan's work week regulations in the late 1980s, and that this large reduction in hours worked was the main cause of Japan's severe and prolonged recession during the 1990s (*Japan's lost decade*). Taking the opposite view, there have been some controversial papers arguing that full-time workers' work hours in Japan have actually increased recently.

This paper, using micro data from the *Survey on Time Use and Leisure Activities* (STULA) taken by the Japanese government every five years since 1976, measures trends in hours worked (*market work*) and leisure for Japanese over the past three decades. The main findings of this paper are as follows.

First, holding demographic changes constant, the average weekly hours worked per worker increased from 1976 until 1986 by about two hours, and has been relatively stable for the subsequent two decades. Comparing 1986 and 2006, which are *before* and *after* Japan's lost decade, the difference in average hours worked is statistically insignificant, suggesting Japan's average hours worked did not change over those 20 years. This implies that there is a wide discrepancy between the actual hours worked and official statistics reported in OECD data. When dividing samples into weekdays (Monday through Friday) and weekends (Saturday and Sunday), however, some notable characteristics have emerged during the three decades of observation. Average hours worked per weekday among full-time males increased by more than an hour over

those 30 years. On the other hand, there has been a significant decline in hours worked on Saturday, suggesting that people shifted their hours worked from weekends to weekdays after the five-day work week replaced the six-day work week at the end of the 1980s. This suggests that even though the hours worked per week remains unchanged, a major shift in the allocation of time within the week has taken place over the 20 years ending 2006.

Second, although average work hours remained relatively constant for the last two decades, we found that work hours increased the most for the lowest income group while work hours for the highest income group have declined since 2001. This implies that once hourly wages are calculated using actual hours worked, wage inequality in Japan may have become greater since 2001.

Third, although the average hours worked for female full-time employees remained constant for the 20 years ended 2006, commuting time and home production declined by 3 hours. This indicates that the average hours of leisure increased for females even though time spent on market work remained the same. Interestingly, however, time spent on *sleep* had declined consistently since 1976, resulting in a 3-4 hour reduction per week for both male and female full-time employees. Lastly, a comparison of the Japanese and US time-use data suggests that Japanese full-time workers work much longer than their American counterparts.

Since there has been a slight increase in Japan's marginal tax rates since 1970, and there has been a significant level of unpaid hours in Japan over the past 30 years, the trends in hours worked observed in this paper seem to be inconsistent with previous hypothesis presented in the literature to explain differences among countries in hours worked. As pointed out by Nickell (2006), it has so far been impossible to identify specific factors capable of providing a straightforward explanation of cross-country differences in market hours worked, and the results of this paper further reinforce the difficulty of identifying the factors that lead to substantial differences from one country to another.

References for Chapter 3

Aguiar, Mark, and Erik Hurst, "Measuring Trends in Leisure: the Allocation of Time over Five Decades," *Quarterly Journal of Economics*, 122(3), 2007, pp.969-1006.

Alesina, Alberto, Edward L. Glaeser and Bruce Sacerdote, "Work and Leisure in the United States and Europe: Why So Different?," *NBER Macroeconomics Annual 2005*, 2005, pp.1-64.

Blanchard, Olivier, "The Economic Future of Europe," *Journal of Economic Perspectives*, 18(4), 2004, pp.3-26.

Burda, Michael, Daniel S. Hamermesh, and Philippe Weil, "Total Work, Gender and Social Norms," NBER Working Paper No. 13000, 2007.

Crépon, Bruno. and Francis Kramarz, "Employed 40 hours or not employed 39: Lessons from the 1982 mandatory reduction of the work week," *Journal of Political Economy*, 110 (6), 2002, pp.1356–1389.

Genda, Yuji, *Hataraku Kajyo* (*Excess overwork*)、NTT Publishing Company, 2005 (in Japanese).

Hamermesh, Daniel S., Workdays, Workhours and Work Schedules --- Evidence for the United States and Germany, W.E. Upjohn Institute for Employment Research, 1996.

----------, "Timing, Togetherness and Time Windfalls," *Journal of Population Economics*, 15, 2002, pp.601-623.

----------, and Gerard A. Pfann, *The Economics of Time Use*, Elsevier, 2005.

----------, and Stephen. J. Trejo, "The demand for hours of labor: Direct evidence from California," *The Review of Economics and Statistics*, 82 (1), 2000. pp.38–47.

Hayashi, Fumio, and Edward C. Prescott, "The 1990s in Japan: A Lost Decade," *Review of Economic Dynamics*, 2002, pp.206-235.

Hunt, Jennifer, "Has work-sharing worked in Germany?," *The Quarterly Journal of Economics*, 114 (1), 1999, pp.117–148.

Juster, Thomas and Frank P. Stafford, "The Allocation of Time: Empirical Findings, Behavioral Models, and Problems of Measurement," *Journal of Economic Literature*, 29(2), 1991, pp.471-522.

Kobayashi, Keiichiro, and Masaru Inaba, "Business cycle accounting for the Japanese economy," *Japan and the World Economy*, 18 (4), 2006, pp.418–440.

Mitchell, Joshusa, "Forecasting the Effects of the August 23rd Fair Labor Standards Act Overtime Changes: Evidence from a California Natural Experiment," mimeo, Department of Economics, Stanford University, 2005.

Morioka, Koji, Hatarakisugi no Jidai (*An Era of Overwork*), Iwanami Shoten, 2005 (in Japanese).

Motonishi, Taizo, and Hiroshi Yoshikawa, "Causes of the long stagnation of Japan during the 1990s: Financial or real?," *Journal of the Japanese and International Economies*, 13 (3), 1999, pp.181–200.

Nickell, Stephen, "Are Europeans Lazy? Or Americans Crazy?," Remarks delivered at the Annual Conference of the Fondazione RodolfoDeBenedetti, entitled "Are Europeans Lazy? Or Americans Crazy?" at Portovenere, La Spezia, 27 May, 2006.

OECD, "Clocking in and Clocking out: Recent Trends in Working Hours," *Observer*, October, OECD, 2004.

――――――――, *Employment Outlook*, OECD, 2007.

Ogura, Kazuya, *Endless Workers*, Nikkei Publishing Inc., 2007 (in Japanese).

――――――――, and Takashi Fujimoto, "Nihon no Chojikan Roudou to Fubarai Zangyo no Jittai to Jissho Bunseki" (The Fact and Empirical Analysis on Long Work Hours and Unpaid Work in Japan), Report on Labour Market Policy Analysis, No.22, the Japan Institute for Labor Policy and Training, 2005 (in Japanese).

Prescott, Edward, "Why do Americans Work So Much More than Europeans?," *Quarterly Review*, 28(1), Federal Reserve Bank of Minneapolis, pp.2-13.

Ramey, Valerie, and Neville Francis, "A Century of Work and Leisure," NBER working paper, No. 12262, 2006.

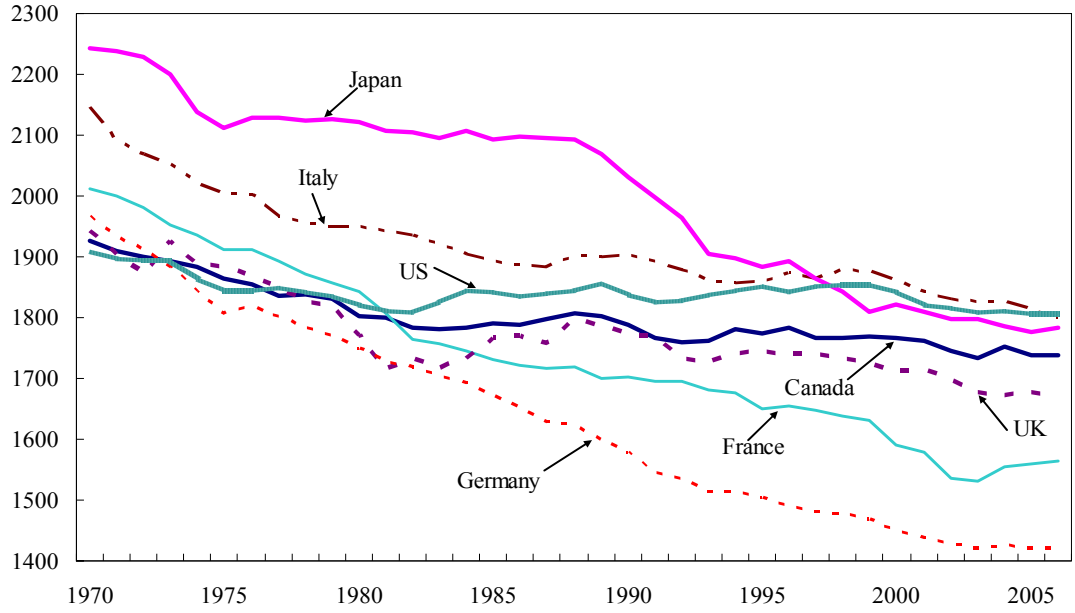
Reid, Margaret, *Economics of Household Production*, New York: Wiley, 1934.

Research Institute for Advancement of Living Standards, *Kinrosha no Shigoto to Kurashi ni kansuru ankeito Houkokusho* (Reports form the Fourteenth survey on "Work and Life of Employees"), 2007 (in Japanese).

Robinson, John P., and Geoffrey Godbey, *Time for Life --- the Surprising Ways Americans Use their Time*, The Pennsylvania State University Press, 1999.

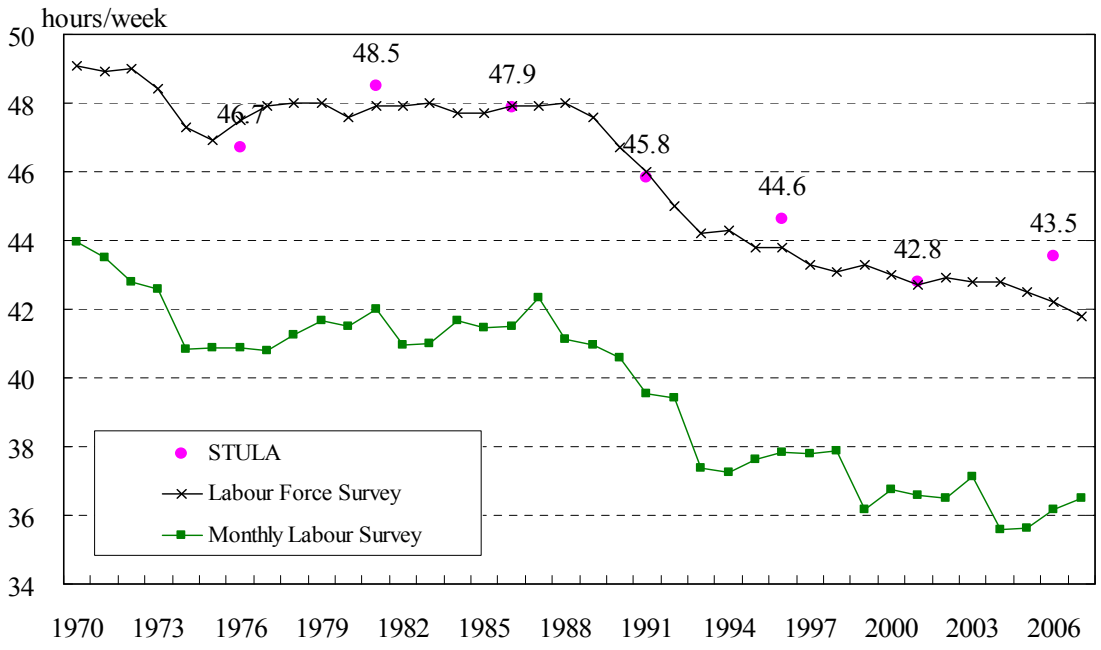
Shor, Juliet, *The Overworked American --- The Unexpected Decline of Leisure*, BasicBooks, 1991.

Figure 3.1: Annual hours worked per person in total employment (G7 countries)



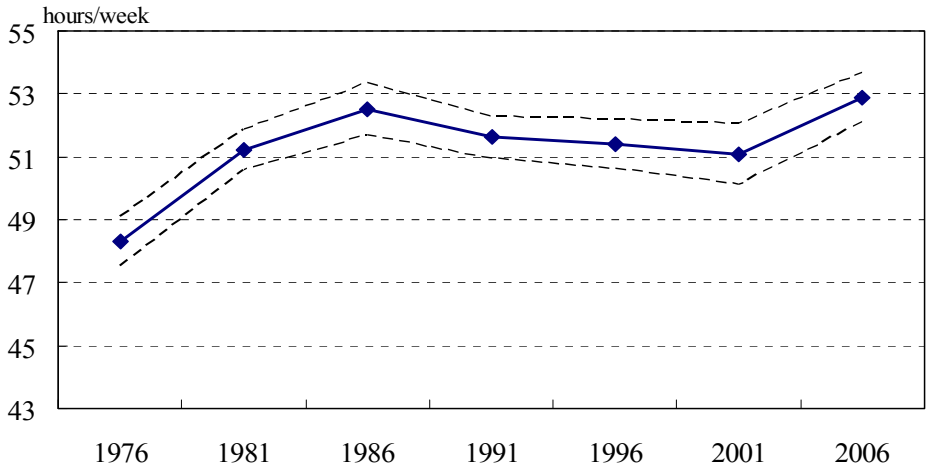
Source: OECD Labour Statistics

Figure 3.2: Weekly hours worked per employee



Source: STULA (MIAC), Labour Force Survey (MIAC), Monthly Labour Survey (MHLW).

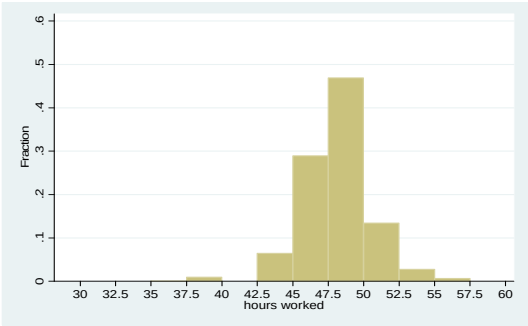
Figure 3.3: Weekly hours worked per full-time male employee (demography fixed)



Note: Dashed lines indicate 95 % confidence interval.

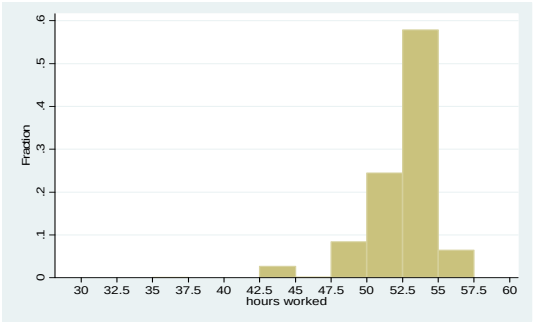
Figure 3.4: Histogram of Weekly hours worked per full-time male employee (demography fixed)

(1)1976



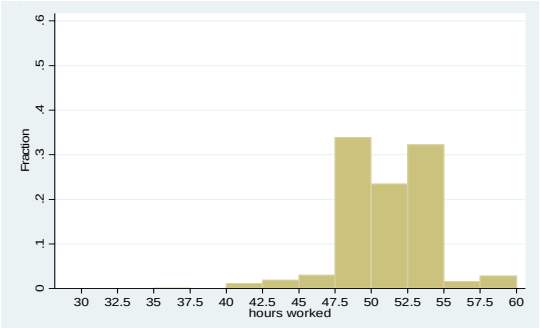
[Mean] 48.322 [Std. Dev.] 2.418

(2)1986



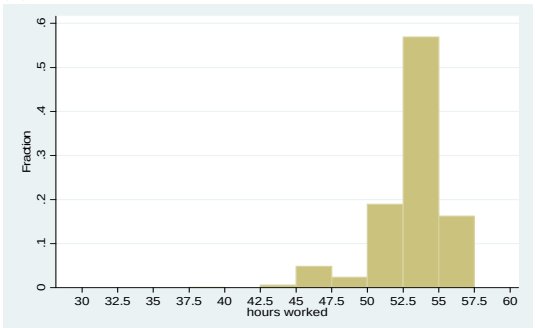
[Mean] 52.518 [Std. Dev.] 2.532

(3)2001



[Mean] 51.073 [Std. Dev.] 3.030

(4)2006



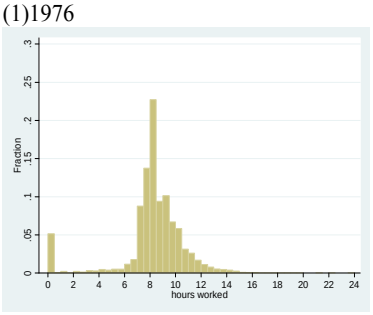
[Mean] 52.863 [Std. Dev.] 2.438

Note: 78 cells used in Table 3.2 are used to draw the histograms.

Figure 3.5: Hours worked per weekday, full-time male employee (demography unfixed)

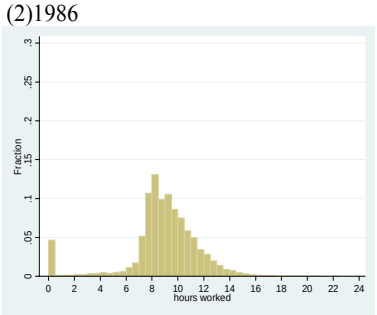
(1) Weekday

(1)1976



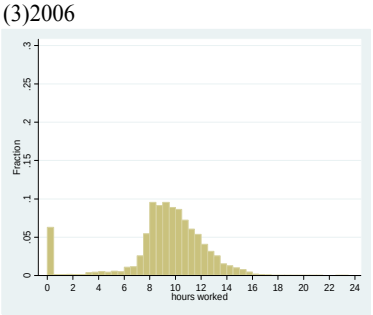
[Mean] 8.087 [Std. Dev.] 2.532

(2)1986



[Mean] 8.735 [Std. Dev.] 2.811

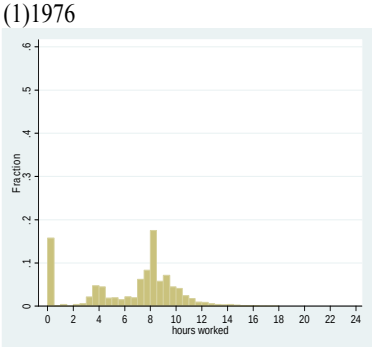
(3)2006



[Mean] 9.148 [Std. Dev.] 3.248

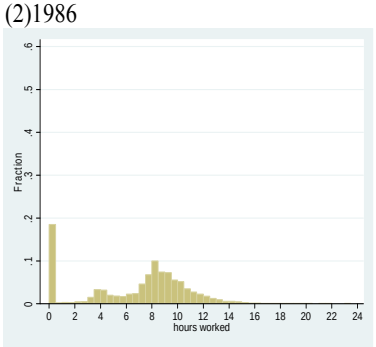
(2) Saturday

(1)1976



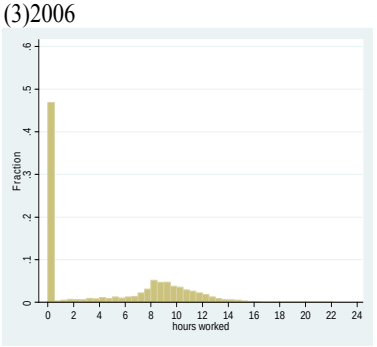
[Mean] 6.430 [Std. Dev.] 3.585

(2)1986



[Mean] 6.683 [Std. Dev.] 4.009

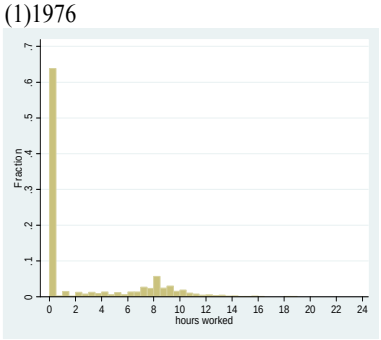
(3)2006



[Mean] 4.597 [Std. Dev.] 4.864

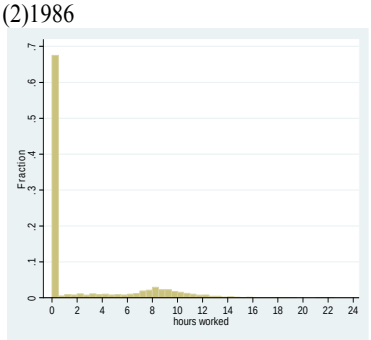
(3) Sunday

(1)1976



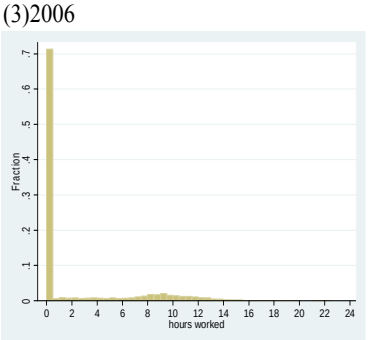
[Mean] 2.639 [Std. Dev.] 3.955

(2)1986



[Mean] 2.410 [Std. Dev.] 3.980

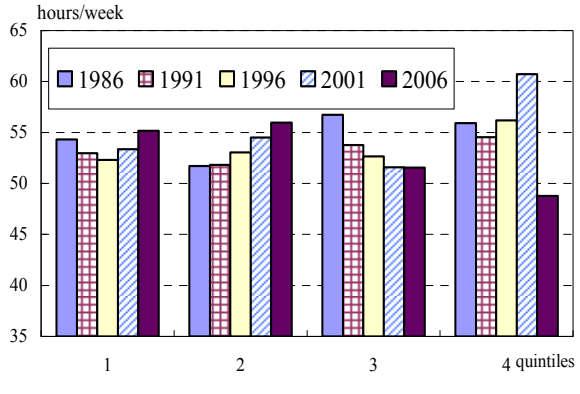
(3)2006



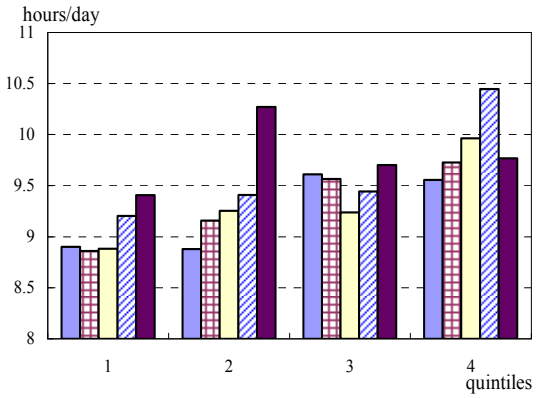
[Mean] 2.264 [Std. Dev.] 4.093

Figure 3.6: Income distribution and hours worked per week (full-time male employees)

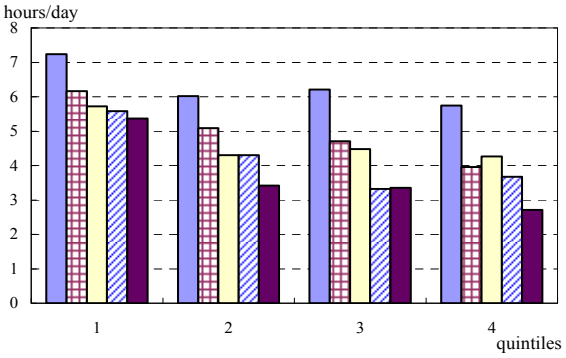
(1) 30s (Week)



(2) 30s (Weekday)



(3) 30s (Saturday)



(4) 30s (Sunday)

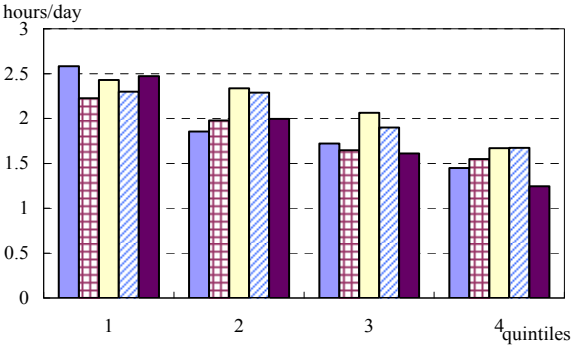
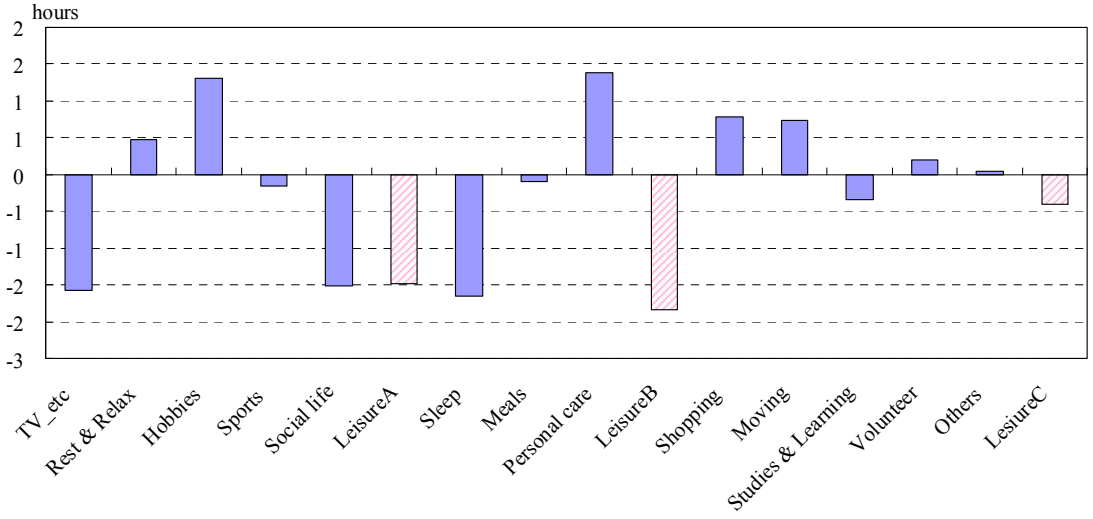


Figure 3.7: Decomposition of changes in Leisure A to C per week from 1986 to 2006, full-time employees (demography fixed)

(1) Males



(2) Females

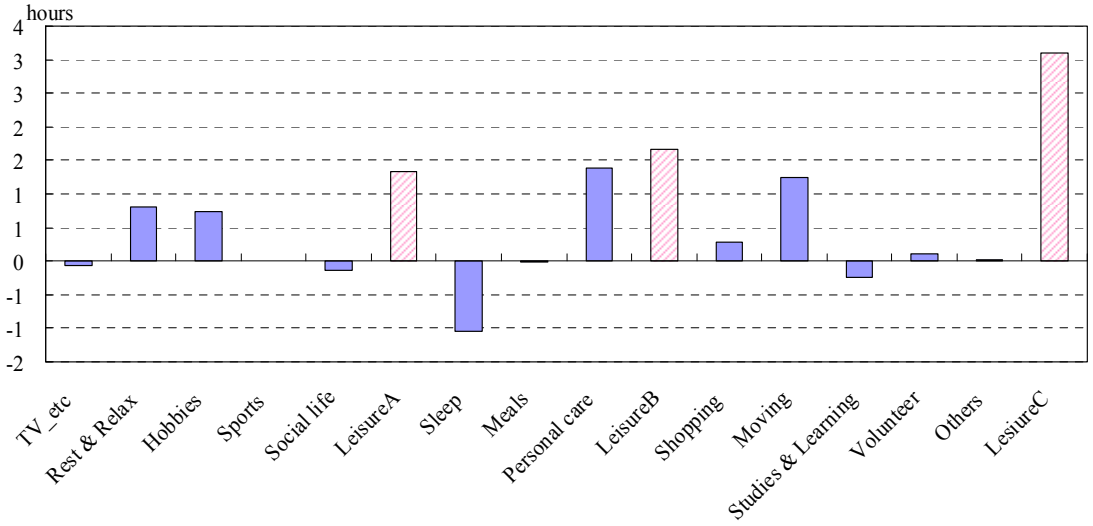


Table 3.1: Demographic and compositional changes since 1976

(1) Male

		1976	1981	1986	1991	1996	2001	2006
Marrital status	(married=1)	0.82	0.82	0.80	0.77	0.73	0.72	0.70
Age	22-29	0.22	0.17	0.17	0.17	0.19	0.18	0.15
	30-39	0.26	0.29	0.29	0.23	0.21	0.23	0.26
	40-49	0.26	0.25	0.24	0.27	0.26	0.22	0.21
	50-59	0.17	0.21	0.21	0.22	0.22	0.25	0.26
	60-65	0.09	0.08	0.08	0.11	0.12	0.12	0.13
Education	Junior high or less	0.46	0.37	0.28	0.23	0.20	0.16	0.13
	High school	0.37	0.42	0.43	0.46	0.46	0.46	0.45
	College or vocational school	-	0.05	0.07	0.06	0.07	0.08	0.10
	University or Graduate School	0.17	0.16	0.21	0.25	0.27	0.30	0.33
Having a child	(a child less than six=1)	0.29	0.26	0.19	0.14	0.14	0.14	0.14
Self employed	(self employed=1)	0.29	0.25	0.22	0.19	0.16	0.15	0.14
Work status	full-time (>=35h)	0.97	0.97	0.96	0.96	0.96	0.94	0.92
	part-time (<35h)	0.03	0.03	0.04	0.04	0.04	0.06	0.08
Samples sizes		124,956	75,118	169,432	169,908	161,706	112,371	104,214

(2) Female

		1976	1981	1986	1991	1996	2001	2006
Marrital status	(married=1)	0.80	0.80	0.80	0.77	0.75	0.73	0.71
Age	22-29	0.22	0.18	0.17	0.18	0.19	0.18	0.15
	30-39	0.25	0.27	0.28	0.22	0.21	0.22	0.25
	40-49	0.24	0.24	0.24	0.27	0.26	0.21	0.21
	50-59	0.19	0.21	0.21	0.22	0.22	0.26	0.26
	60-65	0.09	0.09	0.10	0.11	0.12	0.13	0.13
Education	Junior high or less	0.51	0.40	0.30	0.24	0.20	0.15	0.11
	High school	0.42	0.47	0.48	0.52	0.52	0.51	0.49
	College or vocational school	-	0.09	0.17	0.17	0.20	0.23	0.26
	University or Graduate School	0.07	0.03	0.05	0.07	0.08	0.10	0.14
Having a child	(a child less than six=1)	0.29	0.25	0.19	0.13	0.14	0.13	0.13
Self employed	(self employed=1)	0.51	0.42	0.35	0.28	0.24	0.18	0.14
Work status	full-time (>=35h)	0.81	0.79	0.76	0.73	0.69	0.64	0.61
	part-time (<35h)	0.19	0.21	0.24	0.27	0.31	0.36	0.39
Samples sizes		142,164	82,545	184,581	184,020	174,618	120,645	113,228

Notes: (1) “not married” includes divorced and widowed.

(2) 1976 survey includes “College or vocational school” samples in “University or Graduate school”.

Table 3.2: Market work per week (demography fixed)

	1976	1981	1986	1991	1996	2001	2006	change (demography fixed)			change (demography unfixed)		
								76→06	76→86	86→06	76→06	76→86	86→06
All samples													
per worker	44.88	47.15	46.97	46.03	45.24	44.23	46.27	1.39 +	2.08 **	-0.70	-1.48 **	1.21	-2.69 **
								[0.08]	[0.01]	[0.38]	[0.00]	[0.12]	[0.00]
per employee	44.78	47.30	47.64	46.67	46.20	45.51	47.29	2.51 **	2.86 **	-0.35	-1.75 +	1.45	-3.20 **
								[0.01]	[0.00]	[0.71]	[0.06]	[0.12]	[0.00]
per full-time employee	46.79	49.76	50.09	49.14	48.84	48.31	50.12	3.33 **	3.30 **	0.04	1.94 **	2.37 **	-0.43
								[0.00]	[0.00]	[0.96]	[0.00]	[0.00]	[0.52]
Males													
per worker	49.24	51.62	52.58	51.77	51.15	50.35	52.49	3.24 **	3.33 **	-0.09	0.57	2.19 **	-1.48 +
								[0.00]	[0.00]	[0.69]	[0.27]	[0.00]	[0.05]
per employee	48.15	50.81	52.22	51.38	51.09	50.58	52.42	4.27 **	4.07 **	0.20	2.11 **	3.25 **	-1.14 *
								[0.00]	[0.00]	[0.51]	[0.00]	[0.00]	[0.05]
per full-time employee	48.32	51.21	52.52	51.61	51.40	51.07	52.86	4.54 **	4.20 **	0.35	3.07 **	3.43 **	-0.36
								[0.00]	[0.00]	[0.56]	[0.00]	[0.00]	[0.50]
Females													
per worker	38.71	40.82	39.02	37.92	36.87	35.56	37.45	-1.26	0.31	-1.57	-4.03 **	-0.48	-3.55 **
								[0.25]	[0.78]	[0.15]	[0.00]	[0.65]	[0.00]
per employee	39.28	41.58	40.17	38.98	38.22	37.24	38.91	-0.37	0.89	-1.26	-5.36 **	-1.08	-4.28 **
								[0.79]	[0.51]	[0.35]	[0.00]	[0.44]	[0.00]
per full-time employee	43.53	46.67	44.92	43.89	43.41	42.43	44.30	0.77	1.39 *	-0.62	0.07	0.31	-0.23
								[0.23]	[0.03]	[0.33]	[0.91]	[0.62]	[0.69]

Notes: (1) *p*-values of significance test for the difference in two years are reported in parenthesis.
(2) "**", "*", and "+" denote that the differences are statistically significant in 1, 5, 10 percent levels, respectively.

Table 3.3: Hours worked per week, per full-time male employee (demography fixed)

	1976	1981	1986	1991	1996	2001	2006	76→86	86→06
by Education									
College or more	46.43	50.09	52.27	51.64	51.77	52.02	52.88	5.84 ** [0.00]	0.62 [0.57]
High School	48.60	51.38	52.59	51.70	51.25	50.69	52.99	3.99 ** [0.00]	0.40 [0.63]
Junio High or less	50.90	52.73	52.78	51.37	51.10	50.31	52.57	1.88 * [0.04]	-0.22 [0.81]
by Age									
20S	48.50	51.85	54.41	52.32	52.15	51.97	53.49	5.91 ** [0.00]	-0.92 [0.25]
30S	49.40	52.30	53.99	53.17	53.15	53.44	53.77	4.58 ** [0.00]	-0.22 [0.71]
40S	48.15	50.78	52.52	51.91	52.16	51.11	54.21	4.37 ** [0.00]	1.69 + [0.08]
50S	47.26	50.14	50.07	49.72	48.78	48.64	50.90	2.81 ** [0.00]	0.83 [0.35]
60S	46.69	48.96	46.34	45.96	45.21	43.71	46.26	-0.35 [0.83]	-0.08 [0.96]

Note: See Table 3.2.

Table 3.4: Fraction of Hours worked per day, full-time male employee (demography unfixed)

		1976	1981	1986	1991	1996	2001	2006
Weekday	0 h	0.052	0.036	0.047	0.058	0.065	0.072	0.063
	0<h<=8	0.287	0.289	0.222	0.200	0.177	0.176	0.139
	8<h<10	0.490	0.476	0.421	0.416	0.404	0.380	0.371
	h>=10	0.171	0.199	0.310	0.326	0.354	0.372	0.427
Saturday	0 h	0.158	0.154	0.184	0.307	0.411	0.449	0.467
	0<h<=8	0.369	0.347	0.313	0.254	0.193	0.195	0.170
	8<h<10	0.348	0.360	0.302	0.265	0.225	0.187	0.184
	h>=10	0.125	0.139	0.200	0.174	0.171	0.168	0.180
Sunday	0 h	0.638	0.571	0.674	0.708	0.721	0.721	0.712
	0<h<=8	0.174	0.211	0.160	0.136	0.130	0.125	0.125
	8<h<10	0.125	0.148	0.092	0.083	0.071	0.070	0.072
	h>=10	0.063	0.071	0.074	0.073	0.078	0.084	0.091

Note: “4 days” includes 1.5 day holidays per week samples.

Table 3.5: Hours worked per day, per full-time male employee (demography fixed)

(1) Weekday

	1976	1981	1986	1991	1996	2001	2006	76→86	86→06
All samples	8.02	8.34	8.70	8.70	8.80	8.79	9.12	0.68 ** [0.00]	0.42 ** [0.00]
by Education									
College or more	8.01	8.42	8.93	9.01	9.20	9.23	9.52	0.92 ** [0.00]	0.59 ** [0.00]
High School	8.01	8.33	8.63	8.64	8.67	8.64	9.04	0.62 ** [0.00]	0.41 ** [0.00]
Junio High or less	8.06	8.21	8.48	8.34	8.39	8.40	8.63	0.42 * [0.01]	0.15 [0.34]
by Age									
20S	8.09	8.45	9.00	8.86	8.94	8.81	9.08	0.91 ** [0.00]	0.08 [0.62]
30S	8.23	8.57	8.94	8.95	9.09	9.23	9.36	0.70 ** [0.00]	0.43 * [0.01]
40S	8.05	8.32	8.78	8.78	8.93	8.86	9.40	0.72 ** [0.00]	0.62 ** [0.00]
50S	7.75	8.04	8.25	8.38	8.36	8.42	8.77	0.50 ** [0.00]	0.52 ** [0.00]
60S	7.49	7.83	7.59	7.61	7.60	7.47	7.93	0.11 [0.54]	0.34 + [0.05]

(2) Saturday

	1976	1981	1986	1991	1996	2001	2006	76→86	86→06
All samples	6.10	6.47	6.64	5.76	5.19	4.88	5.03	0.54 * [0.01]	-1.62 ** [0.00]
by Education									
College or more	5.18	5.71	6.03	4.76	3.97	3.93	3.82	0.85 ** [0.00]	-2.21 ** [0.00]
High School	6.37	6.61	6.76	5.99	5.41	5.11	5.24	0.39 * [0.02]	-1.52 ** [0.00]
Junio High or less	7.11	7.49	7.46	6.98	6.82	6.03	6.66	0.35 [0.12]	-0.80 ** [0.00]
by Age									
20S	6.22	6.70	6.95	5.63	5.13	5.26	5.49	0.73 + [0.08]	-1.46 ** [0.00]
30S	6.03	6.44	6.85	5.93	5.45	5.02	4.97	0.82 + [0.09]	-1.88 ** [0.00]
40S	6.04	6.45	6.52	5.84	5.19	4.84	4.96	0.48 [0.30]	-1.55 ** [0.00]
50S	6.08	6.31	6.33	5.63	4.91	4.50	4.84	0.25 [0.67]	-1.49 * [0.02]
60S	6.41	6.47	6.15	5.48	5.06	4.33	4.54	-0.26 [0.68]	-1.61 * [0.01]

Table 3.5: Hours worked per day, per full-time male employee (demography fixed)

(3) Sunday

	1976	1981	1986	1991	1996	2001	2006	76→86	86→06
All samples	2.31	2.99	2.39	2.23	2.17	2.20	2.38	0.07	-0.01
								[0.56]	[0.95]
by Education									
College or more	1.48	2.34	1.86	1.80	1.77	2.00	2.13	0.38 **	0.28 *
								[0.01]	[0.05]
High School	2.44	3.04	2.54	2.36	2.36	2.35	2.45	0.09	-0.09
								[0.40]	[0.41]
Junio High or less	3.47	4.03	2.96	2.67	2.44	2.23	2.65	-0.51 **	-0.31 +
								[0.00]	[0.07]
by Age									
20S	2.15	2.92	2.60	2.18	2.14	2.60	3.01	0.46 *	0.40 +
								[0.03]	[0.06]
30S	2.21	2.81	2.43	2.30	2.33	2.22	2.35	0.21	-0.07
								[0.33]	[0.73]
40S	2.35	2.85	2.15	2.22	2.21	2.10	2.11	-0.19	-0.04
								[0.48]	[0.87]
50S	2.48	3.40	2.39	2.14	1.96	1.94	2.17	-0.08	-0.22
								[0.82]	[0.55]
60S	2.71	3.42	2.41	2.37	1.98	2.05	2.14	-0.30	-0.28
								[0.51]	[0.54]

Note: See Table 3.2.

Table 3.6: Results of matching estimation

	1986		1991		1996		2001		2006	
	simple	matching	simple	matching	simple	matching	simple	matching	simple	matching
diff	-2.21 **	-0.39	-2.24 **	-0.99	-1.29 *	-1.31 +	-0.21	1.98 *	-1.36	0.30
std.err.	(0.42)	(0.60)	(0.50)	(0.71)	(0.54)	(0.78)	(0.65)	(0.94)	(0.65)	(1.00)
p-value	<0.00>	<0.51>	<0.00>	<0.17>	<0.02>	<0.09>	<0.74>	<0.04>	<0.74>	<0.77>
wife	not working	working	not working	working	not working	working	not working	working	not working	working
sample sizes	12,972	10,871	9,417	8,856	9,079	7,793	5,481	6,616	4,760	6,821

Notes: (1) "diff" = "average hours worked of full-time males whose wives are not working" minus "average hours worked of full-time males whose wives are working".

(2) **, *, and + imply 1, 5, 10% statistically significant respectively.

Table 3.7: Total work and Leisure A, B and C per week, per full-time employee (demography fixed)

		1976	1981	1986	1991	1996	2001	2006	76→86	86→06
Male	Market work	48.32	51.21	52.52	51.61	51.40	51.07	52.86	4.20 **	0.35
									[0.00]	[0.53]
	Total work	56.29	59.32	60.73	60.00	59.25	59.05	61.27	4.44 **	0.54
									[0.00]	[0.38]
	Leisure A	30.70	29.90	30.71	31.69	30.88	30.76	29.23	0.02	-1.48 **
									[0.97]	[0.01]
	Leisure B	104.18	103.65	101.10	101.78	101.38	101.01	99.26	-3.08 **	-1.83 **
									[0.00]	[0.01]
	Leisure C	111.05	108.38	106.85	107.60	108.37	108.62	106.44	-4.21 **	-0.41
									[0.00]	[0.50]
Female	Market work	43.53	46.67	44.92	43.89	43.41	42.43	44.30	1.39 *	-0.62
									[0.03]	[0.33]
	Total work	63.13	66.52	65.51	64.47	62.44	61.12	62.50	2.38 +	-3.01 *
									[0.07]	[0.02]
	Leisure A	22.88	22.55	24.01	25.17	25.05	25.71	25.35	1.13	1.34
									[0.19]	[0.12]
	Leisure B	95.80	95.07	94.96	95.83	96.66	97.24	96.62	-0.84	1.66
									[0.50]	[0.19]
	Leisure C	104.17	101.17	102.03	103.10	105.14	106.37	105.12	-2.13	3.09 *
									[0.11]	[0.02]

Note: See Table 3.2.

Table 3.8: Trends in Sleep, per full-time employee (demography fixed)

		1976	1981	1986	1991	1996	2001	2006	76→86	86→06
Male	per week	56.58	55.71	54.09	53.37	53.34	52.84	52.44	-2.48 **	-1.66 **
									[0.00]	[0.00]
	weekday	7.92	7.82	7.57	7.43	7.40	7.31	7.22	-0.35 **	-0.35 **
									[0.00]	[0.00]
	Saturday	7.97	7.95	7.66	7.71	7.81	7.82	7.81	-0.31 **	0.15 **
									[0.00]	[0.00]
	Sunday	8.96	8.66	8.57	8.53	8.54	8.48	8.51	-0.40 **	-0.06
									[0.00]	[0.22]
Female	per week	53.61	52.79	51.79	51.17	51.35	51.02	50.75	-1.81 **	-1.05 **
									[0.00]	[0.01]
	weekday	7.50	7.43	7.25	7.13	7.12	7.06	7.04	-0.25 **	-0.22 **
									[0.00]	[0.00]
	Saturday	7.62	7.52	7.34	7.40	7.57	7.60	7.55	-0.27 **	0.21 *
									[0.00]	[0.02]
	Sunday	8.44	8.13	8.18	8.11	8.18	8.15	8.05	-0.27 **	-0.13
									[0.00]	[0.15]

Note: See Table 3.2.

Table 3.9: Japan-US comparison on time allocation per week (full-time employee; demography fixed)

(1) Japan

		1981	1986	1991	1996	2001	2006
Market work	Males	52.17	53.44	52.17	51.94	51.56	53.32
	Females	46.54	44.65	43.97	43.30	42.09	44.52
Market work	Males	58.62	59.85	58.65	57.65	57.65	59.57
+ commute time	Females	51.55	49.39	49.10	48.21	46.88	49.60
Sleep	Males	55.73	54.23	53.49	53.40	52.91	52.45
	Females	52.71	51.64	50.99	51.21	50.91	50.58
Leisure A	Males	29.70	30.62	31.56	30.87	30.84	29.33
	Females	22.38	23.39	24.58	24.55	25.58	25.26
Leisure B	Males	103.62	101.36	101.95	101.60	101.34	99.59
	Females	94.77	94.21	95.11	96.10	97.07	96.37

(2) US

		1975	1985	1993	2003
Market work	Males	41.77	41.19	44.01	42.92
	Females	34.52	32.02	36.34	36.18
Market work	Males	45.99	45.93	48.32	46.85
+ commute time	Females	37.67	35.67	39.93	38.95
Sleep	Males	55.27	53.92	55.68	56.58
	Females	56.77	54.61	56.92	58.18
Leisure A	Males	31.53	32.82	34.25	33.24
	Females	27.20	30.11	31.49	28.46
Leisure B	Males	103.05	103.28	103.97	102.73
	Females	100.41	101.73	104.16	100.84

Sources: Japan (STULA), the US (American Time-use survey data used in Aguiar and Hurst [2007]).

Appendix: Details on Survey on Time Use and Leisure Activities

Survey on Time Use and Leisure Activities (The Ministry of Internal Affairs and Communications; STULA) is a time-use survey recording the activities of individuals in 15 minute increments over a 24-hour period. The Japanese government took its first survey in 1976, and has interviewed approximately 200,000 Japanese citizens every five years since then. The most recent survey was conducted in 2006. This paper uses micro data from the seven surveys, taken in 1976, 1981, 1986, 1991, 1996, 2001, and 2006. [26]

STULA is taken every five years in the year following the *Population Census* (MIAC). It is a large-scale survey that first selects approximately 6000 survey districts from those established for the *Population Census*, out of which it selects approximately 70,000 to 100,000 households with about 200,000 to 270,000 household members who are at least 10 years old (at least 15 years old for those surveys taken in 1976 and 1981). Except for the survey taken in 1981, the survey covers a consecutive two-day period that is set for each survey district, within an overall nine-day period during October (in some years, survey was conducted from late September to early October). The sample size is therefore approximately twice the number of household members. The survey covers every day of the week from Monday through Sunday, so that assuming a sufficient number of samples, the averages can be interpreted as the hours spent on those activities per week.[27]

STULA uses a pre-coded method in which the respondent chooses the applicable item from a list of activities. The respondent fills in the activity for each 15-minute increment from the list of 20 items shown in Table 3.A-1 (as written in the note to Table 3.A-1, there are fewer items from 1976 until 1986). Other questions asked of respondents in addition to their activities include basic information: age, years of education, marital status, number of persons in household, number of children in household, household annual income, number of employees at workplace, usual work status, and length of usual work hours per week.[28]

[26] Another time-use survey in Japan is the Japan Broadcasting Corporation (NHK)'s *National Time Use Survey*. This survey, which predates the STULA, has been conducted by NHK every five years since 1950, on approximately 30,000 people. NHK's survey differs from the STULA in that it does not survey every day of the week, but does provide more detailed categories on the time spent with mass media.

[27] The 1981 survey covered only three days that year, October 1st (Thursday), 3rd (Saturday), and 4th (Sunday), and each household only answered questions regarding one of those days. The analysis here, treating the answers for Thursday as representative for all weekdays, uses the sum of Thursday multiplied by five, Saturday, and Sunday to estimate the time spent on activities throughout the week. (This same method is used for calculating weekly time spent on activities in the official aggregate data from the STULA)

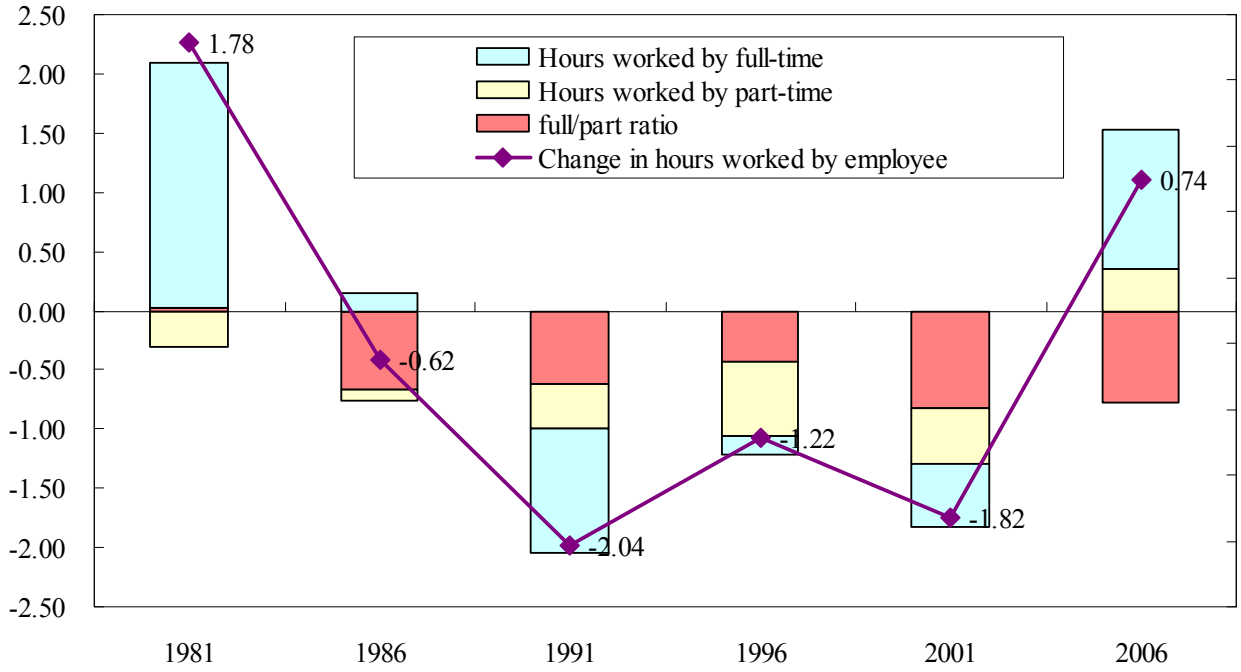
[28] Several caveats must be noted in regards to time-use surveys: (1) they provide no information on activities that take less than 15 minutes; (2) when two activities are pursued at the same time, only the primary activity is recorded; (3) there is a possibility that different respondents may categorize the same activity differently, owing to the roughness of category definitions. Regarding this last point, STULA has used two methods, pre-coding and after-coding, since the 2001 survey. Although after-coding has the advantage of providing information on activities outside of the initially established categories, because a certain level of arbitrariness is unavoidable owing to the fact that the data compilers must ultimately categorize the activities according to some standard, and because of the small sample size, we chose to use only data based on the pre-coding method in our analysis.

Table 3.A-1: Kind of Activities

Activities	Examples and/or notes
1.Sleep	Time from going to bed till getting up
2.Personal care	Washing face, bathing, dressing, hair-dressing, etc.
3.Meals	Includes drinking before or after meals. If the main purpose is socializing, included "18. Social life".
4. Commuting to and from school or work	Going to work or school and returning
5.Work	Work for pay or profit Includes helping family business. Rest between work time should be classified according to the activity actually done.
6.Schoolwork	Studying by students at school, such as high school, college and university Homework is included.
7.Housework	Cooking, table setting, cleaning house, caring for family members other than little child, keeping the family account, visits to the public office on personal or family matters
8.Caring or nursing	Helping family or related person to have a meal, take a bath, dress, move, and to do other
9.Child care	Caring for little child(ren) Including activities concerning education of the child(ren).
10.Shopping	Purchase of food, clothes, or other goods Includes window-shopping.
11.Moving	Moving other than "4. Commuting to and from school or work"
12.Watching TV, listening to the radio, reading newspapers or magazines	Includes watching TV programs recorded on videotape
13.Rest and relaxation	Conversation with family, office colleagues, etc.
14.Studies and researches	Studies and researches other than "6. Schoolwork" Those as a part of work are included in "5. Work".
15.Hobbies and amusements	Seeing a movie or a play, playing or listening to music, caring for pets, gardening, flower arrangement, chess, mahjong, etc.
16.Sports	Athletic amusements such as baseball, volleyball, tennis, etc. Includes light exercises and outdoor leisure such as jogging, hiking, etc.
17.Volunteer and social activities	Voluntary activities or other social activities to promote social welfare by providing one's effort, skill and time without pay
18.Social life	Seeing friends, taking with neighbours, attending meetings, funerals, wedding, receiving friends at home, etc.
19.Medical examination or treatment	Stay in bed due to illness, seeing a doctor for treatment, etc.
20.Other activities	Activities not classified elsewhere

Source: Statistics Bureau, MIAC (http://www.stat.go.jp/english/data/shakai/2001/kodobua.htm)
Notes: (1) 1976 survey combines “School work” and “Studies and Researches.”
(2) 1976 and 1981 surveys do not have separate items for “Child care” and “Caring and Nursing.” 1986 survey does not have item for “Caring and Nursing.” For these survey years, these items were included in “Housework.”

Figure 3.A-1: Decomposition



Chapter 4

Causal Effects of Marriage and Motherhood on Wages: Evidence from Female Workers in Japan

Abstract

This study aimed to identify the causal effects of marriage and motherhood on the wages of female Japanese workers. To this end, we corrected sample-selection bias and to remove bias caused by endogeneity using instrumental variables. Ordinary least-square estimates and sample-selection model estimates were found to be biased. The estimation of the sample-selection model where we also considered the endogeneity bias indicated that marriage had no effect, whereas having one child had a -23.9% effect on wages; however, the latter effect was statistically insignificant. Our results indicate that in the short term, marriage and motherhood have no effects on wages.

4.1 Introduction

Numerous studies have estimated the effects of marriage and motherhood on women's wages. Most studies have shown that there is neither a "marriage premium" nor a "marriage penalty" for female workers. A "marriage premium" refers to a wage premium brought about by marriage, while a "marriage penalty" refers to a wage penalty associated with marriage. However, many studies have reported large "motherhood penalties," or wage penalties resulting from having children.

The marriage penalty may not have been found because most empirical analyses have treated years of experience or tenure as explanatory variables. If marriage interrupts a woman's career, her years of experience and tenure would decrease and her wages might also decrease. The indirect effect of marriage on wage is estimated as the coefficients of years of experience and tenure.

Controlling for years of experience and tenure, many studies have demonstrated the motherhood penalty, suggesting that factors other than career interruption decrease wages. Besides career

interruption, which disturbs human capital accumulation and thereby reduces long-term productivity, there are three other possible explanations for the motherhood penalty.

The first is compensating wage differentials. This means that married women and mothers choose a workplace where they can combine family life and career at the expense of part of their wage. The second is employer discrimination against married women and mothers. If an employer were to discriminate against married women and mothers, demand for those workers would decrease and their wages would decrease. The third is short-term productivity decline. Even if no long-term productivity decline occurs, the burden of housework and parenting may reduce a woman's productivity at certain times in her life.

Although we presented explanations for the wage penalty which existing studies have provided, previous estimates may have been affected by bias. Some studies have addressed selection bias. For example, Joshi, Paci, and Waldfogel (1999) estimated a Heckit-type sample-selection model to correct selection bias. While such correction is important, that method still cannot overcome the endogeneity problems of reverse causality, by which wages affect marriage and childbearing behaviors. Only Korenman and Neumark (1992) and Neumark and Korenman (1994) used instrumental variables (IVs) to remove biases caused by endogeneity. However, they did not correct selection biases.

The purpose of this study was to identify the causal effects of marriage and motherhood on wages of female workers using panel data from Japan. To this end, we estimated not only ordinary least-squares (OLS) and a sample-selection model (SS), but also an SS model with IVs (SS with IVs).

This paper is organized as follows. In Section 2, we review the existing empirical literature on the effects of marriage and motherhood for female workers. Section 3 describes the data set, and Section 4 presents the estimation procedures and results. Section 5 gives the conclusions.

4.2 Summary of the Literature

Existing studies that empirically analyzed the effects of marriage and motherhood on wages for

female workers have used various estimation methods, including OLS, fixed-effect models (FE), SS, and two-stage least-squares (2SLS) approaches. However, comparison among the resulting estimates is difficult because each type of method has certain problems, and there is the possibility of remaining bias.

While Hersch (1991), Waldfogel (1998b), and Hundley (2000) employed OLS methods, and Waldfogel (1998a) used an FE model, those studies did not correct for sample-selection bias. Women themselves decide whether to work, and thus we cannot observe wages of women who choose not to work; this population would typically be potential low-wage earners, and therefore the effect of marriage on wage may be upwardly biased. If we assume that marriage has no wage effect for any woman and that low-wage women quit their jobs once they marry, then all married female workers are high-wage earners, and the average wage for married female workers would be higher than the average wage for single female workers. This is an example of possible upward bias caused by sample selection. The effect of motherhood might be biased in the same way.

Waldfogel (1995), Harkness and Waldfogel (1999), Joshi, Paci, and Waldfogel (1999), Gupta and Smith (2002), and Kawaguchi (2008) employed Heckit-type SS models. Only Kawaguchi (2008) used data for female Japanese workers. He analyzed wage data for both full-time and part-time workers and found a marriage penalty ranging from -0.077 to -0.198 and a motherhood penalty of -0.152 to -0.238.

Joshi, Paci, and Waldfogel (1999) compared OLS estimates to SS estimates of the motherhood effect. Their results gave an OLS estimate of zero and SS estimate of -0.643, which suggested the existence of a motherhood penalty. This result implies that the estimate would be upwardly biased without correcting for selection bias.

However, correcting selection bias alone is insufficient because the estimates might still be biased by reverse causality, meaning that wages affect marriage behavior and childbearing behavior. That is, if, among the women who remain in the labor market, low-wage female workers have a greater tendency to marry or to marry earlier than high-wage female workers, then the coefficient of the marriage variable would be downwardly biased, creating what is called the endogeneity problem. Regarding motherhood, because of the expense of raising children, it is possible that high-wage

female workers have a greater tendency to have children, in which case estimates would be upwardly biased. To deal with this problem, IVs must be used.

Korenman and Neumark (1992) and Neumark and Korenman (1994) treated marital status and the number of children as endogenous variables and treated family background (e.g., number of siblings) and variables of expectations and attitudes about marriage at age 14 as IVs[29]. Neumark and Korenman (1994) reported that the effect of marriage for white females equaled 0 by OLS but 0.463 by 2SLS, meaning that the OLS estimate was downwardly biased. The effect of having one child for white females was -0.074 by OLS but -0.104 by 2SLS, indicating that the OLS estimate was upwardly biased. However, their research did not correct for selection bias.

Thus, in this paper, we estimated the SS model using IVs to identify, without bias, the causal effect of marriage and motherhood on wages for female Japanese workers.

4.3 Data

We used panel data from Osaka University's 21st Century Center of Excellence Panel Survey (OPSJ), conducted in Japan. The OPSJ has been conducted annually since February 2004 using a placement (self-administered) method. The subject population was a randomly selected, nationally representative sample of 6,000 individuals, with 4,224 and 2,987 respondents in 2004 and 2005, respectively. Excluding 108 individuals lost from the 2,987 respondents in 2005, the OPSJ for 2006 included 2,000 new, randomly sampled individuals. There were 3,767 and 3,312 respondents in 2006 and 2007, respectively. We used data from 2005, 2006, and 2007 because the question about working hours, which was needed to calculate hourly wages, was not included in the 2004 survey.

As the marriage variable, we used a dummy variable relative to being single, which included unmarried, divorced, and widowed women. As the motherhood variable, we used the number of children, following existing studies.

Table 4.1 presents descriptive statistics for the sample. The dependent variable was hourly wages.

[29] IVs include family background variables (e.g., father's education, mother's education, number of siblings) and expectational/attitudinal variables (e.g., dummy variable set equal to 1 if the respondent disagreed/strongly disagreed with statement that it is all right for a woman to work even if her husband disagrees, asked in 1971; ideal age at marriage reported by the respondent at age 14; expected number of children, in 1970).

Explanatory variables, except for interest variables, were age, age squared, years of schooling, self-employment (dummy variable), management executive/company officer (dummy variable), six tenure indicators, seven establishment size indicators, eight industry indicators, six occupation indicators, nine place of residence indicators, three urban size indicators, and survey year indicators.

4.4 Estimation

This paper defines all Japanese females aged 20 or over as the population. In this section, we will examine whether marriage and motherhood affect the market wages offered to them, starting with the wage function, given by equation 1:

$$\ln wage_i = Z_{1i_i}\delta_1 + \alpha_1 marriage_i + \alpha_2 children_i + u_{1i_i} \qquad (1)$$

where *wage* is the hourly wage, *marriage* is the marriage variable, *children* is the motherhood variable, Z_1 represents the other explanatory variables, and u is the error term. However, estimating this equation by OLS might provide biased estimates. Thus, to correct selection bias, we first estimated equation (2),

$$participat\ \ ion_i = 1(Z_i\delta_2 + u_{2i} > 0) \qquad (2)$$

and calculated the inverse Mills ratio $\hat{\lambda}_{i2} = \lambda(Z_i\hat{\delta}_2)$. In the above equation, *participation* is a binary variable of whether to work; Z consists of Z_1, the variable representing whether a woman has children aged 6 or under, and non-labor income. The latter two variables are excluded from equation (1). Previous studies have often used these two exclusion restrictions.

Equations (3) and (4) are first-stage estimations that use instruments to remove bias caused by the endogeneity of the marriage variable and the motherhood variable:

$$marriage_i = Z_i\delta_3 + u_{3i} \qquad (3)$$

$$children_i = Z_i\delta_4 + u_{4i} \qquad (4)$$

Z consists of Z1 and instrumental variables. We used the hyperbolic discounting variable, which represents impulsivity, as an IV for marriage. Briefly, hyperbolic discounting is explained as follows. Standard economic models assume that intertemporal preference is time consistent, and time discounting is exponential. However, there are many self-control problems in economic behavior, such as a person reversing his or her initial plan for the pleasure of the moment. To explain this phenomenon, behavioral economics uses hyperbolic discounting as time discounting. That is, if a person has a time-consistent preference, the time discounting rate for 1 week from 1 year later on the present judgment will equal the time discounting rate for 1 week from actual 1 year later. However, if a person has a time-inconsistent preference, the time discounting rate for 1 week from 1 year later on the present judgment will be lower than the time discounting rate for 1 week from actual 1 year later, which is, in other words, the time-discounting rate for 1 week from the present. This situation in which the nearest discounting rate from today is larger is formulated as hyperbolic discounting.

Laibson (1997, 1998) explained consumption and saving behavior using hyperbolic discounting. If a consumer has a time-inconsistent preference, he has a strong preference for present consumption as a pleasure of the moment. Therefore, he has more debt. Ikeda *et al*. (2008) explained obesity using hyperbolic discounting by empirically analyzing the relationship between hyperbolic discounting and obesity. At the expense of the long-term benefit of health, a person consumes excess calories as a pleasure of the moment and becomes obese.

Thus we hypothesized that the probability of marriage is higher for impulsive females and used the hyperbolic discounting variable as an IV for the marriage variable. By definition, if this variable affected wages through the error term of equation (1), the relevance condition for the IV would be violated. We checked this point statistically.

We generated the hyperbolic discounting variable as follows. The survey that we used included the following hypothetical question: “How much do you need 9 days from now in exchange for receiving 10,000 yen 2 days from now?” We calculated the time-discounting rate from the answers

to this question. In a similar way, we calculated the time-discounting rate from the question "How much do you need 97 days from now in exchange for receiving 10,000 yen 90 days from now?" We generated a dummy variable which equaled 1 when the former rate was larger than the latter rate as the hyperbolic discounting variable.

We used the number of siblings as the motherhood IV. We hypothesized that women with more siblings would tend to have more children. Again, in the case that this variable affected wages thorough the error term of equation (1), the relevance condition for the IV would be violated. We checked this point statistically.

Table 4.2 presents the estimation results of OLS and SS models. Columns (1) and (2) present the OLS results, and columns (3) and (4) give the SS results. In column (1), controlling for various variables, the coefficient of marriage is -0.0797. In other words, the marriage penalty is 7.97%. Controlling for the number of children, the marriage penalty is 9.03% and differs little from the estimate in column (1); the effect of motherhood is statistically insignificant (as shown in column 2).

In column (3), the marriage penalty is 28.9% by the SS model. This value is much larger than the OLS value of 7.97% in terms of the absolute value. Controlling for the number of children, the marriage penalty becomes 29.0% (column 4). Column (4) shows that the effect of motherhood is insignificant, but the coefficient is 0.000361, which is smaller than the OLS estimate of 0.0132. Therefore, without correcting selection bias, the estimates would be upwardly biased, as we expected.

Table 4.3 presents the estimation results from the SS with IVs. The upper panel of Table 4.3 shows the estimation results of the second stage, and the lower panel shows both Wald statistics and P-values of first-stage instruments. Table 4.4 presents the estimation results of the first stage. The effects of the first-stage instruments were significant, and thus the condition of relevance was satisfied. A higher degree of hyperbolic discounting (i.e., a more impulsive woman) increases the probability of marriage. Furthermore, women with more siblings tend to have more children. In addition, when we controlled these IVs as explanatory variables in the OLS estimation of the wage function in Table 4.2, they did not have a significant effect on wages. Thus, the condition of

exogeneity was satisfied. That is, whether we control for the number of children does not affect the effect of marriage. Column (2) shows that the effect of marriage, although insignificant, is 8.75% and larger than the SS estimate of -29.0%. Therefore, if we did not consider the problem of endogeneity, the estimate would be downwardly biased, as we expected. Regarding the effect of motherhood, the coefficient of motherhood was insignificant with a value of -0.239, which is smaller than the SS estimate of 0.000361. Therefore, if we did not consider the problem of endogeneity, the estimate would be upwardly biased, as we expected. In summary, our results indicate that marriage and motherhood have no effects on wages in the short term, except for career interruption, which disturbs human capital accumulation and reduces long-term productivity.

To verify the total effects, including the indirect effects through tenure, Kawaguchi (2008) removed tenure from the explanatory variables, included it as an error term, and estimated the effect of marriage and motherhood. Using the same estimation method, we obtained almost the same results, as shown in Table 4.3. This is not surprising because we removed the bias caused by endogeneity by using IVs; even though we removed tenure from the explanatory variables, the indirect effect was not included in the coefficients of the marriage variable and motherhood variable. If we had not used IVs, we would have estimated the effect including not only indirect effects but also the bias caused by reverse causality and other endogeneity.

4.5 Conclusion

The purpose of this study was to identify the causal effects of marriage and motherhood on the wages of female Japanese workers. To this end, we corrected sample-selection bias and removed bias caused by endogeneity using instruments. We found that the OLS estimates and SS model estimates were biased. From the SS model with IVs, we found that marriage had no effect on wages; the effect of motherhood on wages was -23.9%, but this was statistically insignificant.

These results indicate that in the short run, marriage and motherhood have no causal effects on wages, except for career interruption, which disturbs human capital accumulation and consequently reduces long-term productivity. However, although the effect of motherhood was insignificant, the coefficient decreased to -0.239 when we used the instrumental variables. Thus, we should reserve

judgment on the wage effects of motherhood. Analysis of large data sets is needed to obtain robust results. Future study directions should include rigorous empirical research on the wage effects of marriage and motherhood through career interruption.

References for Chapter 4

Gupta, D. N. and Smith, N., 2002, Children and career interruptions, *Economica* 69: 609–629.

Hersch, J., 1991, Male-female differences in hourly wages: The role of human capital, working conditions, and housework, *Industrial and Labor Relations Review* 44(4): 746–759.

Hundley, G., 2000, Male/female earnings differences in self-employment: The effect of marriage, children and the household division of labor, *Industrial and Labor Relations Review* 54 (1): 95–114.

Ikeda, S., Kang, M.-I., and Ohtake, F., 2008, Fat debtors: Time discounting, its anomalies, and the body mass index. mimeograph

Kawaguchi, A., (2008), How do marriage and motherhood affect wages? *Gender Economic Disparity*, Ch. 7, Kawaguchi, A. eds. , Keisoshobo, pp. 157–190. (in Japanese)

Korenman, S., and Neumark, D., 1992, Marriage, motherhood, and wages, *Journal of Human Resources* 27(2): 233–255.

Laibson, D., 1997, Golden eggs and hyperbolic discounting, *Quarterly Journal of Economics*, 112: 443–477.

Laibson, D., 1998, Life-cycle consumption and hyperbolic discount functions, *European Economic Review*, 42: 861–871.

Neumark, D. and Korenman, S., 1994, Sources of bias in women's wage equations: Results using

sibling data, *Journal of Human Resources*, 29 (spring): 379–405.

Waldfogel, J., 1995, The price of motherhood: Family status and women's pay in a young British cohort, *Oxford Economic Papers*, New Series, 47(4): 584–610.

Waldfogel, J., 1998a, The family gap for young women in the United States and Britain: Can maternity leave make a difference? *Journal of Labor Economics*, 16(3): 505–545.

Waldfogel, J., 1998b, Understanding the 'family gap' in pay for women with children, *Journal of Economic Perspectives*, 12(1): 137–156.

Table 4.1. Summary Statistics

variables		N	mean	s.d.	min	max
Hourly wage		1177	2405.434	8973.330	123.288	245000
Natural og of hourly wage		1177	7.213	0.790	4.815	12.409
Age		1177	44.764	10.887	21	65
Age squared /100		1177	21.222	9.574	4.41	42.25
Current married		1177	0.666	0.472	0	1
Number of children		1177	1.567	1.136	0	5
Years of schooling		1177	12.955	1.961	9	18
Tenure	Under 1 year	1177	0.095	0.294	0	1
	1-5 years	1177	0.252	0.435	0	1
	5-10 years	1177	0.195	0.397	0	1
	10-20 years	1177	0.221	0.415	0	1
	20-30 years	1177	0.153	0.360	0	1
	30-40 years	1177	0.072	0.259	0	1
	over 40 years	1177	0.011	0.105	0	1
Type of employment	Employee	1177	0.685	0.465	0	1
	Public sector employ	1177	0.096	0.295	0	1
	Self-employed	1177	0.219	0.414	0	1
Industry	Agriculture and forestry	1177	0.015	0.123	0	1
	Mining	1177	0.000	0.000	0	0
	Construction	1177	0.053	0.223	0	1
	Manufactureing	1177	0.129	0.335	0	1
	Wholesale/Retail	1177	0.155	0.363	0	1
	Finincial/Insurance	1177	0.032	0.177	0	1
	Real estate	1177	0.009	0.096	0	1
	Transport/Correspondence	1177	0.023	0.150	0	1
	Electric/Gas/Water/Heat supply	1177	0.015	0.123	0	1
	Service	1177	0.289	0.453	0	1
	Others	1177	0.279	0.449	0	1
Occupation	Office worker	1177	0.339	0.474	0	1
	Shop worker	1177	0.129	0.335	0	1
	Managinal post	1177	0.047	0.211	0	1
	Specialist	1177	0.251	0.434	0	1
	Service	1177	0.157	0.364	0	1
	Field worker	1177	0.061	0.240	0	1
	Agriculture, forestry and fisheries	1177	0.015	0.123	0	1
Establishment size	1-5	1177	0.225	0.418	0	1
	6-29	1177	0.206	0.405	0	1
	30-99	1177	0.139	0.346	0	1
	100-299	1177	0.115	0.319	0	1
	300-499	1177	0.042	0.200	0	1
	500-999	1177	0.042	0.202	0	1
	1000-4999	1177	0.070	0.255	0	1
	5000-	1177	0.060	0.238	0	1
Regional block	Hokkaido	1177	0.050	0.218	0	1
	Tohoku	1177	0.076	0.264	0	1
	South Kanto	1177	0.282	0.450	0	1
	North Kanto	1177	0.072	0.259	0	1
	Hokuriku	1177	0.031	0.175	0	1
	Tokai	1177	0.126	0.332	0	1
	Kinki	1177	0.120	0.325	0	1
	Chugoku	1177	0.076	0.266	0	1
	Shikoku	1177	0.035	0.183	0	1
	Kyushu	1177	0.132	0.338	0	1

Table 4.1. Summary Statistics (continued)

variables		N	mean	s.d.	min	max
City scale	12 major cities	1177	0.213	0.410	0	1
	Large city	1177	0.455	0.498	0	1
	City	1177	0.206	0.404	0	1
	Town	1177	0.127	0.333	0	1
Survey year	2005	1177	0.291	0.454	0	1
	2006	1177	0.371	0.483	0	1
	2007	1177	0.338	0.473	0	1
Number of siblings		1151	1.910	1.279	0	8
Hyperbolic discount factor		1160	3.228	1.342	1	5
Participation rate of labor market		2898	0.406	0.491	0	1
non labor income		2898	5.760	4.295	-4	25
kids		2898	0.155	0.362	0	1

Table 4.2. Estimates by the wage equation: OLS and SS

		(1)	(2)	(3)	(4)
		Dependent variable: log(wage)			
		OLS	OLS	Hickit	Hickit
Married		-0.0797*	-0.0903*	-0.290***	-0.290***
		(0.0482)	(0.0534)	(0.0931)	(0.0930)
Number of children			0.0132		0.000361
			(0.0263)		(0.0273)
years of education		0.0264**	0.0270**	0.0329**	0.0329**
		(0.0130)	(0.0130)	(0.0134)	(0.0134)
Tenure	1-5 years	0.0764	0.0782	0.0750	0.0751
		(0.0723)	(0.0722)	(0.0726)	(0.0725)
	5-10 years	0.0728	0.0751	0.0790	0.0790
		(0.0796)	(0.0797)	(0.0798)	(0.0799)
	10-20 years	0.273***	0.276***	0.274***	0.274***
		(0.0891)	(0.0895)	(0.0894)	(0.0899)
	20-30 years	0.371***	0.375***	0.377***	0.377***
		(0.0984)	(0.0988)	(0.0985)	(0.0987)
	30-40 years	0.483***	0.486***	0.485***	0.485***
		(0.128)	(0.128)	(0.128)	(0.128)
	over 40 years	0.474	0.475	0.488	0.488
		(0.315)	(0.316)	(0.308)	(0.308)
Lambda				0.338**	0.336**
				(0.138)	(0.144)
(uncencered) observations		1177	1177	1177	1177
cencered observations		-	-	1721	1721
R-squred		0.253	0.253	0.258	0.258

Note: The robust standard error is given in parentheses. *, **, and *** indicate significance at 10, 5, and 1%, respectively. Specifications include age, age squared, years of education, two types of employment indicators (public sector employee, self-employed), six tenure indicators, seven establishment size indicators, eight industry indicators, six occupation indicators, nine place-of-residence indicators, three urban size indicators, and survey year indicators. OLS indicates the ordinary least-square technique. Heckit indicates the Heckman two-step estimation methods. Non-labor income and number of children were used as exclusive variables for the Heckit method.

Table 4.3. Estimates by the wage equation: SS with IVs

		(1)	(2)
		SS-IV	SS-IV
Married		0.0822	0.0875
		(0.0569)	(0.0631)
Number of children			-0.239
			(0.246)
years of education		0.0216	0.0167
		(0.0138)	(0.0155)
Tenure	1-5 years	0.0762	0.0754
		(0.0739)	(0.0749)
	5-10 years	0.0785	0.0766
		(0.0820)	(0.0839)
	10-20 years	0.287***	0.283***
		(0.0908)	(0.0939)
	20-30 years	0.383***	0.367***
		(0.0994)	(0.101)
	30-40 years	0.497***	0.481***
		(0.130)	(0.133)
	over 40 years	0.514*	0.513*
		(0.306)	(0.301)
Lambda		-0.162	0.116
		(0.203)	(0.275)
		First Stage Wald Statistics	
Endogenous Variables		[P value]	
Married		3.175	2.785
		[0.075]	[0.095]
Number of children			10.02
			[0.001]
uncencered observations		1160	1134
cencered observations		1696	1160
R-squred		-	-
log likelihhod		-1206.18	-1188.55

Note: The robust standard error is given in parentheses. *, **, and *** represent significance at 10, 5, and 1%, respectively. Specifications include age, age squared, years of education, two types of employment indicators (public sector employee, self-employed), six tenure indicators, seven establishment size indicators, eight industry indicators, six occupation indicators, nine place-of-residence indicators, three urban size indicators, and survey year indicators. SS-IV indicates the sample-selection model with instrumental variables. Non-labor income and number of children were used as exclusive variables for the Heckit method. The hyperbolic discounting variable was used as an instrument for the marital status dummy variable, and the number of siblings was used for the number of children.

Table 4.4 Estimates by the wage equation: SS with IVs (1st stage)

	(1)		(2)		
	Pr(LFP)	Pr(married)	Pr(LFP)	Pr(married)	# of children
	Probit	Probit	Probit	Probit	OLS
Age	0.00938	0.527***	0.00423	0.518***	0.282***
	(0.0183)	(0.0413)	(0.0187)	(0.0381)	(0.0160)
Age^2	-0.0436**	-0.566***	-0.0364*	-0.537***	-0.242***
	(0.0201)	(0.0742)	(0.0207)	(0.0600)	(0.0216)
Years of education	0.0436***	0.0415	0.0380***	0.0232	-0.0644***
	(0.0143)	(0.0583)	(0.0146)	(0.0444)	(0.0151)
non labor income	-0.0634***	0.138*	-0.0628***	0.169***	0.0817***
	(0.00635)	(0.0754)	(0.00640)	(0.0576)	(0.0177)
kids	-1.036***	0.253	-1.040***	0.863	1.540***
	(0.0806)	(1.257)	(0.0816)	(0.970)	(0.287)
Hyperbolic discount factor	0.0441**	0.109*	0.0467**	0.0857*	
	(0.0192)	(0.0609)	(0.0194)	(0.0514)	
Number of siblings			-0.0256		0.0554***
			(0.0206)		(0.0175)
Lambda		2.391		1.541	-0.866**
		(1.885)		(1.427)	(0.396)
Observations	2856	1848	2794	1808	1806
log likelihood	-1721.60	-620.23	-1684.62	-606.73	-2225.65

Note: The robust standard error is given in parentheses. *, **, and *** indicate significance at 10, 5, and 1% respectively. The LFP equals unity if an individual is in the labor force. Specifications include age, age squared, years of education, nine place-of-residence indicators, three urban size indicators, and survey year indicators. Non-labor income and number of children were used as exclusive variables for the Heckit method. The hyperbolic discounting variable was used as an instrument for the marital status dummy variable, and the number of siblings was used for the number of children.

Chapter 5

Labor Market Polarization and Nonroutine Unskilled Employment in Japan

Abstract

The study examines the reasons underlying the increase in workers performing nonroutine manual tasks that, while relatively low-skill, require personal interaction responding to a given situation. Focusing on personal services as approximate variables, it seeks to explain the increase in employment in such tasks by focusing on demand-side factors, including long-term demographic trends such as population aging and shrinking household sizes, economic circumstances, and the increase in high skill workers as service demanders. Using household micro-data, the expenditure share on personal services in consumption expenditure, in general, is found to increase with income, is greater the smaller the number of household members, and also tends to be higher for households with a head aged 60 and over. Comparing patterns in 1994 and 2004, demographic changes are important factors determining the expenditure share on services and they have contributed to the increase in the expenditure share on personal services in the case of regular households. Regarding the share of those employed in service occupations at prefecture-level employment in 2007, the employment shares of all personal services and food services tend to be high in regions where household sizes are small and the share of high-skill workers is high. As to differences between 1997 and 2007, demographic factors and the increase in the employment share of high-skill workers - with regard to all personal services and food services - have contributed to increases in the employment share of these services. These results suggest that demographic trends as well as the increase in the share of high skill workers have increased the demand for nonroutine manual personal services in Japan.

5.1 Introduction

Against the background of ongoing computerization and globalization, recent years have seen an increasing polarization in labor markets with regard to the type of tasks involved. Parellel to an increase in the number of workers performing high-skill tasks requiring specialized knowledge and skills and of those performing low-skill manual tasks that are difficult to mechanize, there has been a decrease in the number of workers with moderate skill levels. Seeking to explore this skill-biased technological change (SBTC), Autor, Levy and Murnane (2003; hereafter referred to as ALM) have developed a model that attempts to explain how computer technology changes the demand for labor. To this end, ALM divide workers into five types of task categories based on whether tasks are routine or nonroutine and whether they are intellectual or physical. The five types of tasks they distinguish are: nonroutine analytic tasks, nonroutine interactive tasks, routine cognitive tasks, routine manual tasks, and nonroutine manual tasks. Applying this categorization to data for the United States, they show that, on the one hand, computerization has substituted for and led to a decrease in routine manual and routine cognitive tasks and, on the other hand, has complemented and led to an increase in nonroutine analytic tasks and nonroutine interactive tasks. Studies applying ALM's approach to the United Kingdom and Germany have arrived at similar results.[30]

Focusing on Japan and following the theoretical framework of ALM, Ikenaga (2009) similarly grouped detailed job classifications in the *Population Census* into the five categories of nonroutine analytic, nonroutine interactive, routine cognitive, routine manual, and nonroutine manual tasks (see Table 5.1) and examined employment trends

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[30] Goos and Manning (2007), for example, showed that with respect to the polarization of occupations in the United Kingdom over the past 25 years, the ALM hypothesis has relatively strong explanatory power. Similarly, Spitz-Oener (2006), using the ALM framework, showed that in West Germany, a similar trend could be observed as in the United States, with the spread of the computer in the workplace substituting for workers performing routine manual and cognitive tasks and complementing analytic and interactive tasks.

in these categories as well as the relationship between the introduction of information technology (IT) and those trends. The findings suggested that in Japan, too, the input of labor engaged in knowledge-intensive nonroutine analytic tasks and that engaged in relatively low-skill nonroutine manual tasks such as domestic help, nursing, protective and guarding services has increased, while the input of labor engaged in routine manual tasks has decreased. Moreover, the study indicated that while the introduction of IT capital complements nonroutine analytic tasks and has likely led to an increase in the number of workers performing such tasks, it has substituted for routine tasks.

The patterns suggested when dividing workers into these five task categories thus is that routine tasks tend to be substituted by IT or be outsourced abroad, while among nonroutine tasks, knowledge-intensive high-skill tasks are boosted by the introduction of IT, raising the value added of such tasks. Focusing on changes in tasks and their implications for labor as a factor of production, previous studies have succeeded in explaining many of the trends observed in the labor market. However, what they have not been able to explain is the increase in nonroutine manual tasks. Nonroutine manual tasks such as domestic help, nursing, protective and guarding services, repairs do not require particularly high skills. Instead, they require personal interaction responding to a given situation, and the argument of this study is that in order to explain the increase in such tasks, it is necessary to take demand-side aspects into account, such as the super-aging of society and the decline of household sizes observed.

Given these considerations, the purpose of this study is to empirically examine the reasons for the increase in nonroutine manual tasks focusing on the case of Japan. Using various sources such as the *National Survey of Family Income and Expenditure* and the *Employment Status Survey*, this study employs the above-mentioned classification of tasks into five types and focuses on workers in service occupations[31]

[31] The term "service workers" in the Japanese occupational classification refers to those engaged in personal services and does not include, for example, professionals engaged in business services. Therefore, in order to avoid any confusion, the term "personal services" is employed in Section 5.3.2 when referring to those classified as "service workers."

and their subcategories, which are assumed to represent nonroutine manual tasks, and on professional, technical and managerial workers, which represent the job category coming closest to the definition of (high-skill) nonroutine analytic and nonroutine interactive tasks.

As factors contributing to the increase in the demand for nonroutine manual tasks, demographic trends, economic circumstances, and, representing demanders of personal services, the presence of high-skill workers, who have high opportunity costs, are taken into account, and the following two analyses are conducted.

First, to explore the role of demand for service consumption, its relationship with household characteristics such as income, age of household head, family structure and size is examined using household micro-data. In a next step, using factor decomposition, the reasons underlying intertemporal changes in the demand for service consumption are investigated, focusing on the contribution of demographic trends and economic circumstances. Second, because data that would allow the identification of high-skill workers (e.g., based on their occupation, educational attainment) as demanders of personal services are not available at the household level, prefecture-level data are used to explore the relationship between the level of employment in service occupations on the one hand and regional attributes and the level of high-skill employment on the other. Again, as in the case of the analysis of household data, a factor decomposition is conducted in order to examine intertemporal changes.

The main results of the analysis can be summarized as follows. First, the expenditure share on personal services (and individual subcategories) in consumption expenditure, in general, increases with income. Moreover, for personal services overall and many subcategories, the expenditure share is greater the smaller the number of household members. In addition, expenditure shares also tend to be higher for households with a head aged 60 and over. Comparing patterns in 1994 and 2004, it is found that demographic changes such as population aging, the decrease in household

sizes, and the increase in the proportion of female single-person households are important factors determining the expenditure share on services. These findings suggest that demographic changes have contributed to the increase in the expenditure share on overall personal services and most of the service subcategories in the case of regular households. Moreover, factors that cannot be explained by differences in household characteristics between the two years such as the appearance of new services also cannot be ignored.

Second, regarding the share of those employed in service occupations (all personal services, living-related services, food and beverage preparing and serving services (hereafter referred to as "food services" for brevity) in total prefecture-level employment in 2007, the employment shares of all personal services and food services tend to be high in regions where household sizes are small and the share of high-skill workers is high. Moreover, regarding differences between 1997 and 2007, demographic factors such as the increase in the ratio of those aged 65 and over with regard to living-related services, the decline in household sizes with regard to all personal services and food services, and the increase in the employment share of high-skill workers with regard to all personal services and food services have contributed to increases in the employment share of these services. Overall, the results obtained thus suggest that the increase in workers performing nonroutine manual tasks is due to demographic changes such as the advance in population aging and the decline in household sizes as well as the increase in the employment share of high-skill workers.

The remainder of this study is organized as follows. Section 5.2 provides some basic employment and wage statistics regarding nonroutine tasks. Section 5.3 then presents the empirical analysis examining the demand for personal services using household data as well as the relationship between service sector employment on the one hand and regional characteristics and high-skill employment using prefectural data on the other. Section 5.4 provides a summary and discussion.

5.2 Basic employment and wage statistics regarding nonroutine tasks

To provide some background, this section presents simple employment and wage statistics for the five task categories distinguished by ALM and for broadly-defined service sector industries.

5.2.1 Employment

This section looks at employment trends. Aggregating the detailed occupational classifications of the *Population Census* into ALM's five task categories and set the share of each in total employment in 1985 to 100, it can be seen that nonroutine analytic tasks and nonroutine manual tasks have greatly increased, while routine manual tasks have greatly decreased (Figure 5.1).

Next, employment trends in broadly-defined service industries that cannot be clearly distinguished into skilled and unskilled services are examined. The industries are: information and communication; real estate; eating and drinking places, accommodation, and entertainment; medical health and welfare; education and learning support; business services; laundry, hairdresser, and living-related services; and compound services. Again, setting the share in total employment in 1985 for these industries to 100, it is found that business services[32] and medical health and welfare[33] saw a large increase. On the other hand, laundry, hairdressing, and living-related services, eating and drinking places, accommodation, and entertainment, and education and learning support only saw a negligible increase (Figure 5.2). At a more detailed industry level, industries such as

[32] Looking at more detailed industry classifications, industries that saw an increase are professional services such as legal, accounting, and tax services, as well as building maintenance and cleaning services, protective and guarding services, and labor dispatch services.

[33] A particularly large increase can be observed for the share of those employed in welfare for the aged and nursing services, which has increased more than ten-fold.

garment sewing services and repairs as well as live-in domestic services saw a large decline, while bath services, other laundry, hairdressing, beauty and bath services (including new services such as coin laundries, beauty salons, beauty treatment services, and manicure services) saw a large increase in their employment shares.

5.2.2 Wages

Here, wage trends between 1995 and 2005 using the *Basic Survey on Wage Structure* and classifying occupations into the above-mentioned five tasks are presented. It should be noted, however, that because the job classification in the *Basic Survey on Wage Structure* is not comprehensive, the categories here are not strictly comparable to those for employment based on the *Population Census*. Using the job categories provided in the *Basic Survey of Wage Structure* suggests that wages for nonroutine analytic tasks during the period indicated rose at an annual rate of 0.6 percent (Figure 5.3 and Appendix Table 5.1). In contrast, the wages for nonroutine manual tasks declined at an annual rate of 0.5 percent, whereas employment in these tasks, as indicated above, rose.

Turning to wages by industry (scheduled cash earnings for 1995 and 2007), these tend to be below the level for all industries in manual interpersonal service industries such as eating and drinking places; accommodations; social insurance, social welfare, and nursing services (men); and laundry, hairdressing, beauty and bath services (Figure 5.4). Comparing wages in 1995 and 2007, in many cases, wages in industries where they were already high in 1995 were even higher in 2007, while wages in industries where they were low in 1995 were even lower. Similarly, when looking at rates of increase in real wages, a decrease in wages in the above-mentioned manual personal services can be observed (Figure 5.5).

Thus, summing up, while the employment shares of both knowledge-intensive nonroutine analytic tasks as well as relatively low-skill nonroutine manual tasks increased, wage levels in the latter category, nonroutine manual tasks, in general were

already low and decreased further.

5.3 Empirical analysis

5.3.1 Household-level analysis of the demand for personal services

Nonroutine manual tasks such as domestic help, nursing, protective and guarding services and repairs are tasks requiring personal interaction responding to a given situation. Regarding the demand for such tasks, it is generally thought that this is strongly influenced by household characteristics and changes therein, such as demographic aging, shrinking household sizes, and female employment trends. Factors other than changes in household characteristics – such as the creation of demand through the appearance of new services – are also thought to play a role, and in order to understand trends in the demand for such services and the type of tasks they involve, it is important to examine the extent to which the different factors affect this demand.

To investigate the relationship between expenditures on services that are substitutes for home production activities and household characteristics, Mazzolari and Ragusa (2007), using the United States' Consumer Expenditure Survey, examined the correlation between household expenditure shares on such services and household head education and hourly wage. They show that the more years of education the household head had, the greater was the expenditure share on home services. Moreover, they found that in a regression including all family types (husband/wife families, other families) that there is a positive relationship between the wage of the household head and the expenditure share on home services. However, when running a separate regression for husband/wife families where the wife works, they found that the wage of the household head was no longer significant, while the relationship with the wage of the wife was positive and significant.

To examine the relationship between household characteristics and expenditure

on personal services in Japan, the present study uses household micro-data from the *National Survey of Family Income and Expenditures* for the years 1994 and 2004.[34] The analysis focuses on two-or-more-person households where the household head is a male over the age of 20 (labeled "regular households" reflecting Japanese social norms) and single-person households with a male or female household head aged 20 or over. Variables considered include the age of the household head, the number of children under the age of six, the presence of parents/a parent aged 70 or over, household income, the wife's employment status, and the wife's earned income (if employed).

As dependent variables, the share of expenditure on personal services overall and on subcategories in overall consumption expenditure[35] are used. Individual expenditure items counted as expenditures on personal services are eating out,[36] other domestic services,[37] repair and maintenance,[38] medical and welfare,[39] recreation,[40] hairdressing and beauty services, ceremonial services,[41] and child-related services[42] (regular

[34] Anonymized micro data provided by the Research Centre for Information and Statistics of Social Science attached to the Institute of Economic Research at Hitotsubashi University are used. In the analysis, only observations for households with no blank month(s) in their household account books (regular households: the three months from September to November) and singles (the months of October and November) are used and outliers (±4 standard deviations from the mean in terms of income and consumption; households with a negative income) are excluded. See Takayama (1992) and Takezawa and Matsuura (1998) for details on how the micro-data of the *National Survey of Family Income and Expenditure* should be employed.

[35] Consumption expenditure is calculated as follows: Consumption expenditure = consumption expenditure in the *National Survey of Family Income and Expenditures* – remittances + imputed rent + benefits in kind.

[36] Ordinary eating out and (only for single person households) charges for board.

[37] Domestic help; sewage and disposal charges (for 2004, bulky waste disposal fees and other cleaning); charges for repairs of furniture and other domestic utensils; charges for tailoring and repair of garments and footwear; laundry charges; and charges for door-to-door delivery services.

[38] Home-related repairs and maintenance costs, automotive maintenance and repairs, charges for repairs of recreational durables; charges for repairs of recreational goods; and services related to personal effects.

[39] Medical services and (only for 2004) nursing care services.

[40] Recreational services and (only for 2004) veterinary services.

[41] Religious and ritual expenses; wedding ceremony-related expenses, funeral service-related expenses, other ceremonial expenses.

households only), and the sum of these is taken as expenditure on personal services overall.

Independent variables are defined as follows. Regarding household characteristics, the household income[43] bracket and the household head age bracket are used. In addition, for regular households, the number of household members, the number of children under the age of six, a dummy indicating the presence of a parent aged 70 or over, dummies for the employment status of the wife of the household head (not employed (reference group), non-part-time, part-time), and interaction terms of the dummies for the employment status of the wife and the wife's employment income are included. In addition, for single-person households, a gender dummy for the household head is used. Furthermore, district dummies (Hokkaido/Tohoku (reference region), Kanto, Hokuriku/Tokai, Kinki, Chugoku/Shikoku, Kyushu /Okinawa) are employed.

With regard to the expenditure share on personal services overall, we would expect variables to have the following signs:

- *Income*: A positive sign is expected because expenditures on services (except for medical and welfare services) represent discretionary expenditures and because the opportunity cost of self-production of services is assumed to be higher with higher (earned) income.
- *Number of household members*: The more hands there are in the household, the more likely it is that services will be produced within the home; hence, a negative sign is expected.
- *Wife's employment status*: If the wife is employed (especially non-part-time), her opportunity cost will be high, raising the likelihood that services will be purchased; hence, a positive sign is expected.

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[42] Tutorial fees and nursery fees.

[43] Income = Receipts – non-consumption expenditures – insurance premium payments – repayment of loans + imputed rent + gifts

- *Regional dummies*: The utility and availability of services is likely to depend on regional characteristics; hence, the sign may either be positive or negative, depending on the region.

Moreover, the demand with regard to specific service categories is likely to depend on age, the existence of family members needing care (i.e., the number of children under the age of six and or the presence of parents/a parent aged 70 or over), and, in the case of single-person households, the gender of the household head.

5.3.1.1 Expenditure shares on personal services in 1994 and 2004

The relationship between household characteristics and the expenditure share is estimated using ordinary least squares (OLS) and the results for personal services overall for regular households for 1994 and 2004 are shown in Tables 5.2(a) and Table 5.2(b) respectively.

Regarding the expenditure on personal services overall, the coefficients on income are positive and significant in all cases, with larger coefficients for higher income brackets, while that on household size is negative and significant. Next, looking at age brackets, the coefficients are significant in all cases except one, and the expenditure share for those in their 30s, 40s, and 50s tends to be lower and that for those in their 60s and over tends to be higher than that for those in the 20s.

Next, the regression exercise is repeated using each of the personal service subcategories as the dependent variable. Focusing on the role of income first, the results indicate that the expenditure shares on recreation, repair and maintenance, and ceremonial services tend to rise with income. For 1994, the expenditure shares on medical and welfare and hairdressing and beauty services tend to remain unchanged irrespective of the income bracket from a certain income level, while for 2004 those shares do not show a significant relationship with income. Finally, the expenditure

shares on eating out and other domestic services tend to rise up to a certain income bracket, but after that decrease somewhat, although for the top income brackets, no clear pattern can be discerned.

Looking at the role of family structure, other than with regard to child-related services, a greater number of household members tends to be associated with a lower expenditure share on services. The result with regard to child-related services can be explained by the fact that, because the number of household members includes the number of children, this raises the expenditure share on such services. Furthermore, if there are children below the age of six or parents/a parent aged 70 or over, this tends to raise the expenditure share on other domestic services, repairs and maintenance, and medical and welfare services. Looking at the role of the age of the household head, with the exception of eating out and child-related services, the expenditure share tends to be greatest for those in their 60s and 70s.

Turning next to the wife's employment status, if the wife works – either non-part-time or part-time – this tends to go hand in hand with a higher expenditure share on child-related services and ceremonial services and a lower expenditure share on recreational services and medical and welfare services. The lower expenditure shares can be explained by the time constraints on working wives and that the wife herself and family members being healthy would allow the wife to work outside the home. Regarding the role of the wife's employment income, a positive relationship is generally observed with respect to the expenditure share on eating out, child-related services, and personal beauty care. On the other hand, a negative relationship with respect to medical and welfare as well as ceremonial services is found, which is difficult to interpret.

The results for single-person households are shown in Tables 5.2(c) and 5.2(d). Looking at personal services overall, as in the case of regular households, the expenditure share on services significantly increases with household income, but in contrast with regular households, the expenditure share on services is highest for those in

their 20s, reaches a bottom for those in their 40s and 50s, and then increases somewhat but remains below the level of those in their 20s. Another finding is that the expenditure share on services is lower for female than for male single-person households.

Next, looking again at individual service categories, the relationship with income is similar to that for regular households, with the expenditure shares on recreational services, repairs and maintenance, and ceremonial services generally rising with income. On the other hand, there appears to be no clearly discernable relationship between the income level and the expenditure share on medical and welfare, hairdressing and beauty services, and eating out (with the exception of 2004 for eating out), while the expenditure shares on other domestic services (in both years) and on eating out (in 2004) increase up to a certain income bracket but then decreases slightly. Again, for high income earners, the pattern becomes somewhat irregular.

Regarding the role of age, as in the case of regular households, the expenditure share on eating out decreases with age, while that on other domestic services, repairs and maintenance, medical and welfare services, and ceremonial services is highest for those in their 60s or 70s. However, in contrast with regular households, the expenditure share on recreational services of those 60 and over is lower than that of those in their 20s. Moreover, there are notable differences in the expenditure patterns of male and female single-person households, with women spending less on eating out and recreational services than men, but spending more on medical and welfare services as well as hairdressing and beauty services.

Summing up these findings, the major pattern is that the expenditure share on services tends to increase with income (although there are cases where it peaks out at a certain income level) and, in the case of regular households, tends to decrease with the number of household members. The expenditure shares of those 60 and over in most cases are higher than those for other age brackets.

5.3.1.2 Comparison between 1994 and 2004

The difference in expenditure patterns between 1994 and 2004 can be decomposed into differences due to changes in household characteristics between the two years in terms of their age structure, income structure, changes in household size, etc., and differences due to other factors. Regarding changes in household characteristics, potential factors include long-term demographic trends such as population aging and shrinking household sizes as well as economic developments affecting households' economic circumstances such as cross-sectional income structures as a result of temporary cyclical trends. Other factors apart from those affecting households include the appearance of new services between the two years, changes in the utility function, and other variables that are not considered in this study. Against this background, the purpose of the present section is to decompose changes in the demand for personal services into those resulting from various changes in household characteristics and those due to other changes. This is done using the following Blinder-Oaxaca decomposition:[44]

$$\overline{SER_i}^{2004} - \overline{SER_i}^{1994} = [E(X_{2004}) - E(X_{1994})]'\beta^* + [E(X_{2004})'(\beta_{2004} - \beta^*) + E(X_{1994})'(\beta^* - \beta_{1994})]$$

where $\overline{SER_i}^{2004}$: Ratio of expenditure on service *i* in 2004;

$\overline{SER_i}^{1994}$: Ratio of expenditure on service *i* in 1994;

X is a vector of independent variables and a constant; and

β is a vector of coefficients and the intercept.

The first component ($[E(X_{2004}) - E(X_{1994})]'\beta^*$) on the right-hand side is the part of the outcome differential that is "explained" by group differences between household groups in the two years, while the second summand ($[E(X_{2004})'(\beta_{2004} - \beta^*) + E(X_{1994})'(\beta^* - \beta_{1994})]$) shows the differences resulting from other factors. β^* is assumed to be the benchmark coefficient and there is little reason

[44] See Jann (2008) for details.

here a priori to choose one over the other. Therefore, the coefficients from the pooled regression for year groups are used as an estimate for β^*.

Comparing the household data for 1994 and 2004 for regular households, an increase in the expenditure share on personal services can be observed (basic statistics for these variables are provided in Appendix Table 5.2(a)). Moreover, reflecting the aging of Japan's population, there are more older heads of household. In addition, household sizes have decreased, the number of children under the age of six has also decreased, and the proportion of households in the upper income brackets has fallen.

As the results of the decomposition for regular households (Table 5.3(a)), looking at personal services overall, demographic factors, i.e., population aging and the shrinking of household sizes, together made a positive contribution of almost 0.5 percentage points (i.e., more than 40 percent) to the increase in the expenditure share, while economic circumstances (i.e., the decrease in the share of high income bracket households) made a negative contribution of a comparable size. Looking at individual service categories, with the exception of eating out and child-related services, demographic factors made a positive contribution to the increase in the expenditure share. Depending on the type of service concerned, the direction of the contribution of population aging, the shrinking of household sizes, and the decrease in the number of children under six differs, but nearly all the coefficients are highly significant. The reason that, with regard to eating out, demographic changes make a negative contribution is that the negative impact of population aging is large and outweighs the contribution of the decrease in household sizes and the number of children. Except with regard to eating out and child-related services, population aging made a positive contribution to the increase in service expenditures, while the decrease in household sizes also made a positive contribution except in the case of expenditures on child-related services. The contribution of the decrease in children under six is relatively small when compared with other demographic factors; moreover, the direction of its impact differs for the different

service categories and the effect on the expenditure on services overall consequently is insignificant.

Turning now to the contribution of factors other than differences in household characteristics between the two years, this is quite sizeable in the case of the expenditure shares on eating out, other domestic services, medical and welfare services, recreation, and child-related services. While the underlying reasons for the observed changes are a matter of conjecture, it seems likely that the substantial increase in the expenditure share on medical and welfare services is at least partly related to the introduction of nursing care insurance in April 2004.[45] On the other hand, in the case of domestic services, the negative contribution of other factors may reflect the fact that certain categories such as home helper services that in 1994 had been classified under domestic services fell under the medical and welfare services heading in 2004. Finally, it can be conjectured that with regard to eating out, recreation, and child-related services, new services were introduced.

Turning now to single-person households and comparing again 1994 and 2004, it turns out that the expenditure share on personal services of these households actually declined (see Appendix Table 5.2(b)). Further comparison between 1994 and 2004 shows that, as in the case of regular households, the proportion of older households has increased. In contrast with regular households, however, the proportion of single-person households falling into the upper income brackets has increased. Moreover, there has also been an increase in the share of female single-person households.

The Blinder-Oaxaca decomposition for single-person households is presented in Table 5.3(b). This shows that population aging and the increase in the proportion of female households both lowered the expenditure share on personal services overall. As seen in Section 5.3.1.1, female and older person households tend to spend less on eating

[45] The introduction of nursing care insurance increased the variety of care services available. Moreover, because the use of covered nursing care services involves a copayment, this is likely to have led to an increase in the expenditure on medical and welfare services.

out and recreation, and the increase in the proportion of such households in single-person households overall due to demographic trends consequently has made a substantial contribution to the decrease in the expenditure share on these services as well as personal services overall. In contrast, with regard to other service categories, these demographic trends contributed to an increase in the expenditure share. The coefficients on age of head and female head are positive and highly significant in most cases. Looking at the contribution of factors other than differences in household characteristics between the two years, this is negative for personal services overall and, in contrast with the result for regular households, also for eating out. On the other hand, the contribution of other factors is positive for medical and welfare services, which again likely reflects the introduction of the nursing care insurance scheme.

In the preceding analysis, actual income was considered to be households' opportunity cost on service expenditure. Strictly speaking, however, rather than realized income, the opportunity cost is the income that would be earned if the person were to be employed in the labor market. Consequently, as a robustness check , the estimations were repeated using, instead of income, an alternative measure for households' economic circumstances to represent expected income in the labor market, namely, the unemployment rate for each age bracket, sex and district.[46] The results, presented in Appendix Table 5.3, are consistent with the estimations using income, except that the effect of population aging tends to be smaller.

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[46] In order to represent the employment environment individuals faced as accurately as possible, detailed unemployment rates are calculated by age bracket, by sex and by district for 1994 and 2004 as follows. The unemployment rate by age bracket and by sex for 1994 and 2004 is multiplied by the ratio of the unemployment rate for each district to that for all Japan. In the case of regular households (only men), the unemployment rate by year, by age bracket, and by district (2×6×6=72), and in the case of single-person households, the unemployment rate by year, by sex, by age bracket, and by district (2×2×6×6=144) is applied to the individual micro-data. Moreover, because those over 60 are assumed to have exited the labor force due to retirement, interaction terms both with a dummy variable for those under 60 and those aged 60 or over are used.

Summarizing the above results, demographic trends such as population aging, shrinking household sizes, and the increase in the proportion of female households (among single-person households) explain much of the change in expenditure shares on personal services overall and individual service categories, although there are some exceptions. In the case of regular households, these demographic trends in most cases – including personal services overall and many subcategories – have led to an increase in the expenditure share on such services. Moreover, among regular households, the decrease of the proportion of those in higher income brackets has led to a decrease in the expenditure share. As for factors other than differences in household characteristics between the two years, unobserved variables - possibly the introduction of the nursing care insurance scheme, the appearance of new services - to a considerable degree have also contributed to changes in expenditure patterns.

5.3.2 Regional characteristics, high skill employment and personal services employment

Section 5.3.1 suggested that households' expenditure share on personal services increases with income as the opportunity cost for those with higher income is greater. Another way to look at the relationship is from the perspective of comparative advantage, which again would suggest that high skill workers spend more on personal services. Because the household-level data employed in Section 5.3.1 do not contain information on the skill level such as job type or educational attainment of service demanders, this section attempts to gauge the effect of high skill employment on service demand using aggregate data. Specifically, the relationship between regional characteristics and high skill employment within the region on the one hand and employment in personal service occupations on the other is examined. The underlying reasoning is that nonroutine manual tasks tend to be of a form that requires direct contact with the final demander, i.e., such tasks typically require physical proximity, and that, since such tasks are labor

intensive and productivity growth is low, an increase in (local) demand is likely to directly translate into an increase in employment.

Previous studies for other countries have shown that there is a positive relationship between the proportion of high skill workers within a particular region and low skill workers engaged in tasks that substitute for home production. Manning (2004), for example, developed a model in which the demand for low skill workers, many of whom are engaged in "housework" services that are not tradable across regions, depends on the presence of high skill workers within the region and, using data for U.S. cities, showed that physical proximity to high skill workers raises the employment of low skill workers. Moreover, Mazzolari and Ragusa (2007), taking up the work of Manning, developed a theoretical model of individuals' utility maximization under time and budget constraints (see the Appendix for details of their model). Since skilled workers have a comparative advantage in areas other than "housework" production tasks, the fraction of unskilled workers employed in the "housework" sector – non-tradable time-intensive services that can be broadly thought of as substitutes for home production activities - should increase with the demand for home goods. Based on this model, given that the demand for home goods is higher in cities with a higher proportion of skilled individuals in the workforce, they predict that the fraction of unskilled workers employed in home services is increasing in the share of skilled workers in the city. In order to test their model, Mazzolari and Ragusa, using data for U.S. cities, look at the shares of university graduates and unskilled labor (high school drop outs) and find that at the city level, a higher share of skilled individuals in the workforce is associated with a higher fraction of unskilled workers employed in "home services".

Employing this theoretical framework and using prefecture-level data[47] in the

[47] A somewhat problematic issue in this context is how to appropriately define regions to reflect the idea of vicinity to service demanders. Analyzing employment structures at the regional level, Zhou (2007), for example, reaggregates municipal data of the *Population Census* into regions based on the concept of Urban Employment Areas which consider regional links in terms of daily economic activity, employment, and interaction within and between sub-areas as well as the commuter ratio. Applying the above-mentioned theoretical framework using regional data with vicinity defined in this way remains a task for future research.

Employment Status Survey this section examines the relationship between the ratio of personal services employment (personal services overall and the subcategories of living-related services[48] and food and beverage preparing and serving services (hereafter referred to "food services" for brevity)[49]) to the employed on the one hand and regional characteristics (demographic patterns, income, etc.) and that of employment in professional, technical and managerial services (representing high skill workers) on the other. Although personal services overall and food services include activities that cannot really be considered to be home services, if we define home services only as living-related services, the range of services considered would probably be too limited. Thus, following Mazzolari and Ragusa (2007), personal services overall and food services are included in the investigation.

Let us start the analysis by looking at the correlation between the ratio of professional, technical and managerial workers and the personal services employment ratio overall for 1992, 1997, 2002, and 2007, and for the pooled data. Doing so, it turns out that the correlation for personal services employment overall is significant and positive for the cross-section data for each of these years as well as for the pooled data (Table 5.4(a)). In addition, an examination of individual service categories shows that while the correlation with the ratio of those employed in living-related services in the cross-section data for individual years is insignificant, it is significant and positive in the pooled data. What is more, the correlation with food services is generally significant and

[48] Living-related services include family-life supporting services (housekeepers and maids, home helpers, etc.) and personal sanitary services (hairdressers and beauticians, bathhouse workers, laundry and dry cleaners, etc.).

[49] Food and beverage preparing and serving service workers include cooks, bartenders, serving workers; servants, waiters and waitresses (in lodging facilities, transportation, etc.); barmaids, club hosts and hostesses, geisha and dancers ; recreation and amusement park workers; masters, managers and *banto* (attendants) of hotels; etc. Workers in personal services overall, in addition to those engaged in living-related services and food and beverage preparing and serving services, include superintendents of residences and buildings, those employed in other service occupations (travel attendants, temporary keepers, commodity lessors, advertising workers, undertakers and crematory workers, and others). Because the subcategories of living-related services and food and beverage preparing and serving services were not available for 1992, the data for this year are calculated using their proportion to total services in 1997.

positive in the cross-section data for individual years as well as in the pooled data.

Next, using the employment share in personal services and in the subcategories as the dependent variable and regional characteristics and the skilled employment share as explanatory variables, the relationship between these variables using the cross-sectional data for 1997 and 2007 is examined. Specifically, the following independent variables are used. As for variables related to demographic characteristics,[50] the population share of those 65 and over, the number of family members per household, and the population share of children under 8 years of age[51] are included. Regions' economic characteristics are represented by per capita prefectural income[52] and, standing for high skill workers, the employment share of those engaged in professional, technical and managerial occupations and the ratio of university graduates in the population aged 15 and over. Finally, the ratio of employed women (15-64 years old) is also included.

The estimation results for 1997 and 2007 are shown in Table 5.4(b). Although there are relatively few significant coefficients when compared with the analysis of household data in Section 5.3.1, the results nevertheless paint a similar picture. For example, for personal services overall, the coefficient on the number of household members is significantly negative for both years, while the coefficient for professional, technical and managerial workers is significant and positive for 2007. Moreover, for 2007, for living-related services, the coefficient on the ratio of those aged 65 and over is positive and significant at the 10 percent level, while for food services, the coefficient on that variable is significantly negative. On the other hand, the coefficients on per capita prefectural income and the ratio of employed women are mostly insignificant. Finally, although there are a couple of cases where the coefficient on the ratio of university

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[50] Demographic data were obtained from the *Population Census* for 1995 and 2005.

[51] Since age brackets in the *Population Census* are divided into 0-4 year-olds and 5-9 year-olds, in order to obtain an age bracket close to that of "under 6 years" used in Section 3.1, figures for "under 8 years of age" were constructed by dividing figures for the "5-9 year-olds" by two and adding the result to the figures for the "0-4 year-olds" bracket.

[52] Data were obtained for 1997 and 2005.

graduates, contrary to expectations, is significantly negative, rather than any relationship between personal services employment shares and demand from the population of university graduates, this likely reflects the fact that personal service employees themselves have relatively low academic achievement and therefore the ratio of the more educated is likely to be lower in areas where the ratio of personal services workers is higher.

Turning now to the comparison of 1997 and 2007, a clear increase in the share of workers employed in personal services can be observed (see Appendix Table 5.4). Moreover, there has been an increase in the ratio of those aged 65 and over and the ratio of professional, technical and managerial workers, while the number of household members, the ratio of children under 8, and per capita prefectural income all decreased.

The contribution of these different changes to the increase in the share of services employees is examined conducting again the Blinder-Oaxaca decomposition, with the results displayed in Table 5.4(c). They show that with regard to personal services overall and living-related services, demographic trends made a significant positive contribution to the increase in the employment shares of these services. Population aging made a significant positive contribution to living-related services employment and a significant negative contribution to food services employment. Moreover, both the decline in the number of household members and, of particular interest here, the increase in the ratio of professional, technical and managerial workers made a significant positive contribution to the employment shares of personal services overall and food services. At the same time, the decrease in per capita prefectural income did not have a significant impact on employment shares.

Summarizing the results with regard to the relationship between regional personal service employment ratios and the ratio of skilled workers, the cross-section data for 2007 suggest that in regions where the ratio of professional, technical and managerial workers is high, the shares of those employed in personal services overall and in food

services are also high. Moreover, the comparison between 1997 and 2007 showed that the increase in the ratio of professional, technical and managerial workers made a positive contribution to the increase in the employment shares of services overall and food services.

Finally, again as a robustness check, the Blinder-Oaxaca decomposition was repeated using the job applicant ratio by prefecture (calculated as: non-employed job applicants/ (non-employed job applicants + employed persons)) representing local employment conditions instead of per capita prefectural income as a proxy for opportunity costs. The results were generally consistent with those obtained when using per capita prefectural income (see Appendix Table 5.5).

5.4. Summary and discussion

The aim of this paper was to examine the reasons underlying the increase in workers performing nonroutine manual tasks that, while relatively low-skill, require personal interaction responding to a given situation. Approximating such tasks by focusing on workers in personal services, the analysis sought to explain the increase in employment in such services by focusing on demand-side factors, including long-term demographic trends such as population aging and shrinking household sizes, economic circumstances such as households' and regional income as a result of temporary cyclical trends, and the increase in high skill workers as service demanders.

The findings can be summarized as follows. First, regarding the demand for personal service consumption, it was found that households' expenditure on personal services (as well as individual subcategories) tends to rise with income and is inversely related to household size. Moreover, although there are exceptions, the expenditure share on such services is typically highest for households with a head aged 60 or over. Comparing 1994 and 2004, it was found that the expenditure share on personal services has increased for regular households and decreased for single-person household. The

decomposition analysis showed that demographic factors such as population aging, the decrease in household sizes, and the growing share of female single-person households all significantly contributed to these changes. Moreover, demographic trends tended to raise the expenditure shares on most subcategories and personal services overall in the case of regular households. At the same time, factors other than changes in household characteristics not included in the analysis (such as the appearance of new services) cannot be ignored.

Second, regarding the relationship between employment in personal services on the one hand and regional characteristics and high skill employment on the other, the cross-section analysis found that, both in 1997 and 2007, the employment shares of personal services overall and food services were higher in regions with smaller household sizes. In addition, a positive association between the employment shares of these services and the ratio of high skill workers was found for 2007. Furthermore, the decomposition analysis examining the contribution of various factors to the increase in the employment share of services suggested that the increase in the ratio of those aged 65 and over contributed to employment in living-related services, while other demographic factors such as the decrease in household sizes contributed to an increase in the employment shares of personal services overall and food services. Finally, the increase in the ratio of high skill workers contributed to the increase in the employment share of personal services overall and food services.

Overall, therefore, the results suggest that demographic trends such as the aging of the population and shrinking household sizes, as well as the increase in the share of high skill workers, have increased the demand for nonroutine manual personal services in Japan.

As seen earlier, the increase in employment in nonroutine manuals tasks and personal services in recent years has gone hand-in-hand with a stagnation in the wages for such tasks and services. In this context, an interesting model is the one developed by

Autor, Katz and Kearney (2006), which shows that the effect of the falling price of computer capital on the wages for (low-skill) nonroutine manual tasks is ambiguous due to the presence of two offsetting mechanisms. The first is the possible q-complementarity between routine tasks and nonroutine manual tasks – i.e. a rise in routine input that is met by an increase in computer capital spurred by its price decline would raise the marginal productivity of nonroutine manual tasks and hence wages for such tasks, although such effects are likely to be smaller than in the case of nonroutine analytic and interactive tasks. The second is the additional labor supply for nonroutine manual tasks from workers displaced from routine tasks, which would lower the wages for nonroutine manual tasks. In addition, Mazzolari and Ragusa (2007), examining the wages of unskilled workers, found evidence of a positive association between relative wage growth at the top of the wage distribution and relative wage growth at the bottom, whose magnitude is increasing with the fraction of low-wage workers employed in home services. These studies raise very important issues to address with regard to developments in Japan, too, such as whether the increased demand for personal services results in an increase in wages, which would contribute to a decrease in wage differentials, or whether it induces an influx of labor from other sectors, which would keep wages from rising. Examining developments in the supply and the wages of workers performing relatively low-skill nonroutine manual tasks is an important topic for future research.

References for Chapter 5

Autor, David, Frank Levy and Richard J. Murnane (2003), "The Skill Content of Recent Technological Change: An Empirical Exploration", *Quarterly Journal of Economics,* 118(4), November, pp.1279-1333.

Autor, David, Lawrence Katz and Melissa Kearney (2006), "The Polarization of the US Labor Market", *American Economic Review,* 96:2, pp.189-194.

Goos, Maarten and Alan Manning (2007), "Lousy and Lovely Jobs: The Rising Polarization of Work in Britain" *Review of Economics and Statistics,* 89 (February), pp.118-33.

Ikenaga, Toshie (2009), "Polarization of the Japanese Labor Market – Adoption of ICT and changes in tasks required (in Japanese: Roudou shijyou no nikyokuka- IT no dounyu to gyoumu naiyou no henka ni tsuite)", *The Japanese Journal of Labour Studies*, No.584, pp. 73-90

Jann, Ben (2008), "A Stata implementation of Blinder-Oaxaca decomposition", ETH Zurich Sociology Working Paper No.5

Manning, Alan (2004), "We Can Work It Out: The Impact of Technological Change on the Demand for Low-Skill Workers", *Scottish Journal of Political Economy,* Vol. 51, No.5 (November), pp.581-603.

Mazzolari, Francesca and Giuseppe Ragusa (2007), "Spillovers from High-Skill Consumption to Low-Skill Labor Markets", IZA Discussion Paper No.3048

Spitz-Oener, Alexandra (2006), "Technical Change, Job Tasks, and Rising Educational Demands: Looking outside the Wage Structure" *Journal of Labor Economics,* Vol. 24, pp.235-70.

Takayama, Noriyuki (1992), *Stock Economy* (in Japanese), Toyo Keizai Inc.

Takezawa, Yasuko and Katsumi Matsuura (1998), "Empirical analysis of consumption function for the Japanese household: Micro data analysis (in Japanese: Wagakuni kakei no shouhikansuu no jisshou bunseki: Micro data ni yoru bunseki), *Journal of political economy and commercial science,* Vol. 178, No.5 pp.79-97.

Zhou, Yanfei (2007), "Regional structure of unemployment and employment rates in view of Urban Employment Area (in Japanese: Toshikoyouken kara mita shitsugyou shugyouritsu no chiikiteki kouzou)", *A new tide in regional job creation* (in Japanese: Chiiki koyou soushutsu no shin chouryu), Japan Institute for Labour Policy and Training, pp.56-80.

Table & Figures

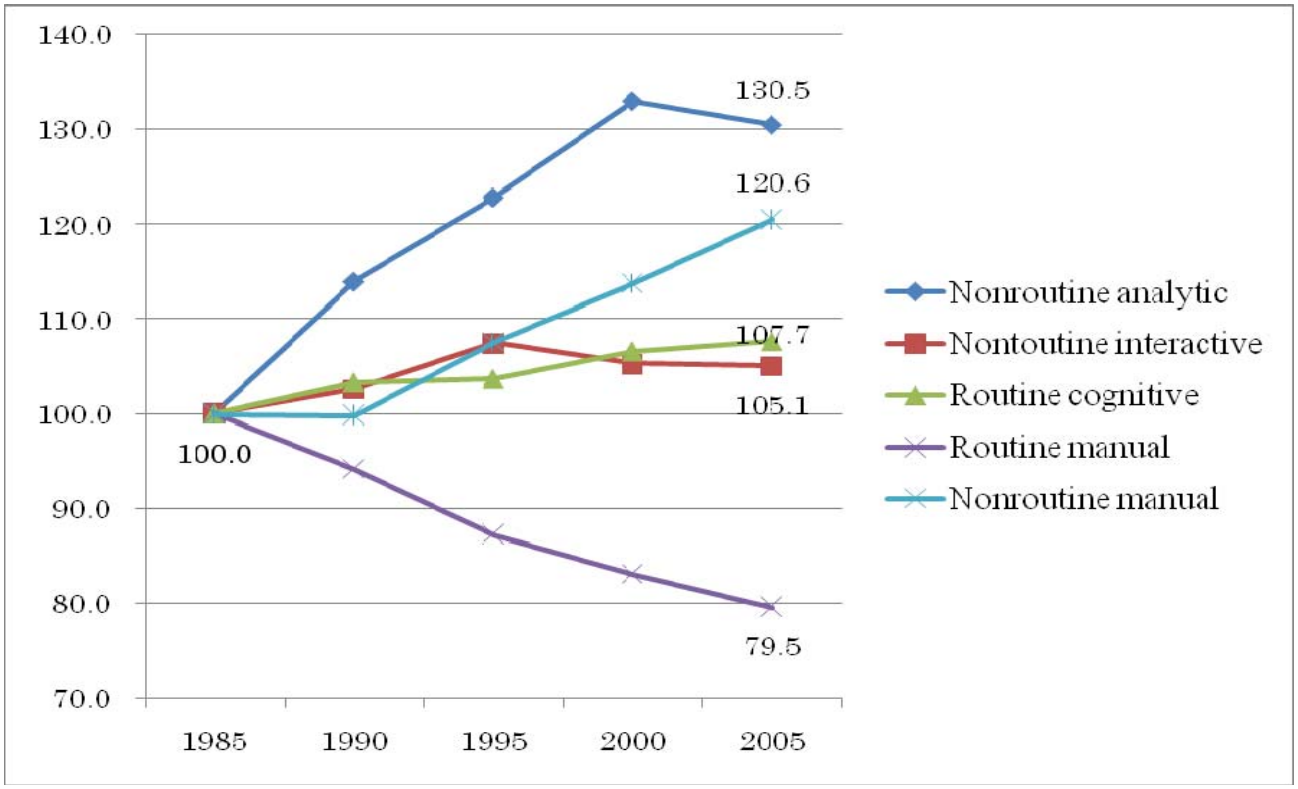
Table 5.1 Definitions of five task measures

Category	Definition	Key words	Example tasks	Implications of previous studies
Nonroutine analytic tasks	Problem solving with high-level expertise and abstract thinking, including researching, analyzing, planning, designing	Mathematics, science, logical thinking and analyzing	Research, investigation, design	Increase through the need for creating higher value added (+) Complementary to IT (+)
Nonroutine interactive tasks	Creating value with high-level personal communication, including negotiating, coordinating, teaching, training, selling, advertising, presenting, directing or managing, leading or instructing or consulting	Coordinating with others, social perceptiveness, active listening, speaking, **persuasion, negotiation**	Legal, control and management, consulting, education, art, performance, sales and marketing	Increase through the need for creating higher value added (+) Decrease through flatter organizations?(-)
Routine cognitive tasks	Clerical work requiring precise attainment of the predetermined standards, including calculating, measuring, monitoring, data-processing, dealing with customers	Operation and control, operation monitoring	Clerical staff, desk work, accounting, monitoring and inspection	Substitutable by IT (-), Increase in white-collar jobs (+)
Routine manual tasks	Physical work requiring rapid and accurate attainment of predetermined standards, including regular and repetitive production work by hand or by operating and controlling machines	Operation and control, operation monitoring , troubleshooting	Agricultural, forestry and fisheries, manufacturing	Substitutable by IT (-), Affected by global competition (-)
Nonroutine manual tasks	Physical work not requiring a high-level of expertise but a flexible response depending on circumstances	Coordination with others, social perceptiveness, active listening, speaking, **service orientation**	Service, entertainment, beautician, security, driving transportation machinery, repairing or renovating	Not fully substitutable by machines Increase through demographic factors such as aging? (+)

Source: Ikenaga (2009), Table 3.

Figure5.1 Trends in tasks measured in labor inputs

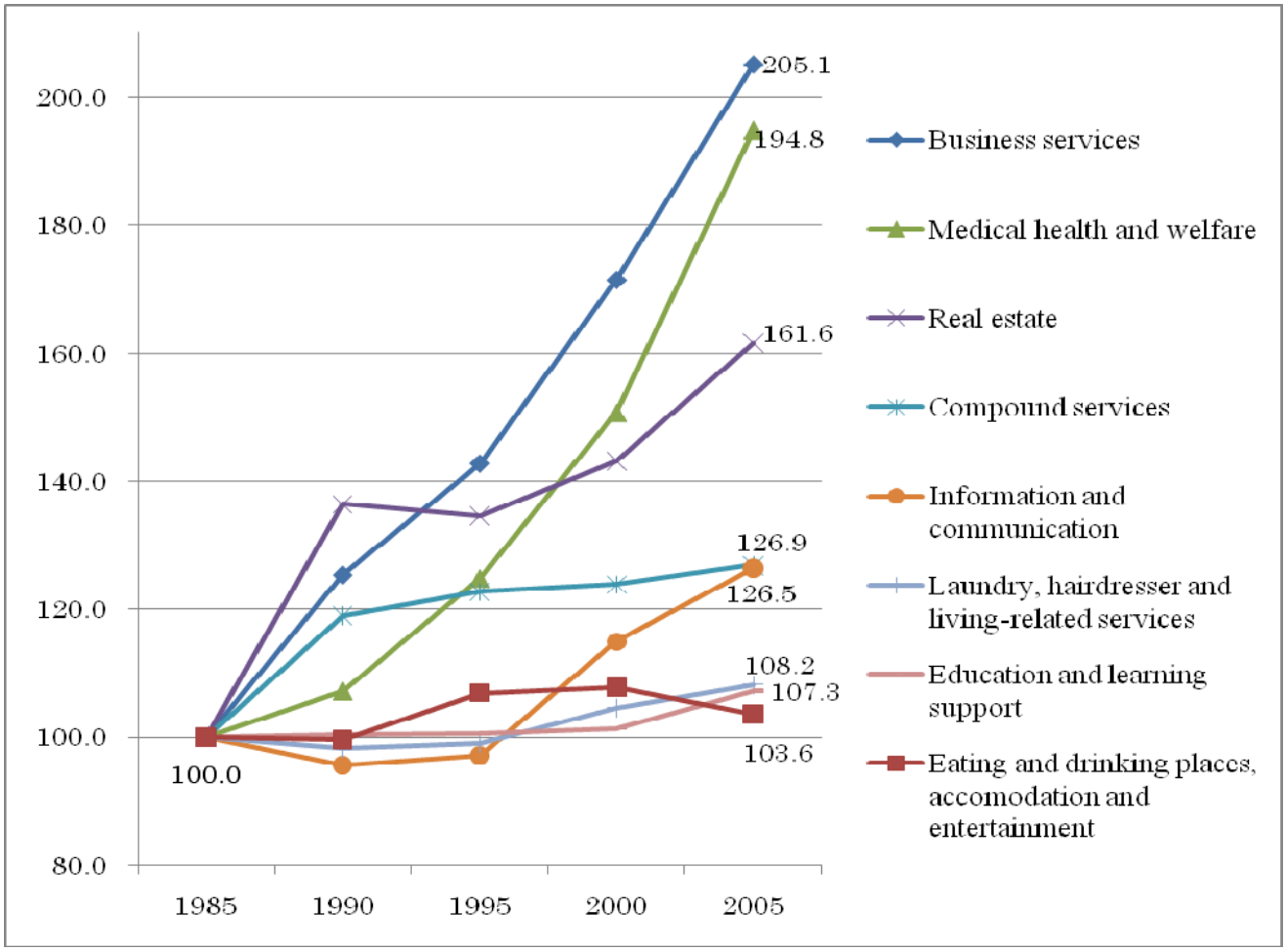
(Shares in total employment in 1985 as 100)



Source: Population Census

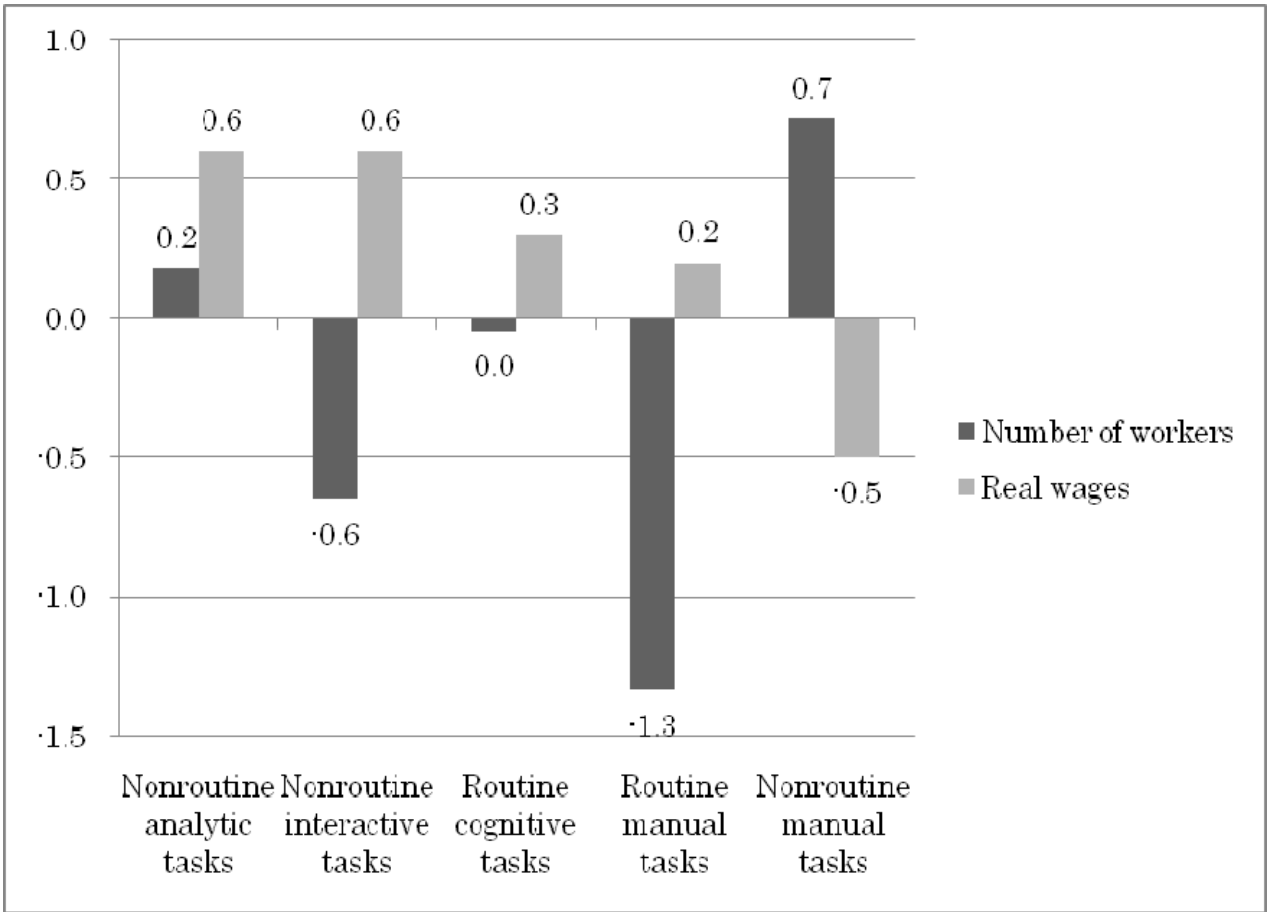
Figure5.2 Trends in service industry employment

(Shares in total employment in 1985 as 100)



Source: same as Figure 5.1

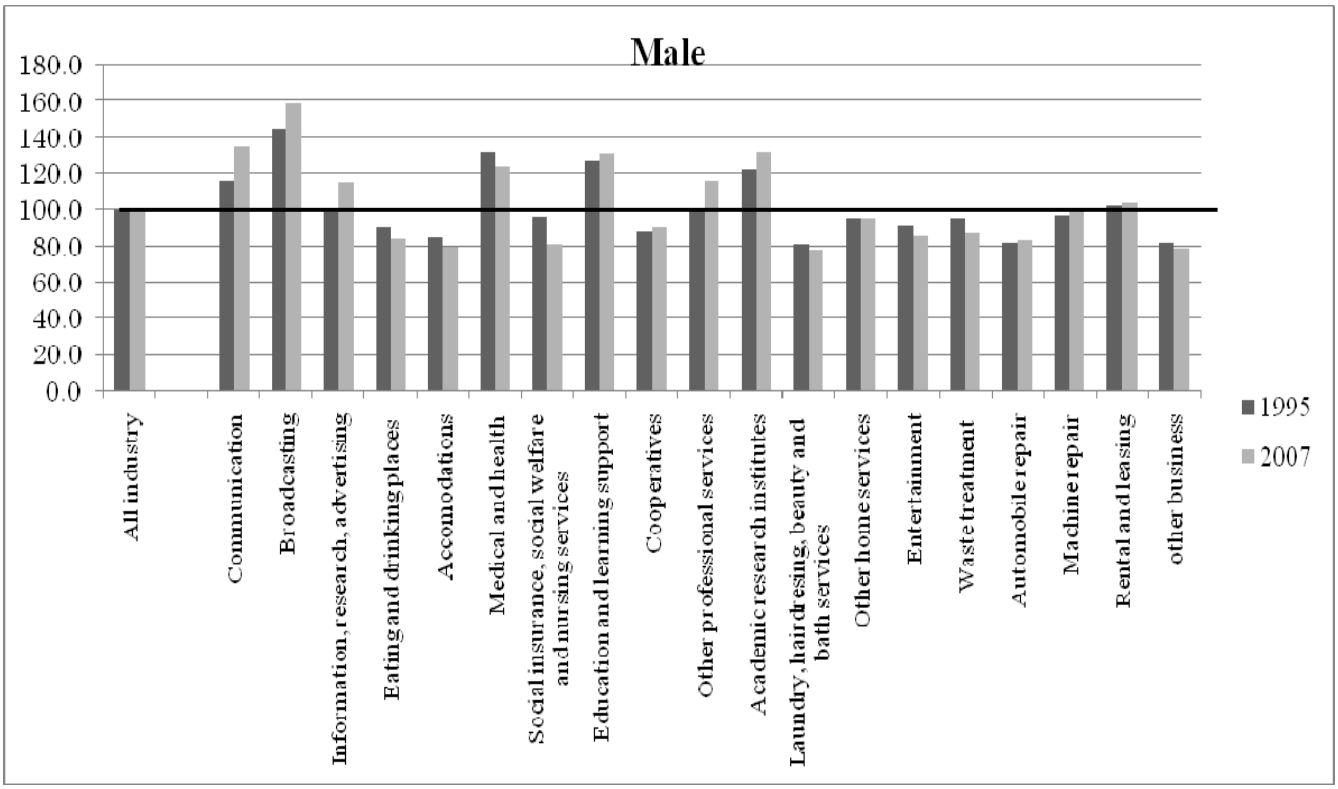
Figure 5.3 Annual changes in number of workers and real wages between 1995 and 2005 (%)

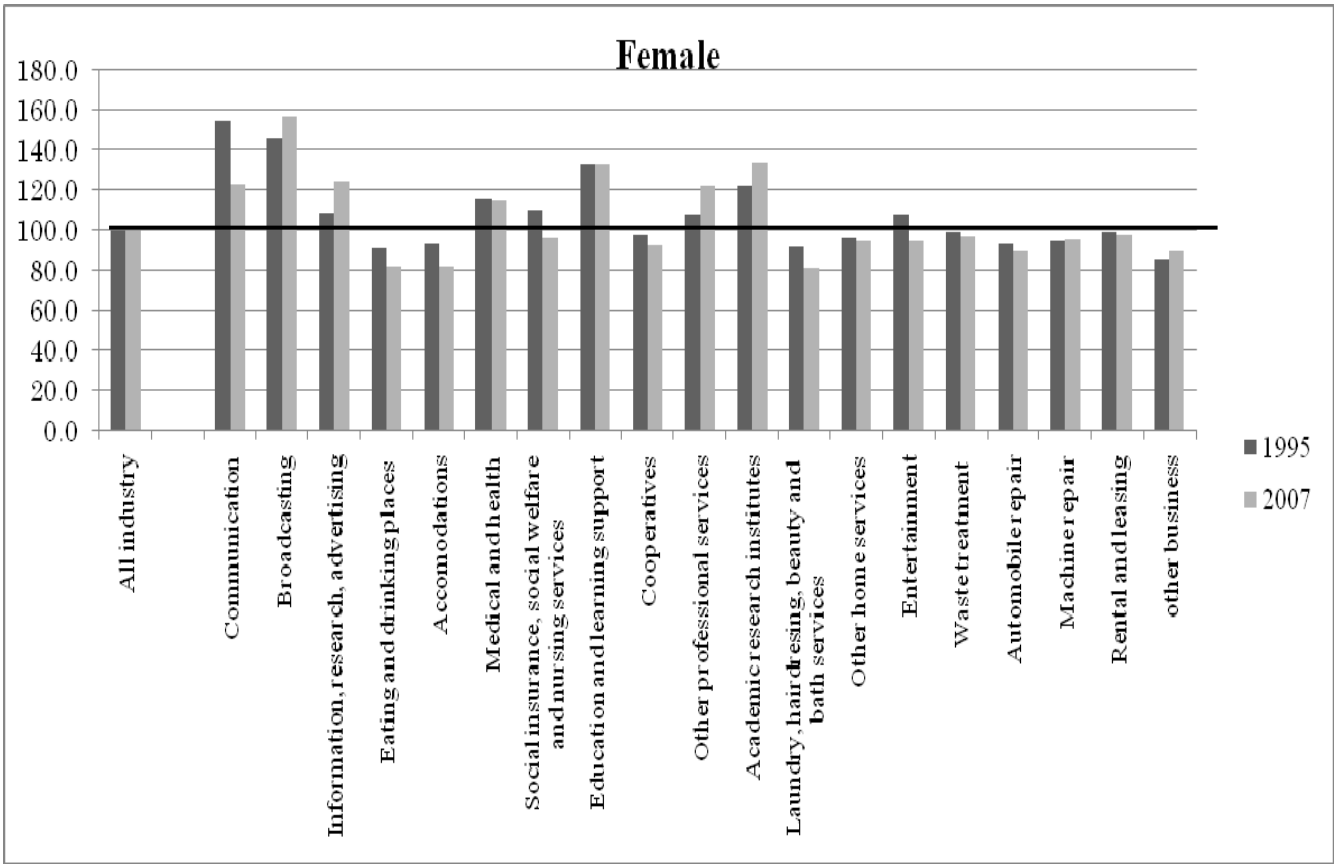


Source: Population Census and the Basic Survey on Wage Structure

Figure5.4 Comparison of wage level of service industries

(1995, 2007, scheduled cash earnings, 100=all industry)

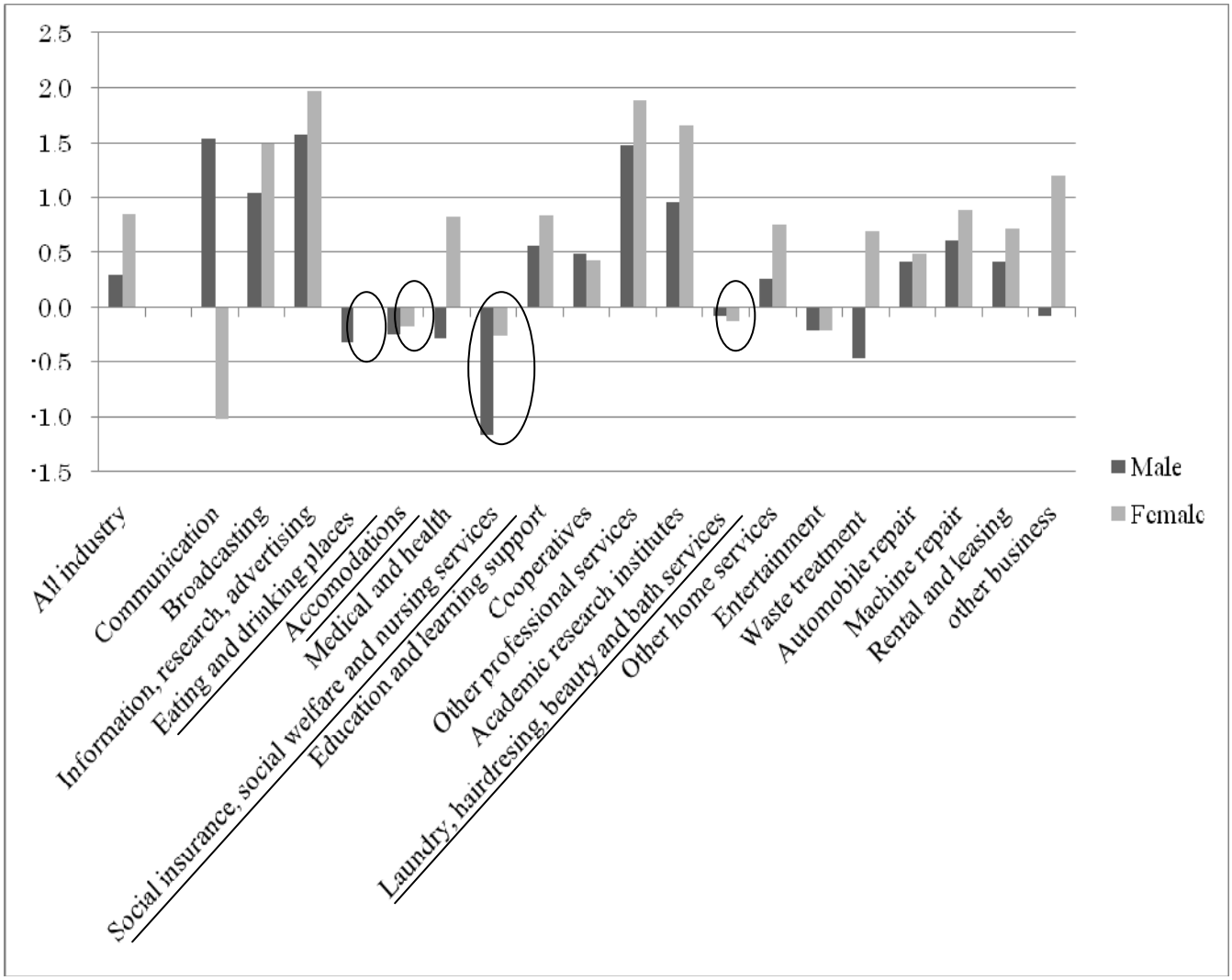




Source : Basic Survey on Wage Structure

Figure 5.5　Annual changes of real wages of service industries

(1995- 2007, scheduled cash earnings)



Source : Same as Figure5.4.

Table5.2(a) Share of expenditure on services in overall consumption expenditure for two-or-more-person households (1994)

1994	Personal service total	Eating out	Other domestic services	Repair and main-tenance	Medical and welfare	Re-creation	Hairdressing and beauty services	Cere-monial services	Child-related services
Income bracket dummies									
Less than 400 thousand yen (reference)									
400-600 thousand yen	2.476***	0.583***	0.050*	0.656***	-0.283***	1.360***	-0.050	0.214***	-0.054
600-800 thousand yen	4.402***	0.852***	0.111***	1.092***	-0.336***	2.393***	-0.058	0.326***	0.021
800-1,000 thousand yen	5.942***	0.961***	0.163***	1.573***	-0.302***	2.876***	-0.075*	0.465***	0.281***
1,000-1,200 thousand yen	6.951***	1.067***	0.174***	2.120***	-0.335***	3.216***	-0.108***	0.604***	0.214***
1,200-1,400 thousand yen	7.201***	1.014***	0.209***	2.519***	-0.375***	3.258***	-0.149***	0.653***	0.072
1,400-1,600 thousand yen	8.190***	1.002***	0.231***	2.987***	-0.266**	3.333***	-0.211***	1.151***	-0.038
1,600-1,800 thousand yen	9.238***	0.957***	0.163***	3.881***	-0.336**	3.914***	-0.209***	0.992***	-0.124
1,800 thousand yen and more	9.508***	1.036***	0.156***	3.809***	-0.340**	4.238***	-0.226***	1.099***	-0.264***
Size of household	-0.752***	-0.385***	-0.063***	-0.217***	-0.052***	-0.208***	-0.049***	-0.123***	0.347***
No. of children of younger than 6 years old	-0.075	-0.130***	0.010	0.122***	0.386***	-0.229***	-0.033***	0.093***	-0.295***
Dummy for parent(s) aged 70 or older living in the household	-0.166	-0.094**	0.097***	0.431***	0.094*	-0.417***	0.035**	0.362**	-0.674***
Age group dummies									
20-29 years old (reference)									
30-39 years old	0.489**	-0.411***	0.136***	-0.018	0.192	0.698***	0.068***	0.066*	-0.069
40-49 years old	-0.989***	-1.134***	0.159***	-0.244**	-0.173	-0.438***	0.103***	0.069	0.669***
50-59 years old	-2.922***	-1.355***	0.264***	-0.234*	-0.212**	-1.191***	0.146***	0.204***	-0.539***
60-69 years old	0.512**	-1.764***	0.240***	0.726***	0.540***	0.286*	0.379***	0.724***	-0.620***
70 years or older	1.168***	-2.263***	0.307***	1.391***	0.292**	0.418**	0.465***	1.067***	-0.509***
Dummy for wife working non-part-time	-0.677***	-0.177***	-0.035*	0.083	-0.198***	-0.517***	-0.011	0.214***	-0.036
Dummy for wife working part-time	0.154	-0.160**	-0.025	0.050	-0.107	-0.019	0.035	-0.010	0.390***
Wife working non-part-time × wife's earned income	0.000***	0.000***	0.000**	-0.000**	-0.000***	0.000***	0.000***	-0.000***	0.000***
Wife working part-time × wife's earned income	-0.000**	0.000***	-0.000	-0.000	-0.000***	-0.000***	0.000	0.000	-0.000*
District dummies									
Hokkaido & Tohoku (reference)									
Kanto	-0.231	0.510***	-0.198***	-0.670***	-0.091*	0.180**	-0.063***	-0.274***	0.375***
Hokuriku & Tokai	-0.091	0.348***	-0.121***	-0.521***	-0.093	0.227**	0.006	-0.042	0.106**
Kinki	-0.610***	0.299***	-0.191***	-0.707***	-0.284***	-0.002	-0.039*	-0.053	0.366***
Chugoku & Shikoku	-0.539***	0.046	-0.093***	-0.434***	-0.132**	-0.148	-0.019	0.013	0.227***
Kyushu & Okinawa	0.309*	0.188***	-0.074***	-0.230**	0.057	0.127	-0.099***	-0.007	0.347***
Constant	11.671***	4.293***	0.723***	1.095***	1.997***	2.813***	0.951***	0.341***	-0.542***
Adj-R squared	0.072	0.078	0.025	0.038	0.025	0.046	0.044	0.029	0.120
Observations	31243	31243	31243	31243	31243	31243	31243	31243	31243

Note: *, **, *** imply that the coefficients are significant at the 10%, 5%, and 1% level respectively.

Table5.2(b) Share of expenditure on services in overall consumption expenditure for two-or-more-person households (2004)

2004	Personal service total	Eating out	Other domestic services	Repair and main-tenance	Medical and welfare	Re-creation	Hairdressing and beauty services	Cere-monial services	Child-related services
Income bracket dummies									
Less than 400 thousand yen (reference)									
400-600 thousand yen	2.809***	0.552***	0.082***	0.668***	-0.019	1.324***	0.053*	0.188***	-0.038
600-800 thousand yen	5.404***	0.971***	0.141***	1.330***	-0.018	2.591***	0.079***	0.311***	0.001
800-1,000 thousand yen	7.287***	1.054***	0.155***	1.884***	0.080	3.307***	0.070**	0.410***	0.327***
1,000-1,200 thousand yen	8.080***	1.062***	0.187***	2.218***	0.131	3.469***	0.076***	0.561***	0.376***
1,200-1,400 thousand yen	8.431***	1.134***	0.236***	2.729***	-0.074	3.441***	0.046	0.796***	0.123*
1,400-1,600 thousand yen	9.633***	1.046***	0.208***	3.170***	-0.000	3.964***	0.029	1.146***	0.070
1,600-1,800 thousand yen	9.838***	0.975***	0.276***	2.788***	0.355	4.307***	0.009	1.244***	-0.117
1,800 thousand yen and more	12.209***	1.304***	0.268***	3.964***	0.350	4.740***	0.040	1.505***	0.039
Size of household	-0.976***	-0.430***	-0.054***	-0.260***	-0.093***	-0.334***	-0.101***	-0.085***	0.381***
No. of children of younger than 6 years old	0.300***	-0.106***	0.022**	0.194***	0.349***	-0.049	-0.012	0.020	-0.117***
Dummy for parent(s) aged 70 or older living in the household	0.457***	-0.121**	0.148***	0.626***	0.685***	-0.451***	0.071***	0.234***	-0.734***
Age group dummies									
20-29 years old (reference)									
30-39 years old	-0.056	-0.520***	0.076***	0.024	0.094	0.539***	0.086***	-0.168	-0.188*
40-49 years old	-0.666**	-1.266***	0.157***	-0.003	0.023	-0.021	0.111***	-0.197	0.530***
50-59 years old	-2.776***	-1.636***	0.302***	0.193*	-0.006	-1.019***	0.107***	-0.062	-0.655***
60-69 years old	1.540***	-1.810***	0.382***	1.181***	1.158***	0.586***	0.353***	0.456***	-0.764***
70 years or older	2.266***	-2.466***	0.417***	1.901***	1.276***	0.394**	0.577***	0.798***	-0.632***
Dummy for wife working non-part-time	-0.113	0.065	-0.008	0.251**	-0.254***	-0.517***	-0.019	0.206***	0.164***
Dummy for wife working part-time	-0.076	-0.057	-0.017	0.011	-0.177**	-0.227**	-0.037*	0.144**	0.283***
Wife working non-part-time × wife's earned income	-0.000	0.000***	0.000	-0.000***	-0.000**	-0.000	0.000***	-0.000***	0.000***
Wife working part-time × wife's earned income	-0.000***	0.000**	-0.000	-0.000	-0.000***	-0.000***	0.000**	-0.000**	0.000
District dummies									
Hokkaido & Tohoku (reference)									
Kanto	-0.290*	0.528***	-0.178***	-0.582***	-0.376***	0.446***	-0.076***	-0.284***	0.233***
Hokuriku & Tokai	0.171	0.431***	-0.110***	-0.425***	-0.181**	0.390***	0.026	-0.034	0.074*
Kinki	-0.543***	0.401***	-0.217***	-0.583***	-0.391***	0.041	-0.062***	-0.087	0.356***
Chugoku & Shikoku	-0.178	-0.060	-0.017	0.116	-0.179**	-0.162	-0.017	-0.092	0.234***
Kyushu & Okinawa	0.617***	0.259***	0.023	0.082	0.100	0.048	-0.077***	-0.043	0.224***
Constant	12.193***	4.747***	0.437***	0.602***	2.254***	3.259***	0.905***	0.453***	-0.464***
Adj-R squared	0.100	0.090	0.048	0.043	0.031	0.061	0.070	0.027	0.131
Observations	29796	29796	29796	29796	29796	29796	29796	29796	29796

Note: *, **, *** imply that the coefficients are significant at the 10%, 5%, and 1% level respectively.

Table5.2(c) Share of expenditure on services in overall consumption expenditure for one-person households (1994)

1994	Personal service total	Eating out	Other domestic services	Repair and main-tenance	Medical and welfare	Recreation	Hairdressing and beauty services	Ceremonial services
Income bracket dummies Less than 200 thousand yen (reference)								
200-300 thousand yen	4.662***	1.580***	0.129	0.623***	0.016	1.763***	0.279*	0.271
300-400 thousand yen	3.987***	0.216	0.364***	0.819***	0.000	2.032***	0.222	0.333*
400-500 thousand yen	5.483***	0.944	0.293***	1.295***	-0.132	2.694***	0.005	0.384*
500-600 thousand yen	6.632***	0.700	0.434***	1.363***	0.001	3.805***	-0.023	0.353
600-700 thousand yen	7.753***	0.441	0.633***	2.387***	-0.384**	4.287***	-0.189	0.579*
700-800 thousand yen	9.871***	0.213	0.439***	2.532***	0.842	5.388***	-0.129	0.586
800 thousand yen and more	12.095***	0.678	0.476***	4.611***	0.031	5.828***	-0.466***	0.938*
Age group dummies 20-29 years old (reference)								
30-39 years old	-4.507***	-3.039***	0.011	-0.386*	0.171	-1.313**	-0.016	0.065
40-49 years old	-7.353***	-4.660***	0.172*	0.009	0.625**	-3.772***	0.315***	-0.043
50-59 years old	-9.296***	-7.193***	0.145**	-0.181	0.770***	-3.886***	0.477***	0.571***
60-69 years old	-9.037***	-9.649***	0.281***	0.518**	1.232***	-3.602***	0.587***	1.595***
70 years or older	-9.670***	-10.283***	0.449***	0.743***	0.691***	-3.159***	0.314***	1.576***
Female head of household dummies	-10.162***	-9.247***	0.142**	-0.117	0.355***	-1.724***	0.471***	-0.041
District dummies Hokkaido & Tohoku (reference)								
Kanto	2.743***	2.419***	-0.107	-0.003	0.017	0.398	0.095	-0.075
Hokuriku & Tokai	3.789***	1.634***	-0.163*	0.299	-0.080	1.791***	0.052	0.256
Kinki	2.635***	2.051***	-0.133	0.107	-0.248	0.568	0.230*	0.061
Chugoku & Shikoku	1.238	0.737	-0.031	0.368	-0.095	-0.035	0.023	0.271
Kyushu & Okinawa	1.520*	0.842	-0.069	0.730**	0.049	0.191	-0.170	-0.053
Constant	25.271***	18.514***	0.229**	-0.338	0.187	6.305***	0.659***	-0.286
Adj-R squared	0.318	0.471	0.027	0.038	0.057	0.098	0.058	0.053
Observations	3318	3318	3318	3318	3318	3318	3318	3318

Note: *, **, *** imply that the coefficients are significant at the 10%, 5%, and 1% level respectively.

Table5.2(d) Share of expenditure on services in overall consumption expenditure for one-person households (2004)

2004	Personal service total	Eating out	Other domestic services	Repair and main-tenance	Medical and welfare	Recreation	Hairdressing and beauty services	Ceremonial services
Income bracket dummies Less than 200 thousand yen (reference)								
200-300 thousand yen	2.772***	0.864**	0.111*	0.300*	0.019	1.256***	0.033	0.190
300-400 thousand yen	5.393***	2.157***	0.172***	1.035***	-0.370	2.292***	-0.113	0.220
400-500 thousand yen	6.898***	1.929***	0.396***	1.235***	-0.302	3.375***	-0.062	0.325**
500-600 thousand yen	8.945***	2.229***	0.318***	2.315***	-0.689***	4.194***	0.150	0.428**
600-700 thousand yen	10.380***	1.443***	0.332***	3.005***	-0.765***	5.190***	0.144	1.032***
700-800 thousand yen	14.330***	2.488***	0.565***	3.722***	-0.484	6.973***	0.006	1.060*
800 thousand yen and more	13.916***	2.612***	0.505***	3.340***	-0.650**	6.492***	0.224	1.393**
Age group dummies 20-29 years old (reference)								
30-39 years old	-5.125***	-3.134***	0.057	-0.380**	0.116	-1.437***	-0.107	-0.239***
40-49 years old	-8.828***	-4.929***	0.134*	-0.596***	0.564***	-3.479***	-0.317*	-0.202*
50-59 years old	-7.249***	-5.742***	0.343***	0.286	0.525**	-2.599***	-0.420***	0.359**
60-69 years old	-6.894***	-8.102***	0.380***	1.039***	1.673***	-2.314***	-0.230	0.660***
70 years or older	-6.939***	-8.834***	0.372***	1.821***	1.317***	-2.902***	-0.136	1.424***
Female head of household dummies	-5.954***	-6.364***	0.107**	0.239	0.528***	-1.680***	0.817***	0.398***
District dummies Hokkaido & Tohoku (reference)								
Kanto	1.960***	2.018***	-0.142**	-0.693**	0.193	0.435	0.112	0.037
Hokuriku & Tokai	2.607***	1.070**	-0.097	-0.090	0.313	0.850**	0.109	0.453**
Kinki	3.517***	2.258***	-0.205***	-0.271	0.203	0.985**	0.175	0.372**
Chugoku & Shikoku	2.112***	0.681*	0.007	0.254	0.061	0.727	0.109	0.272
Kyushu & Okinawa	1.789**	0.750*	0.088	-0.185	0.200	0.887**	-0.192**	0.241
Constant	19.596***	13.884***	0.047	-0.526*	0.709**	5.146***	0.907***	-0.571***
Adj-R squared	0.210	0.388	0.038	0.061	0.052	0.112	0.033	0.050
Observations	3547	3547	3547	3547	3547	3547	3547	3547

Note: *, **, *** imply that the coefficients are significant at the 10%, 5%, and 1% level respectively.

Table 5.3(a) Blinder-Oaxaca decomposition for prediction difference for two-or-more-person households between 1994 and 2004

Two-or-more-person households	Personal services total	Eating out	Other home services	Repair and maintenance	Medical and welfare	Recreation	Hairdressing and beauty services	Ceremonial services	Child-related services
Prediction for 2004	14.152	3.104	0.557	1.506	2.206	4.580	0.829	0.582	0.789
Prediction for 1994	13.015	2.996	0.692	1.422	1.406	4.201	0.830	0.559	0.910
Difference	**1.137**	**0.108**	**-0.135**	**0.084**	**0.800**	**0.379**	**-0.001**	**0.022**	**-0.121**
Group difference	**0.000**	**-0.125 *****	**0.037 *****	**0.096 *****	**0.132 *****	**-0.062 *****	**0.081 *****	**0.097 *****	**-0.255 *****
Demographic factors	**0.496**	**-0.059**	**0.051**	**0.268**	**0.123**	**0.124**	**0.080**	**0.150**	**-0.239**
(Age of head)	0.238 ***	-0.194 ***	0.034 ***	0.205 ***	0.127 ***	0.031 ***	0.055 ***	0.121 ***	-0.142 ***
(Size of household)	0.264 ***	0.127 ***	0.018 ***	0.073 ***	0.021 ***	0.083 ***	0.023 ***	0.033 ***	-0.112 ***
(Children younger than six)	-0.006	0.008 ***	-0.001 **	-0.010 ***	-0.025 ***	0.010 ***	0.002 ***	-0.004 ***	0.015 ***
Economic circumstances (Income bracket)	**-0.496 *****	**-0.054 *****	**-0.012 *****	**-0.167 *****	**0.002**	**-0.204 *****	**0.003 *****	**-0.050 *****	**-0.015 *****
Other difference	**1.137 *****	**0.233 *****	**-0.172 *****	**-0.011 *****	**0.668 *****	**0.442 *****	**-0.082 *****	**-0.074 *****	**0.134 *****

Table 5.3(b) Blinder-Oaxaca decomposition for prediction difference for one-person households between 1994 and 2004

One-person-households	Personal service total	Eating out	Other home services	Repair and maintenance	Medical and welfare	Recreation	Hairdressing and beauty services	Ceremonial services
Prediction for 2004	18.606	7.026	0.544	1.480	1.757	5.606	1.329	0.863
Prediction for 1994	21.111	10.040	0.696	1.185	0.855	6.253	1.311	0.771
Difference	**-2.505**	**-3.014**	**-0.153**	**0.295**	**0.903**	**-0.647**	**0.018**	**0.092**
Group difference	**-1.458 *****	**-1.753 *****	**0.066 *****	**0.236 *****	**0.166 *****	**-0.441 *****	**0.038 *****	**0.230 *****
Demographic factors	**-1.538**	**-1.716**	**0.059**	**0.183**	**0.177**	**-0.507**	**0.045**	**0.220**
(Age of head)	-1.156 ***	-1.346 ***	0.053 ***	0.180 ***	0.156 ***	-0.424 ***	0.013	0.211 ***
(Female head)	-0.382 ***	-0.370 ***	0.006 ***	0.003	0.021 ***	-0.083 ***	0.032 ***	0.009 *
Economic circumstances (Income bracket)	**0.112**	**-0.018**	**0.005**	**0.050 ***	**-0.010**	**0.767 ***	**-0.005**	**0.012**
Other difference	**-1.047 *****	**-1.261 *****	**-0.219 *****	**0.059**	**0.737 *****	**-0.206**	**-0.019**	**-0.138 ***

Note: 1) *, **, *** imply that the coefficients are significant at the 10%, 5%, and 1% level respectively.
2) Parents of 70 years old and older dummy, wife working dummy, interaction of wife working and wife's earned income, district dummy are not presented in this table.

Table5.4(a) Regional correlation between high skill and service workers

Correlation coefficients between ratio of professional, technical and managerial workers to total employed and that of service workers

	1992	1997	2002	2007	1992-2007
Personal services total	0.361**	0.306**	0.313**	0.303**	0.489***
Living-related services	-0.175	-0.156	-0.152	-0.029	0.213***
Food and beverages preparing and serving services	0.319**	0.249*	0.102	0.307**	0.368***

Table5.4(b) Relation between ratio of service workers and regional attributes or ratio of high-skill workers

Dependent variables / Explanatory variables	1997			2007		
	Personal services total	Living -related services	Food and beverage preparing and serving services	Personal services total	Living -related services	Food and beverages preparing and serving services
Ratio of people aged 65 and over	-0.099	-0.004	-0.070	-0.075	0.061*	-0.159***
Number of family members per household	-2.587***	-0.176	-1.943***	-2.135**	-0.237	-0.158***
Ratio of children younger than 8 years old	0.718	-0.056	0.723**	0.183	0.006	0.256
Per capita prefectural income	0.000	-0.000	0.000	-0.000	-0.000	-0.000
Ratio of employed women (15-64years old)	0.054	0.005	0.037	0.040	-0.015	0.061**
Ratio of professional, technical and managerial workers	0.127	0.045	0.020	0.368***	-0.050	0.263***
Ratio of university graduates	-0.057	-0.041	-0.014	-0.149*	0.028	-0.131**
Constant	7.146	2.437	3.606	11.112***	2.915**	5.656**
Adj-R squared	0.379	0.417	0.375	0.429	0.134	0.522
Observations	47	47	47	47	47	47

Table 5.4(c) Blinder-Oaxaca decomposition for prediction difference between 1997 and 2007

	Services total	Personal life supporting services	Food and beverage preparing and serving services
Prediction for 2007	10.143	2.074	5.492
Prediction for 1997	7.968	1.546	5.419
Difference	**2.174 *** **	**0.528 *** **	**0.073**
Group difference	**-0.216**	**0.108 ** **	**-0.589 * **
Demographic factors	5.630	0.255	-0.520
(Ratio of people aged 65 and over)	-0.501 *	0.194 *	-0.648 ***
(Number of family members per household)	6.426 ***	0.062	0.490 ***
(Ratio of children younger than 8years old)	-0.295	-0.001	-0.362 **
High skill workers factors (professional, technical and managerial workers)	0.281 **	-0.006	0.153 *
Economic circumstances (Prefectural income)	0.036	0.017	-0.004
Other difference	**2.390 *** **	**0.261 ** **	**0.662 ** **

Note: 1) *, **, *** imply that the coefficients are significant at the 10%, 5%, and 1% level respectively.
2) Ratio of university graduates and that of employed women are not shown in this table.

Appendix Table 5.1 Level and changes in hourly scheduled cash earnings of occupations obtained in the Basic Survey on Wage Structure between 1995 and 2005

Tasks	Occupations	Level (yen, nominal)		Annual changes in real terms (%)
		1995	2005	
Occupation total		1704	1830	0.9
Nonroutine analytic tasks	Natural science researcher, (Engineer), Chemical analyst, 1st class authorized architect, Surveying engineer*, System engineer, Programmer, Medical radiation and X-ray technicians , Clinical experts	1673	1738	0.6
Nonroutine interactive tasks	Physician, (Dentist), (Veterinarian), Pharmacist, Nurse, Assistant nurse, Nursing helper, Nutritionist, Physical Therapist & Occupational Therapist*, Dental hygienist, Dental technician, Kindergartner, Care manager*, Welfare institution worker,*, (Lawyer), (Registered accountant and licensed tax accountant), Kindergarten teacher, High school teacher, Univ. professor, Univ. associate professor, (Univ. lecturer), Special school teacher, (Coacher, Cram school teacher), Reporter, (Designer), (Public consultant on social and labor insurance), (real estate appraiser), Insurance agent, Automobile trade salesperson, Household goods salesperson, Cook, Carpenter	1674	1754	0.6
Routine cognitive tasks	Word processor operator, Key puncher, Operator of computer, Sales clerk, Supermarket checker	1262	1279	0.3
Routine manual tasks	Launderer, Iron and steel furnace operator, Nonferrous metal smelter, Molder, Forger, Metal rolling mill operator, Tempering worker, Metal inspector, Chemical operatives, Man-made fiber spinner, Glass formers, Potter, Lathe operator, 工 Milling machine operator, Metal press machine operator, Welders, Sheet metal worker, Galvanizer, Ironworker, Buffing worker, Finishing worker, Machine assembler, Machine inspector, Heavy electric machine assemblers, Communication equipment assembler, Semi-conductor chips maker, Printed-wiring worker, Light electric machine inspector, Automobile assembler, Bakers and confectioner, Fine spinning worker, Weaver, Dress maker, Sewing machinist, Sewer, Wooden patternmaker, Wooden furniture makers, Woodworker, Paper maker, Paper container maker, Prepress operator, Offset printers, Synthetic resin product former, metal and construction painter, Drawers, Boiler operator, Crane operator, Construction machinery operator, Lifting operator, Hooking operator, Electric power station and substation operator, Electrical equipment fitter, Drilling and blasting worker, Earth worker, Molding form maker, Concrete trimmer, Reinforcing-bar placer, Ship stevedore, Land stevedore, Building sweeper, Janitor	1451	1451	0.2
Nonroutine manual tasks	Home helper*、Barbers and Beautician, Machine repairer, Automobile repairer, Construction assistant, Plasterer, Piper fitter, Servant, waiter and waitress, Flight attendant, Recreation and amusement park worker, Watchperson, Gate keeper, Train driver, Chauffeur, Truck driver, Taxi driver, Bus driver、Other automobile driver, Pilot, Conductor	1475	1384	-0.5

Note: 1) Wages of each task are weighted average using monthly labor input (working hours ×number of workers)
2) Occupations in parentheses are found only in 2005. Those with * are classified from 2001.

Appendix Table 5.2(a) Basic statistics for two-or-more-person households

	1994					2004				
	Obs.	Mean	S.E	Min.	Max.	Obs.	Mean	S.E	Min.	Max.
Personal services total	31243	13.015	8.139	0	79.637	29796	14.152	8.894	0	79.970
Eating out	31243	2.996	2.689	0	36.989	29796	3.104	2.740	0	37.943
Other home services	31243	0.692	0.909	0	33.388	29796	0.557	0.869	0	18.109
Repair and maintenance	31243	1.422	4.469	0	75.883	29796	1.506	4.839	0	75.211
Medical and welfare	31243	1.406	2.923	0	58.008	29796	2.206	3.849	0	63.099
Recreation	31243	4.201	4.562	0	62.894	29796	4.580	4.883	0	61.858
Hairdressing and beauty services	31243	0.830	0.857	0	16.862	29796	0.829	0.950	0	28.341
Ceremonial services	31243	0.559	2.509	0	73.653	29796	0.582	2.717	0	75.023
Child-related services	31243	0.910	2.454	0	37.497	29796	0.789	2.430	0	33.557
Household income	31243	857162	350091	75297	2660360	29796	789878	334003	64239	2507668
Less than 400 thousand yen	31243	0.048	0.214	0	1	29796	0.083	0.276	0	1
400-600 thousand yen	31243	0.189	0.391	0	1	29796	0.222	0.415	0	1
600-800 thousand yen	31243	0.268	0.443	0	1	29796	0.282	0.450	0	1
800-1,000 thousand yen	31243	0.212	0.409	0	1	29796	0.196	0.397	0	1
1,000-1,200 thousand yen	31243	0.135	0.342	0	1	29796	0.108	0.310	0	1
1,200-1,400 thousand yen	31243	0.072	0.259	0	1	29796	0.056	0.230	0	1
1,400-1,600 thousand yen	31243	0.039	0.193	0	1	29796	0.027	0.163	0	1
1,600-1,800 thousand yen	31243	0.020	0.140	0	1	29796	0.014	0.116	0	1
1,800 thousand yen and more	31243	0.018	0.132	0	1	29796	0.012	0.111	0	1
Size of household	31243	3.596	1.280	2	8	29796	3.284	1.217	2	8
No. of children of younger than 6 years old	31243	0.296	0.609	0	4	29796	0.227	0.542	0	4
Dummy for parent(s) aged 70 or older living in the household	31243	0.118	0.322	0	1	29796	0.116	0.320	0	1
Age of head of the household	31243	47.986	12.654	20	80	29796	52.731	13.999	20	80
20-29 years old	31243	0.053	0.224	0	1	29796	0.036	0.185	0	1
30-39 years old	31243	0.229	0.420	0	1	29796	0.175	0.380	0	1
40-49 years old	31243	0.298	0.457	0	1	29796	0.215	0.411	0	1
50-59 years old	31243	0.218	0.413	0	1	29796	0.230	0.421	0	1
60-69 years old	31243	0.146	0.353	0	1	29796	0.206	0.404	0	1
70 years or older	31243	0.057	0.231	0	1	29796	0.139	0.346	0	1
Wife not working	31243	0.583	0.493	0	1	29796	0.609	0.488	0	1
Dummy for wife working non-part-time	31243	0.230	0.421	0	1	29796	0.179	0.383	0	1
Dummy for wife working part-time	31243	0.187	0.390	0	1	29796	0.212	0.409	0	1
Wife working non-part-time × wife's earned income	31243	40436.29	99482.96	0	677704	29796	33819.15	95888.5	0	908013
Wife working part-time × wife's earned income	31243	14145.02	34270.46	0	426267	29796	15601.28	36320.28	0	518847.7
Hokkaido & Tohoku	31243	0.133	0.340	0	1	29796	0.129	0.336	0	1
Kanto	31243	0.292	0.455	0	1	29796	0.297	0.457	0	1
Hokuriku & Tokai	31243	0.164	0.370	0	1	29796	0.169	0.375	0	1
Kinki	31243	0.158	0.364	0	1	29796	0.158	0.364	0	1
Chugoku & Shikoku	31243	0.129	0.335	0	1	29796	0.126	0.332	0	1
Kyushu & Okinawa	31243	0.124	0.330	0	1	29796	0.121	0.326	0	1
Unemployment rate (All)	31243	2.511	1.407	0.748	6.875	29796	4.125	1.767	1.068	10.037
Unemployment rate for those younger than 60	24928	2.077	0.612	1.496	5.000	19531	4.081	1.308	2.518	10.037
Unemployment rate for those 60 and over	6315	4.225	2.152	0.748	0.688	10265	4.209	2.408	1.068	7.344

Appendix Table5.2(b) Basic statistics for one-person households

	1994					2004				
	Obs.	Mean	S.E	Min	Max	Obs.	Mean	S.E	Min	Max
Personal services total	3318	21.111	15.113	0	83.695	3547	18.606	13.250	0	84.288
Eating out	3318	10.040	11.503	0	74.094	3547	7.026	9.094	0	66.705
Other home services	3318	0.696	1.468	0	20.269	3547	0.544	1.187	0	25.960
Repair and maintenance	3318	1.185	5.001	0	78.061	3547	1.480	5.294	0	66.517
Medical and welfare	3318	0.855	2.424	0	50.668	3547	1.757	3.615	0	56.275
Recreation	3318	6.253	8.118	0	74.233	3547	5.606	7.209	0	69.980
Hairdressing and beauty services	3318	1.311	1.695	0	19.692	3547	1.329	2.155	0	39.782
Ceremonial services	3318	0.771	3.167	0	62.284	3547	0.863	3.470	0	65.021
Household income	3318	416184	191643	41361	1560613	3547	425256	194139	36652	1332064
Less than 200 thousand yen	3318	0.081	0.273	0	1	3547	0.099	0.298	0	1
200-300 thousand yen	3318	0.196	0.397	0	1	3547	0.177	0.382	0	1
300-400 thousand yen	3318	0.275	0.447	0	1	3547	0.218	0.413	0	1
400-500 thousand yen	3318	0.185	0.388	0	1	3547	0.212	0.409	0	1
500-600 thousand yen	3318	0.117	0.321	0	1	3547	0.129	0.335	0	1
600-700 thousand yen	3318	0.060	0.238	0	1	3547	0.077	0.267	0	1
700-800 thousand yen	3318	0.038	0.190	0	1	3547	0.040	0.196	0	1
800 thousand yen and more	3318	0.047	0.212	0	1	3547	0.048	0.214	0	1
Age of head of the household	3318	47.473	20.179	20	80	3547	54.892	19.644	20	80
20-29 years old	3318	0.329	0.470	0	1	3547	0.189	0.392	0	1
30-39 years old	3318	0.105	0.307	0	1	3547	0.111	0.315	0	1
40-49 years old	3318	0.075	0.264	0	1	3547	0.067	0.250	0	1
50-59 years old	3318	0.107	0.310	0	1	3547	0.103	0.305	0	1
60-69 years old	3318	0.197	0.397	0	1	3547	0.217	0.412	0	1
70 years or older	3318	0.187	0.390	0	1	3547	0.312	0.463	0	1
Female head of household dummies	3318	0.492	0.492	0	1	3547	0.636	0.481	0	1
Hokkaido & Tohoku (reference)	3318	0.117	0.322	0	1	3547	0.122	0.328	0	1
Kanto	3318	0.316	0.465	0	1	3547	0.313	0.464	0	1
Hokuriku & Tokai	3318	0.157	0.364	0	1	3547	0.147	0.354	0	1
Kinki	3318	0.153	0.360	0	1	3547	0.150	0.357	0	1
Chugoku & Shikoku	3318	0.117	0.321	0	1	3547	0.120	0.325	0	1
Kyushu & Okinawa	3318	0.141	0.348	0	1	3547	0.148	0.355	0	1
Unemployment rate (All)	3318	2.501	1.763	0	6.875	3547	3.423	2.786	0	10.037
Unemployment rate for those younger than 60	2046	3.294	1.383	1.260	6.412	1671	5.411	2.184	2.143	10.037
Unemployment rate for those 60 and over	1272	1.225	1.547	0	6.875	1876	1.652	1.942	0	7.344

Appendix Table 5.3 Blinder-Oaxaca decomposition for prediction difference between 1994 and 2004 using unemployment rates

Two-or-more-person households	Personal services total	Eating out	Other home services	Repair and maintenance	Medical and welfare	Recreation	Hairdressing and beauty services	Ceremonial services	Child-related services
Prediction for 2004	14.152	3.104	0.557	1.506	2.206	4.580	0.829	0.582	0.789
Prediction for 1994	13.015	2.996	0.692	1.422	1.406	4.201	0.830	0.559	0.910
Difference	**1.137**	**0.108**	**-0.135**	**0.084**	**0.800**	**0.379**	**-0.001**	**0.022**	**-0.121**
Group difference	**0.048**	**-0.088 ****	**0.004**	**0.157 *****	**-0.109 ****	**-0.016**	**0.058 *****	**0.189 *****	**-0.146 *****
Demographic factors	**0.274**	**-0.075**	**0.031**	**0.187**	**0.046**	**0.077**	**0.069**	**0.146**	**-0.206**
(Age of head)	0.127 **	-0.199 ***	0.017 ***	0.164 ***	0.050 **	0.028	0.044 ***	0.129 ***	-0.106 ***
(Size of household)	0.133 ***	0.114 ***	0.015 ***	0.026 ***	0.021 ***	0.031 ***	0.024 ***	0.019 ***	-0.116 ***
(Children younger than six)	0.014 ***	0.010 ***	-0.001	-0.003	-0.025 ***	0.018 ***	0.001 ***	-0.002 **	0.016 ***
Economic circumstances	**-0.205**	**0.000**	**-0.025**	**-0.017**	**-0.160**	**-0.101**	**-0.010**	**0.048**	**0.062**
Unemployment rate for those younger than 60	-0.185 ***	0.005	-0.028 ***	-0.043	-0.164 ***	-0.045	-0.015 **	0.035	0.071 ***
Unemployment rate for those 60 and over	-0.020	-0.005	0.003	0.026	0.004	-0.056	0.005	0.013	-0.009
Other difference	**1.089 *****	**0.196 *****	**-0.138 *****	**-0.073**	**0.909 *****	**0.396 *****	**-0.059 *****	**-0.166 *****	**0.025**

One-person-households	Personal service total	Eating out	Other home services	Repair and maintenance	Medical and welfare	Recreation	Hairdressing and beauty services	Ceremonial services
Prediction for 2004	18.606	7.026	0.544	1.480	1.757	5.606	1.329	0.863
Prediction for 1994	21.111	10.040	0.696	1.185	0.855	6.253	1.311	0.771
Difference	**-2.505**	**-3.014**	**-0.153**	**0.295**	**0.903**	**-0.647**	**0.018**	**0.092**
Group difference	**-4.151 *****	**-3.530 *****	**0.058** ****	**-0.115**	**-0.062**	**-0.775 *****	**0.006**	**0.266 *****
Demographic factors	**-2.394**	**-2.356**	**0.065**	**0.044**	**0.034**	**-0.487**	**0.036**	**0.271**
(Age of head)	-1.900 ***	-1.927 ***	0.061 ***	0.052	0.011	-0.369 ***	0.005	0.267 ***
(Female head)	-0.494 ***	-0.429 ***	0.004 *	-0.008	0.023 ***	-0.118 ***	0.031 ***	0.004
Economic circumstances	**-1.730**	**-1.164**	**-0.008**	**-0.161**	**-0.097**	**-0.273**	**-0.027**	**-0.002**
Unemployment rate for those younger than 60	-0.691 ***	-0.473 ***	0.002	-0.109 ***	-0.087 ***	-0.039	-0.008	0.022
Unemployment rate for those 60 and over	-1.039 ***	-0.691 ***	-0.010	-0.052	-0.010	-0.234 ***	-0.019	-0.024
Other difference	**1.646 *****	**0.516 ****	**-0.211 *****	**0.410 ****	**0.965 *****	**0.127**	**0.012**	**-0.174**

Notes: 1) *, **, *** imply that the coefficients are significant at the 10%, 5%, and 1% level, respectively.
2) The dummies for parent(s) aged 70 or over living in the household, the wife's employment status, the interaction term between the wife's employment status and earned income, and regional dummies are not shown in this table.

Appendix Table 5.4 Basic statistics for service and high-skill workers, regional attributes

	1997					2007				
	Observations	Mean	S.E	Min.	Max.	Observations	Mean	S.E	Min.	Max.
Ratio of service workers (%)	47	7.968	0.907	6.522	11.572	47	10.143	0.848	8.618	12.648
Ratio of workers in in living-related services (%)	47	1.546	0.223	0.870	1.975	47	2.074	0.243	1.644	2.674
Ratio of workers in food and beverage preparing and serving services (%)	47	5.419	0.726	4.406	8.290	47	5.492	0.627	4.540	7.917
Ratio of people aged 65 and over	47	16.309	2.768	10.078	21.653	47	21.793	2.809	16.077	27.095
Number of family members per household	47	2.951	0.238	2.330	3.450	47	2.663	0.203	2.120	3.090
Ratio of children younger than 8 years old	47	7.560	0.599	6.036	10.457	47	6.736	0.519	5.652	9.121
Per capita prefectural income (1,000yen)	47	2906.298	418.768	2059.000	4384.000	47	2751.979	455.061	2021.000	4778.000
Ratio of employed women (15-64 years old)	47	61.015	4.537	49.513	69.067	47	63.304	3.655	54.674	69.839
Ratio of professional, technical and managerial workers	47	15.386	1.671	12.550	20.473	47	16.479	1.609	13.446	21.873
Ratio of university graduates	47	10.719	3.465	6.073	22.338	47	14.260	4.293	8.179	28.948
Ratio of unemployed persons seeking job (%)	47	6.629	1.456	4.574	11.872	47	6.431	1.241	4.357	11.228

Appendix Table5.5 Blinder-Oaxaca decomposition for prediction difference between 1997 and 2007 using ratio of unemployed seeking job

	Services total	Personal life supporting services	Food and beverage preparing and serving services
Prediction for 2007	10.143	2.074	5.492
Prediction for 1997	7.968	1.546	5.419
Difference	**2.174 *****	**0.528 *****	**0.073**
Group difference	**0.583 ***	**0.336 *****	**-0.034**
Demographic factors	0.358	0.330	-0.230
(Ratio of people aged 65 and over)	0.189	0.307 ***	-0.277
(Number of family members per household)	0.458 ***	0.039	0.375 ***
(Ratio of children younger than 8 years old)	-0.289 **	-0.016	-0.328 ***
High skill workers factors (professional, technical and managerial workers)	0.093	-0.023	0.022
Economic circumstances (Ratio of unemployed persons seeking job)	-0.105	-0.013	-0.066
Other difference	**1.591 *****	**0.191 ***	**0.107**

Note: 1) *, **, *** imply that the coefficients are significant at the 10%, 5%, and 1% level respectively.
2) Ratio of university graduates and that of employed women are not shown in this table.

Appendix: Mazzolari and Ragusa's (2007) theoretical framework

The theoretical framework employed by Mazzolari and Ragusa assumes that individuals are equally productive at producing the composite "home" good *x* (such as food preparation and cleaning), but are either skilled or unskilled at producing other goods, *y*. The economy is made up of many cities that all contain both skilled and unskilled individuals.

In each city, firms produce good *y* based on the following Cobb-Douglas production function: $y = AN_{uY}^{\sigma_u} N_{sY}^{\sigma_s}$

where N_{jY} is the number of skilled (*s*) and unskilled (*u*) workers in sector *y*. Both the aggregate and skill-specific productivity shifters *A* and σ_j $j=u,s$ might vary across cities, but $\sigma_u < \sigma_s$ always holds.

Wages for skilled workers are higher than wages for unskilled workers, i.e. $w_u < w_s$.

The "home" good (*X*) can only be locally traded, while other goods can be traded across regions.

Workers can either use their own time and produce the good domestically (x_h) or purchase it in the local market (x_m). Individuals maximize utility $U(y, x, L)$, where $x = x_m + x_h$ and L is leisure, under the following constraints:

(1) Time constraint $T_m + T_h + L = 1$, where T_m is work-in-the-market time, T_h is work-at-home time, and the endowment of time is normalized to one (perfect substitutability between market goods and home products is assumed).

(2) Budget constraint $p_y y + p_{xm} x_m = w_j T_m$, $j=u,s$.

(3) The production function is assumed to be linear in time and to be the same for goods produced at home and in the market.

In this framework, the choice of the optimal bundle *(y,x,L)* is governed by preferences and relative prices prevailing in the market. The allocation of work time between home and market is determined by an individual's productivity in home production relative to his/her shadow price of time (wage rate w_j, $j=u,s$). Given that skilled workers have a comparative advantage at producing *y*, they do not perform any housework. As a result, the wage at which domestic help can be hired is

equal to w_u, and unskilled workers are indifferent between doing the housework themselves or hiring someone else to do it for them.

In the presence of a strictly positive agency cost ($c>0$), the market demand for household services X_m^D in each city will be given by the sum of the individual demand schedules of skilled individuals, x_m^d.

The individual demand for x_m is, in turn, an increasing function of a skilled worker's opportunity cost of time (that is, his/her own wage w_s) and a decreasing function of the cost of purchasing the services in the market, that is:

$$X_m^D = N_s x_m^d = N_s f(w_s, w_u, c) \qquad \delta f / \delta w_s > 0, \quad \delta f / \delta w_u < 0, \quad \delta f / \delta c < 0$$

This setting leads to the relationship that the fraction of unskilled workers employed in the housework sector is increasing in the demand for home goods. Given that the demand for home goods is higher in cities with a higher proportion of skilled workers, it is expected that the proportion of unskilled workers employed in the housework sector will be higher in cities with a higher proportion of skilled workers.

Chapter 6

Policy Options for Pension Reform in Japan

This chapter examines two policy options for pension reform in Japan: (i) VAT finance in the basic pension and (ii) an introduction of the Swedish system. Dynamic microsimulation techniques are used in this study.

6.1 Introduction

In January 2008, the National Council on Social Security (NCSS) began its discussions on a desirable social security system for Japan. It published its final report in November 2008. The three pension reform proposals given in the reports were (i) maintaining the existing social insurance system, (ii) reforming the social insurance system, and (iii) the new Value Added Tax (VAT) finance. The last induced nationwide controversies. Political parties, industrial associations, and labor unions also proposed their own reform plans. Tax financing the basic pension (the first tier) and the privatization of the earning-related pensions (the second tier) were the two major policy issues hotly debated.

The NCSS pointed out the need for policy appraisal on the basis of statistical data. The NCSS itself provided the detailed simulation data. To sustain the public pension scheme, a decrease in pension benefits or an increase in pension contributions is inevitable. A quantitative analysis serves to select feasible reform plans from various policy options.

The contents of this chapter are as follows. Section 6.2 provides an overview of the PENMOD model. PENMOD applies the dynamic microsimulation method to public pension analyses in Japan. Section 6.3 presents two quantitative simulation results on the paradigmatic pension reform in

Japan: (i) tax finance for the basic pension and (ii) an introduction of the Swedish system. Section 6.4 concludes this chapter.

6.2 An Overview of PENMOD [53]

6.2.1 Dynamic Microsimulation

PENMOD is a dynamic microsimulation model that deals with Japanese public pension systems. The model estimates the life events for each sample. For the pension dynamic microsimulation, it calculates the participant histories for the working generation and the pension benefits for the retired generation. Pension benefits include the basic pension and the earning-related pension. At present, the main Japanese pension models are cohort-type models, which uses population groups in age-sex categories as the estimation units. PENMOD replaces each cohort with the individual samples. It is the first dynamic microsimulation model for pensions in Japan.[54]

Life events estimation is the major simulation technique in PENMOD. Life events estimation simulates events in the life cycles such as birth, death, marriage, working history and retirement for each sample. A sample contributes pension contributions for more than 40 years, and receives pension benefits during the following 20 years. This long time span requires the dynamic microsimulation technique in examining pension reform options. PENMOD conducts two life event analyses: (i) participant histories and (ii) pension benefits. The retirement decision is connected to these two life events.

Participant Histories (Loop 1)

Since the working generation makes pension contributions over the years, the first simulation loop is called Participant Histories. The annual life events analysis is as follows.

(i) Addition of new sample: PENMOD does not conduct birth simulation. It adds the new

[53] Shiraishi (2008b) explains the details of PENMOD.
[54] Several related studies exist in other developed countries. See Harding and Gupta (2007) and Gupta and Harding (2007)

samples of 20-year old to the participant records every year.

(ii) Age Record: Updating every year.

(iii) Determination of death: A random number is generated for each sample and this number is compared with the death probabilities of the relevant age-sex categories.

(iv) Changes in marital status: PENMOD determines whether a female will marry, divorce, or maintain her marital status. The random number generation method is also adopted.

(v) Job changes: Changes in employment status among Type 1 (self-employed participants), Type 2 (employee participants), and Type 3 (dependent spouses of employees, mainly housewives) are simulated. The job change probabilities determine the participant histories for the working generation. The diversification of lifestyles in Japan permits a person to choose various working options, and the cohort-type model cannot trace this trend adequately. This is one of the reasons why PENMOD can become the alternative method in pension analysis.

(vi) Wage determination: Wage determination depends on the job types and age-sex categories.

Retirement Decision

PENMOD simplifies the retirement decision; it basically conforms to the legal rules. PENMOD sets the pensionable age at 65 with respect to the basic pension. The minimum of 25 years of contribution is checked for each sample. When a sample is qualified as a pensioner, PENMOD calculates pension benefits for the basic pension (the first tier) and the earning-related pension (the second tier).

Pension Benefits (Loop 2)

Since the retired generation receives pension benefits, the second loop of life events is called Pension Benefits. Compared with the former participant histories (Loop 1), the second simulation is slightly simpler.

(i) Addition of new samples: PENMOD adds new samples of pensioners to the pension benefits records.

(ii) Determination of death: The simulation method is same as the one in the participant histories. The death probabilities are high among the elderly; some samples in this loop will die.

(iii) Benefit increase: Under the current law, existing pension benefits are reevaluated according to the annual increase in the CPI rate. PENMOD follows this rule and provides benefit increases.

(iv) Survivor's benefit: PENMOD constructs new samples for survivor's benefits when the earning-related pensioners die. A random number is compared with the share ratio of survivors. This new sample will experience life events simulation from the following year.

=== Figure 6.1 ===

Data Sources

Since panel data that cover long-term contribution histories do not exist in Japan, dataset formations are conducted for the participant records from 1961 to 2004. The model develops annual sample datasets from official aggregate statistics. It connects these datasets over the years. New samples constitute artificial data, and the overall dataset is paradata in this context[55]. Dynamic microsimulation can estimate future situations using the dataset; however, the pension amounts in the near future depend on the past records. Past record creation is an important factor in PENMOD. The procedures for this are as follows.

(i) The annual statistical report (JN, *Jigyo Nenpo,* 1961–2004) of the Social Insurance Agency (SIA) forms the basis of PENMOD. The number of participants in national pension and employees' pension insurance are recorded in JN. The information of age categories (the aggregate for every five years) and salary data for both sexes can be obtained.

[55] The paradata method was used in some previous studies also.

(ii) The basic survey on wage structure (WC, *Wage Census*, 1948–2006) conducted by the Ministry of Health, Labour and Welfare (MHLW) presents cross-sectional data on age and income. JN statistical figures are divided by using WC data.

(iii) The population census (PC, *Kokusei Chousa*) is also used for the categorical divisions based on age (i.e., annual data of each category).

(iv) Other data sources are required for public servants: (1) annual pension statistics for civil servants of the central government (*Kokka Koumuin Kyousai Kumiai Jigyo Nenpou*) and (2) annual pension statistics for civil servants of the local governments (*Chihou Koumuin Kyousai Kumiai Jigyo Nenpou*). Data on the number of participants and average income are collected from these data sources.

With regard to pension benefits, the initial benefit record is developed by using the annual statistical report (JN, 1961–2004). At the starting year of the simulation, most pension benefits are for pensioners who have already retired. The data on benefit type are collected: (1) old-age benefit (RN, *Rorei Nenkin*); (2) compiled portable old-age benefits (TRN, *Tu-san Rorei Nenkin*); (3) survivor's benefit (IN, *Izoku Nenkin*); and (4) disability benefit (SN, *Shougai Nenkin*). The numbers and the average pension benefits are collected from JN, and the dataset of 1/50,000 scale is formed.

Change in employment status among Type 1, Type 2, and Type 3 is the most important simulation procedure in PENMOD. The working generation will change its pension status in the following manner: (i) continue, (ii) change, (iii) entry, (iv) exit, and (v) non-job. For example, when a Type 1 self-employed individual continues with his/her job, it is classified as "continue" (from Type 1 to Type 1). When a Type 1 unemployed individual is hired by a private company, it is classified as "entry" (from Type 1 to Type 2). The job change probabilities are calculated from the *Employment Status Survey* (SKKC, *Shugyou Kouzou Kihon Chousa* 2003). In the simulations of life events, a random number is provided to a sample, and PENMOD refers to the relevant probabilities in the sex-age-current job type categories. Based on the comparison between the random number and relevant probability, new participant types are determined.

=== Figure 6.2 ===

6.3 Policy Options with the Quantitative Results

6.3.1 VAT Finance in Basic Pension

VAT finance for the basic pension scheme was the most controversial issue in 2008. The first tier of the public pension is the common arrangement among all pension schemes in Japan. The basic pension receives subsidies from the central government. The subsidy ratio will be raised from a third (i.e., 1/3) to one half (i.e., 1/2) in 2009. The idea of VAT finance asserts that the entire basic pension should be financed by the general budget. Following are the reasons why the VAT finance has become an influential policy proposal.

First, the declining birthrate and the emerging gray society are making people uneasy about their retirement income. Financing basic pensions with the VAT can relieve this anxiety, because pension is ensured even if the working generation cannot afford it. Second, the VAT finance could become an alternative measure for the problem of unpaid contributions. Under the social insurance system, a person who has not been making contributions cannot receive his/her old-age benefit after retirement. Shifting to VAT finance solves this problem because people can receive their pensions without paying contributions. However, concerning the unpaid contributions, the NCSS offers counterarguments such as (i) the financial impact of unpaid contributions is not so large that it will jeopardize future pension financing and (ii) the current drop-out rate is relatively low, and the rapid future increase in unpaid pensioners is unrealistic. Third, the VAT finance can solve the problem of floating participant-records, which has been another critical issue since 2007. People can receive pensions without participant records under the VAT finance scheme. The tax collection by the Inland Revenue functions well compared with the current system in SIA. Fourth, the generational inequality will be addressed by the VAT finance. Previous studies on generational accounting show that the younger generation suffers losses under the existing social security scheme. The VAT reduces the pension contributions for the younger generation by imposing financial burdens on the elderly as well. The advocates of VAT finance assert that it could redistribute the pension burden

among different generations under the future increases in social security expenditures.

The NCSS presents a rather negative simulation results for the VAT finance because of the large transitional cost involved. Let us consider the case of an immediate shift from the existing social insurance arrangements to the VAT finance scheme. If the government neglects the past participant records and offers equal amounts of basic pension to all retired persons, the workers who have contributed in the past will oppose. However, if the government reduces the basic pensions accrued from past contributions, the ideal behind the basic pension—to offer a certain minimum social security to all—will be jeopardized. Alternatively, if the add-on pensions are designed, the transitional cost is more than 8% in VAT rate. This seems unacceptable in Japan.

The feasible policy option in the NCSS's simulation results seems "Case B: Pension reduction with respect to the past unpaid periods." Case B admits the former system remains for the past record and the new system is only for the future record. This means that the new VAT finance will be applied to the future participation years only. For example, a worker having 30 years' past record in his/her 40-year working history at the transition can receive the VAT finance only for the remaining 10 years. Case B does not require the cost of transition; however, the transition period to the new system becomes longer. In addition, the retired persons in the near future cannot enjoy the new system. The advantage of Case B is that rapid VAT increase will be avoided. When the aim of pension reform is to help the so-called lost generation,[56] whose members are under the age of 40 now, Case B will attain the policy goal since most basic pensions will be financed by VAT in 30 years.

=== Figure 6.3 ===

=== Figure 6.4 ===

Simulation Results (Dual Burdens)

[56] They confronted with the heavy economic recession in 1995-2005. Many workers could not find regular occupations and this will cause the future low pensions in their retirements.

PENMOD simulates the introduction of the VAT finance from 2005, showing how the past and future contributions will affect the total expenditure. According to the simulation results, almost all of basic pensions is for the past record during the initial 30 years. The transitional costs are calculated as 3 percentage points of the VAT rate in each year. This is the dual cost of transition. Case B of the NCSS enables the VAT finance by dispersing its transitional costs over more than 40 years.

Simulation Results (Claw Back)

If the additional cost of transition is about 3 percentage points in the VAT rate, the next problem is how to reduce it. In this regard, let us refer to the claw-back system of Canadian pension arrangements[57]. Under the claw-back system, part of the basic pension is decreased in high-income retired persons. The reductions are clawed back through the income tax scheme. Supporters of the claw-back system insist that the VAT finance targets to help only the poor elderly. The NCSS also analyzes the claw-back system with the conclusion that the rate of VAT could be reduced by 1.3% when marginal 0.25% cut in the basic pension is applied for every additional 10 thousand yen to retirement income over 6 million-yen per year[58]. The reduced rate of 1.3% seems a small number; however, the rate varies with respect to the simulation cases. If the cut rate becomes 0.5% for every additional 10 thousand yen and the applied income level is decreased to 3 million-yen, the reduction rate becomes 8.8% of the VAT finance[59].

Since the income records vary among samples in PENMOD, the simulation scenarios that set the different conditions to income levels can be analyzed. I set the following two pension tests, considering the amount of public pensions only. When the sum of the basic pension and the earning-related pension exceeds the target level, the basic pensions will be cut.

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[57] See Takayama(2002) on Canada's claw back system.
[58] This is an income-test for the elderly. The other income sources except pension are also considered. When the total income exceeds over 10 million-yen, the entire basic pension will be cut.
[59] In this case, the entire basic pension will be cut when the total income exceeds over 5 million-yen.

Scenario 1: Cut of 8.9 thousand yen from the basic pension for every 10 thousand yen increase in total pensions. The starting point is 166 thousand yen per month, which is the sum of the first tier and the second for the typical pensioner who had earned average wages in his/her 40 year-working period[60].

Scenario 2: Cut of 6.0 thousand yen from the basic pension for every 10 thousand yen increase in total pensions. The starting point is 133 thousand yen, which is double the basic pension.

These claw-back systems are assumed to be applied to new pensioners starting from 2005[61]. Under these two scenarios, the basic pension vanishes when the initial pension amount exceeds 239 thousand yen per month, and the pensioner will receive just his/her earning-related pension of 174 thousand yen. The reduction rate reaches 27% in this case.

=== Figure 6.5 ===

=== Figure 6.6 ===

According to the simulation results, the saved tax finance increases along with the new pensioners. The reduction rates, which are defined as the ratio to the total VAT finance, are 4.8% in Scenario 1 (2030) and peaks at 12.2% in Scenario 2 (2034). The reason why the reduction rates decrease in the 2040s is that the economic recession of the 1990s has depressed the wages of the current younger generation and this will have an effect 40 years from now. In the 2050s, the transition will be completed, and the reduction rate is 2% in Scenario 1 and 7% in Scenario 2. These simulation results suggest that the introduction of the claw-back system can save the VAT finance by about 2%–7% at the most.

[60] These figures are on the monthly basis. The cut rate is 1.37%, the annual pension is about 2 million-yen.

[61] The claw-back system should be applied to future contributions only. The simulation does not consider this adjustment for simplification.

=== Figure 6.7 ===

=== Figure 6.8 ===

6.3.2 Swedish System

Non-financial defined contribution (NDC) is a new public pension scheme, popularly known as the Swedish system. NDC is the reform plan for the second tier because NDC is the compulsory earning-related pension. NDC introduces the personal account that applies the defined contribution (DC) for individuals, but the personal account is the notional system. Some political parties and newspapers propose an introduction of NDC in Japan. The merits of NDC are as follows. First, NDC promotes transparency in the pension scheme. NDC notionally invests pension contributions at the personal accounts so people can understand their contribution and benefits easily. Second, NDC serves generational equity. NDC does not charge burdens to the younger generations.

The introduction of the minimum pension is another feature of NDC. NDC equalizes the costs and benefits at the personal level; it does not redistribute income among different generations. NDC complements a new minimum pension scheme for the first tier to pursue social adequacy. The minimum pension is to be funded by the VAT in Japan; however, it will not be too costly as it will be applied only to the poor. PENMOD conducts the NDC simulations with the following three policy scenarios.

(i) Income-related pension. The contribution rate is 15% of wages. The notional interest rate is 2.1% per annum in nominal terms, which will be equal to the expected rate of future wage increase. The so-called division factor is 20.7 years which is the life-expectancy after retirement at 65 years old[62]. The notional asset is divided by 20.7 to calculate the annual pension.

(ii) Minimum pension financed by VAT: The pension amount per month is 70 thousand yen. A

[62] This is the G-vale in NDC.

person with no income-related pension can receive the full amount of the minimum pension. The minimum pension is reduced by 5 thousand yen for every 10 thousand yen increase in the income-related pension. The minimum pension vanishes with the monthly 140 thousand yen of income-related pension.

(iii) The year of introduction is 2010. In transition, the old system is applied to the past contributions and the new NDC is applied to the future contributions only. The shift from the existing system to the NDC is gradual.

=== Figure 6.9 ===

=== Figure 6.10 ===

Simulation Results (Income-related Pension and Minimum Pension)

The total expenditure increases rapidly from 10 years after the transition. The income-related pension reaches 150% of the current earning-related pension in 50 years, at the time when the new arrangement takes full effect. The minimum pension will experience relatively low growth. It reaches 70% compared with the current basic pension. The sum of the income-related pension and the minimum pension maintains the same level as the existing scheme. The minimum pension is financed through VAT, and the budget subsidy will increase under the NDC system; however, the VAT finance of NDC is less expensive than the VAT finance in basic pension.

=== Figure 6.11 ===

=== Figure 6.12 ===

Simulation Results (Intergenerational Equity)

Under the current scheme, the generation 1950 (birth year) receives 82.2 trillion yen, the generation 1970 receives 95.6 trillion yen, and the generation 1990 receives 86.4 trillion yen,

respectively. The introduction of NDC changes these values to 82.0 trillion yen (-0.3%) in generation 1950, 103.3 trillion yen (+8.1%) in generation 1970, and 89.9 trillion yen (+4.0%) in generation 1990. For the generation 1950, as most pensions correspond to the past contributions only a small change can be expected. On the other hand, about 60% of pensions in the generation 1970 and almost 100% in the generation 1990 are replaced by the NDC arrangements. The pension amounts will be increased in the generations 1970 and 1990 because the introduction of NDC increases pension benefits for the poor. This result suggests that NDC can contribute more to intergenerational equity.

=== Table 6.1 ===

=== Figure 6.13 ===

=== Figure 6.14 ===

6.4 Conclusions

The pension reforms in 2004 introduced an automatic adjustment mechanism for the public pension finance in Japan. Under the so-called macroeconomic indexation system, the pension expenditure will be contained in accordance with the demographic changes. Thus the possibility of bankruptcy in the pension scheme was avoided; however, in addition to the financial stability problems, a need for minimum guarantees on retirement income is growing.

The transitional cost to a new VAT finance of basic pension is approximately 3 percentage points in the VAT rate for over 40 years. The claw-back mechanism, which decreases the basic pensions for high-income persons, relieves the tax burden by 7% at the most.

The Swedish system replaces the existing basic pension with the minimum pension, and it also replaces the earning-related pension with NDC. PENMOD shows that a new Swedish system ensures the same pension expenditures. The simulation results suggest that an introduction of the

Swedish system is feasible in Japan. The gradual increase in the minimum pension arrangements during transition contributes to strengthen intergenerational equity.

References for Chapter 6

English

Barr, N. (2001), *The Welfare States as Piggy Bank—Information, Risk, Uncertainty, and the Role of the State*, Oxford: Oxford University Press.

Creedy, J., A. Duncan, M. Harris, and R. Scutella (2002), *Microsimulation Modelling of Taxation and the Labour Market : The Melbourne Institute Tax and Transfer simulator*, Cheltenham: Edward Elgar.

Harding, A, and A. Gupta ed. (2007), *Modeling Our Future: Population Ageing, Social Security and Taxation*, International Symposia in Economic Theory and Econometrics, Amsterdam: North-Holland.

Gupta, A, and A. Harding ed. (2007), *Modeling Our Future: Population Ageing, Health and Aged Care*, International Symposia in Economic Theory and Econometrics, Amsterdam: North-Holland

Japanese

Inagaki, S. (2007), *Socio-Demographic Future Simulations in Japan: Microsimulation Analysis*, Japan Statistical Association.

Kawashima, H. (2005), "The Life-cycle Model of the Individual Household in a Microsimulation: Creation of Algorithm" in *Studies in Contemporary Economics*, No.12, August 2005, The Western Association of Economics.

Ministry of Health, Labour and Welfare (MHLW) (2004), *Review of the 2004 Actuarial Valuation of the Public Pension Plans (Zaisei Saikeisan Houkoku).*

National Council on Social Security (NCSS) (2008a), *Medium Report.*

———— (2008b), *Final Report.*

Shiraishi, K. (2008a), "Pension Reform in Japan: Prospects for Minimum Pension Guarantee and Non-Financial Defined Contribution," *CIS Discussion Paper No.358,* Center for

Intergenerational Studies, Institute of Economics, Hitotsubashi University.

Shiraishi, K. (2008b), "The Use of Microsimulation Models for Pension Analysis in Japan," *CIS Discussion Paper No.409,* Center for Intergenerational Studies, Institute of Economics, Hitotsubashi University.

Takayama, N. (2002), "Pension Problems in Canada" in *The Review of Comparatives Social Security,* National Institute of Population and Social Security Research.

Figure 6.1 Life Events Analysis in PENMOD

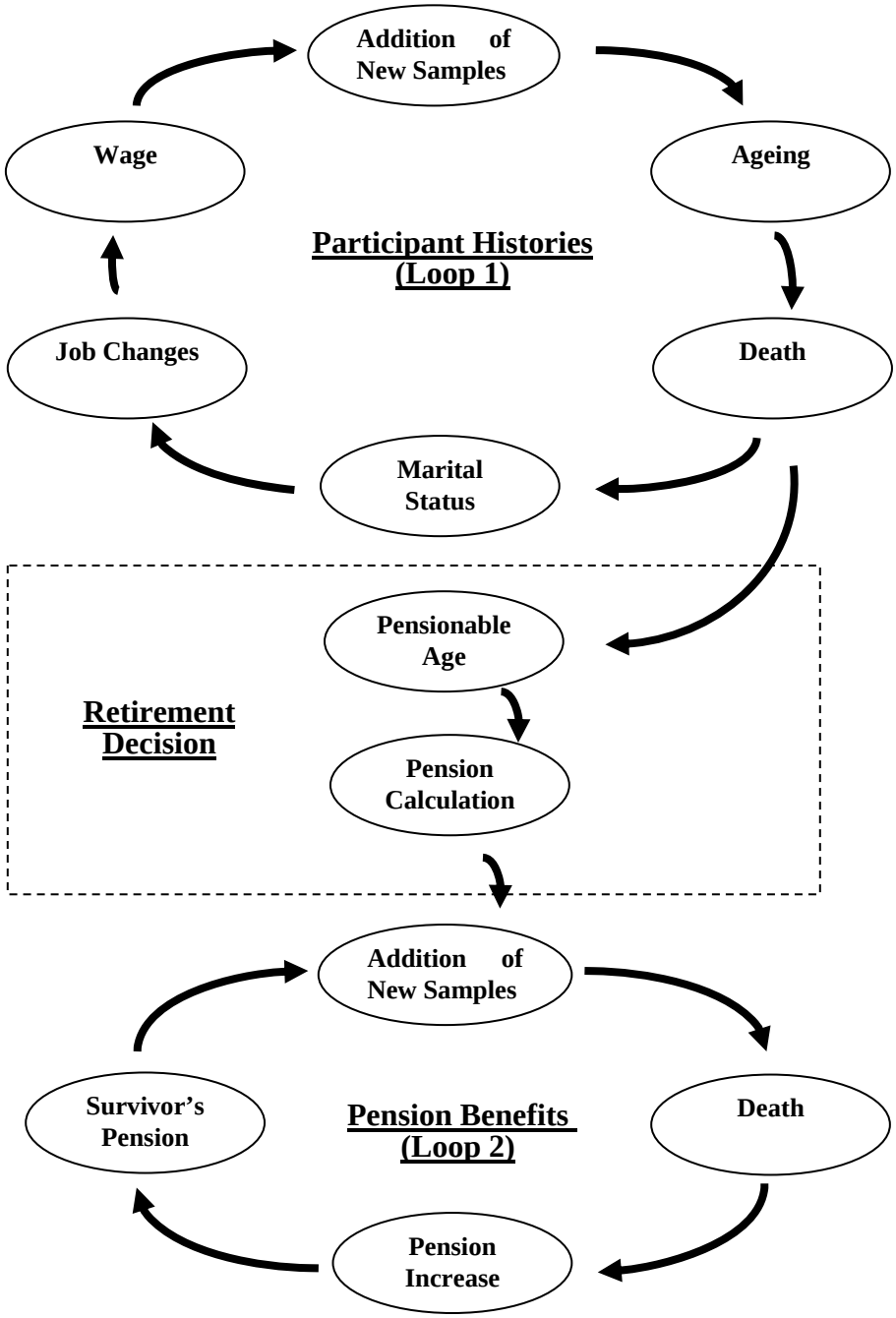
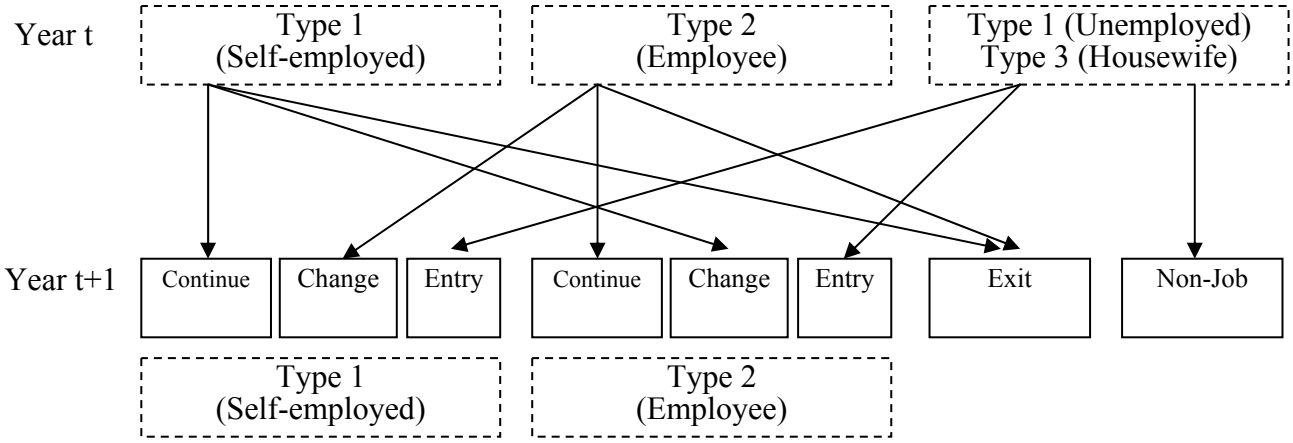
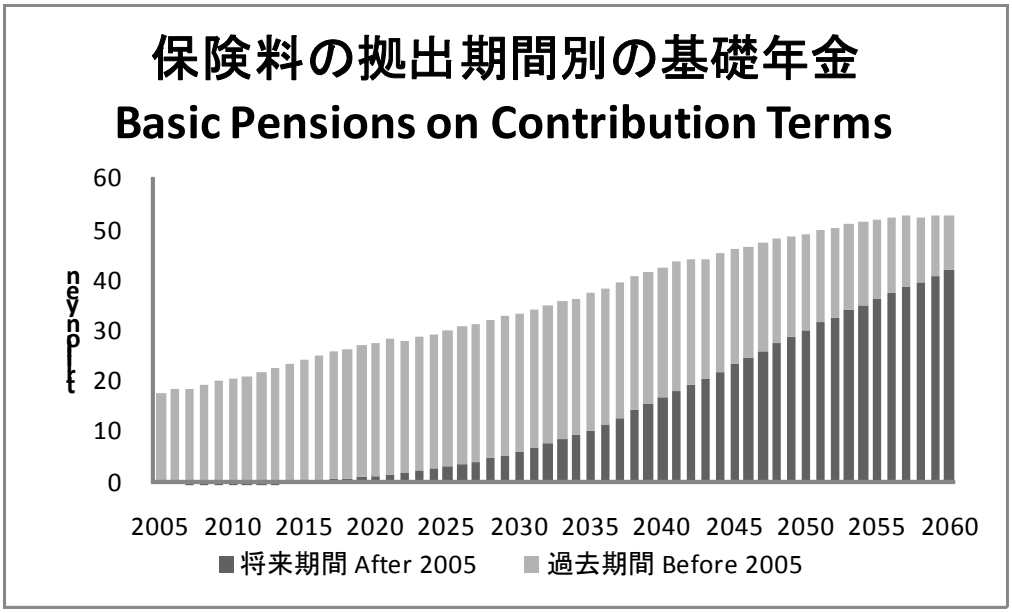


Figure 6.2 Types of Job Changes



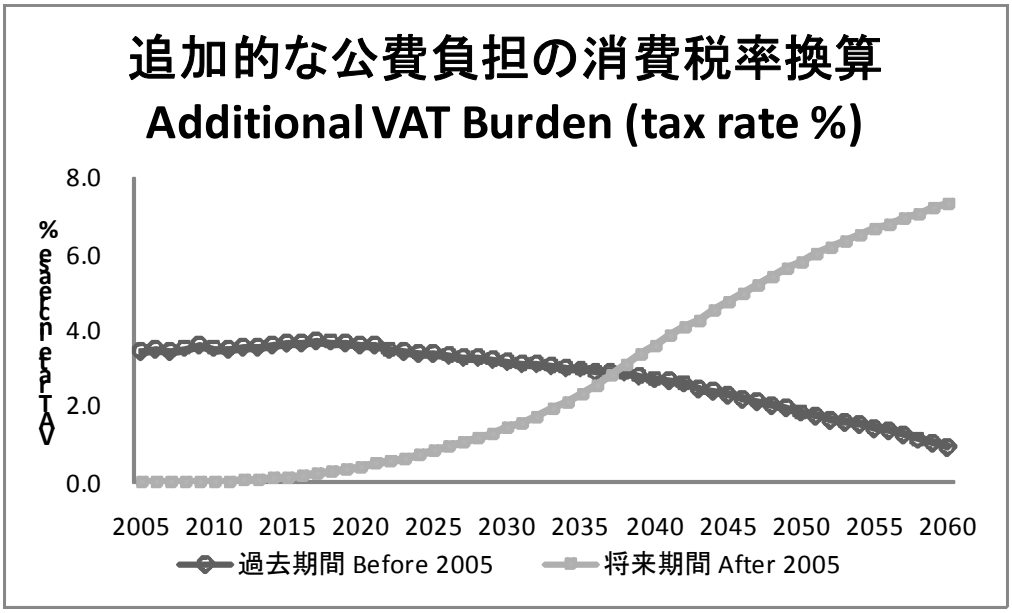
Note 1: The job change probabilities are used for the simulation of life events.
Note 2: There are three possibilities with regard to each participant in the next year. He/she may (i) continue, (ii) change, or (iii) exit. When the participant is unemployed or a housewife, there are only the following two possibilities: (i) entry or (ii) non-job (continue).

Figure 6.3 Basic Pensions with respect to Contribution Terms



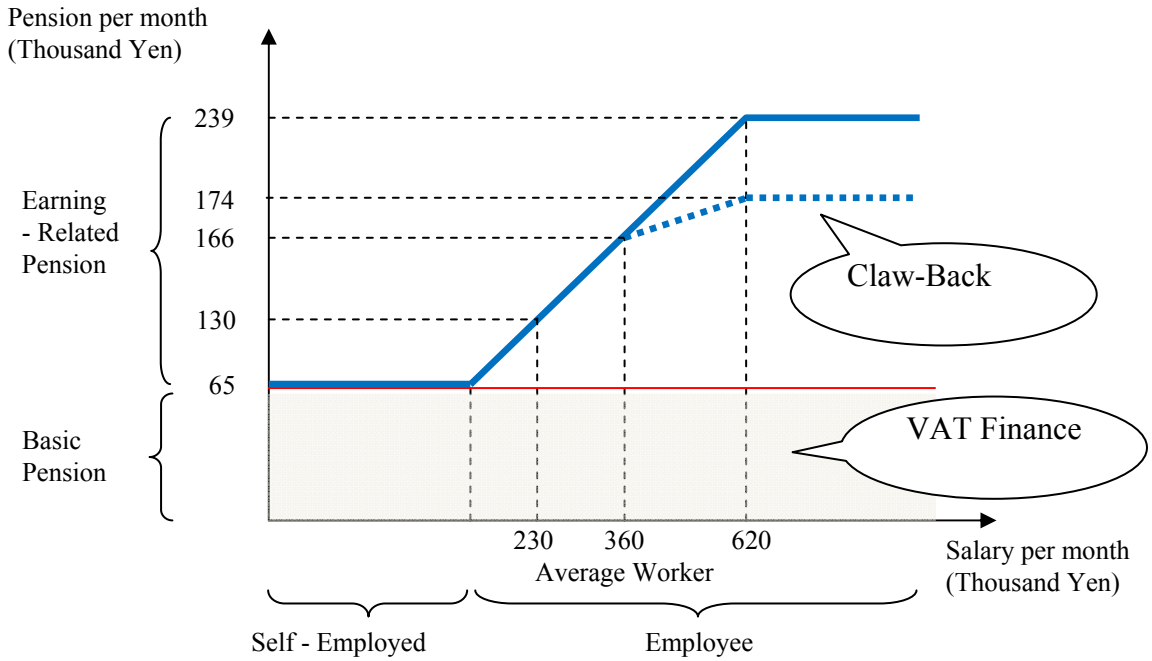
Note 1: The VAT finance for the basic pension from 2005.
Note 2: The pension expenditure is divided into two parts with respect to contribution terms.

Figure 6.4 Additional VAT Burden



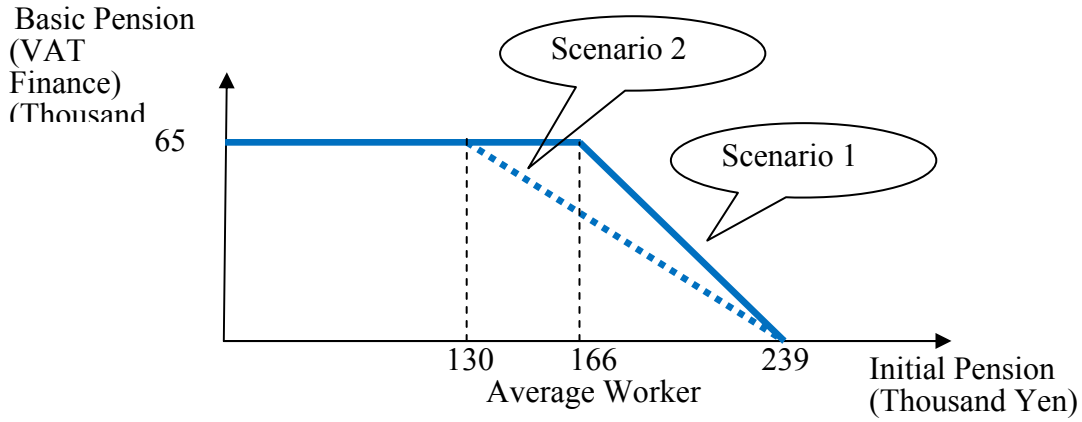
Note 1: Half of the basic pension expenditure is the additional cost of the tax finance. This figure shows the VAT rates for this reform.

Figure 6.5 Pension Arrangements for Typical Worker



Note 1: The relationship between salary and pension
Note 2: The average worker gets a 360 thousand yen salary. He (She) can receive 65 thousand yen's basic pension and 101 thousand yen's earning-related pension.
Note 3: The entire basic pension is financed by the VAT finance
Note 4: The earning-related pensions are decreased in the claw-back system

Figure 6.6 Claw-Back System



Scenario 1: The basic pension is reduced when the initial pension exceeds 166 thousand yen.
Scenario 2: The basic pension is reduced when the initial pension exceeds 130 thousand yen.

Figure 6.7 Reductions in Tax Burden (Claw Back)

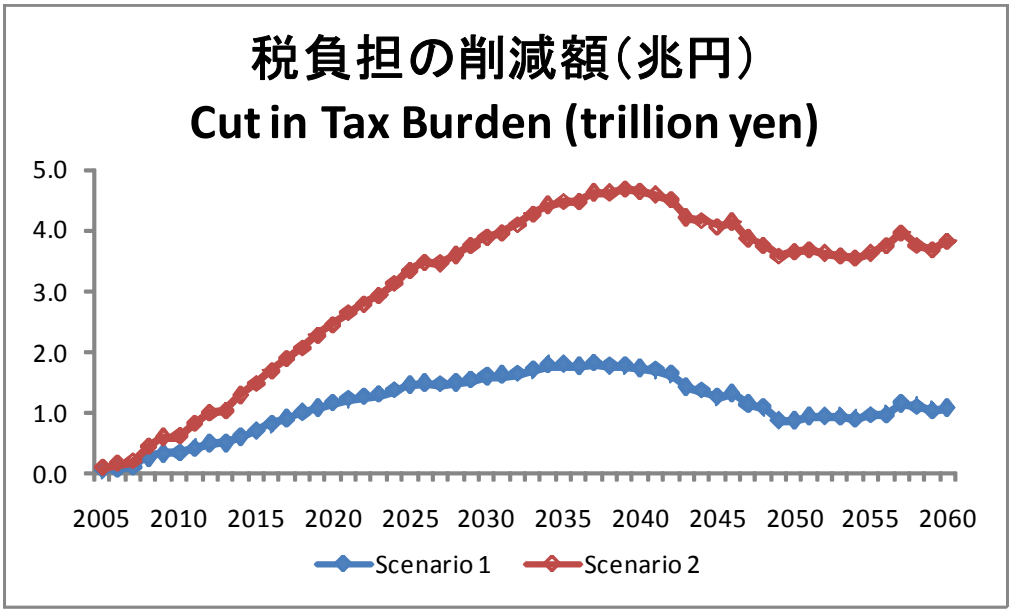


Figure 6.8 Reduction Rates in Tax Burden (Claw-Back)

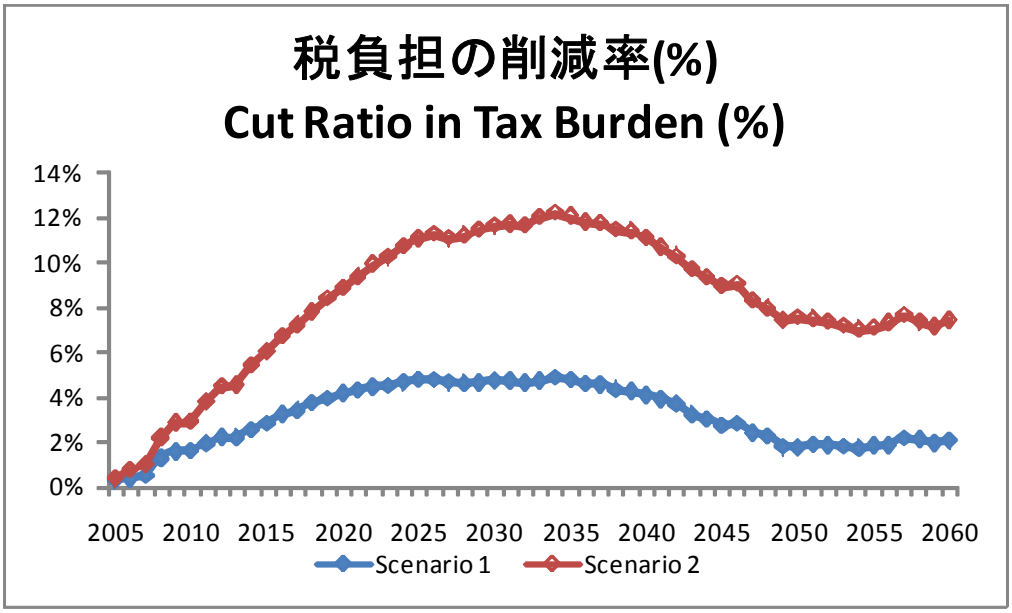
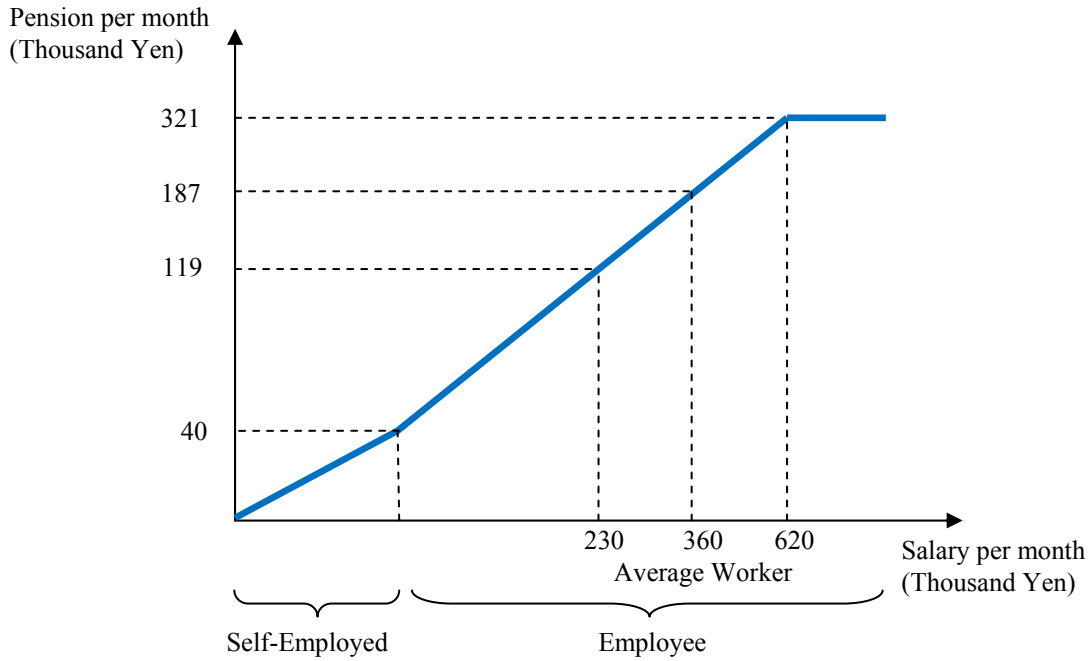


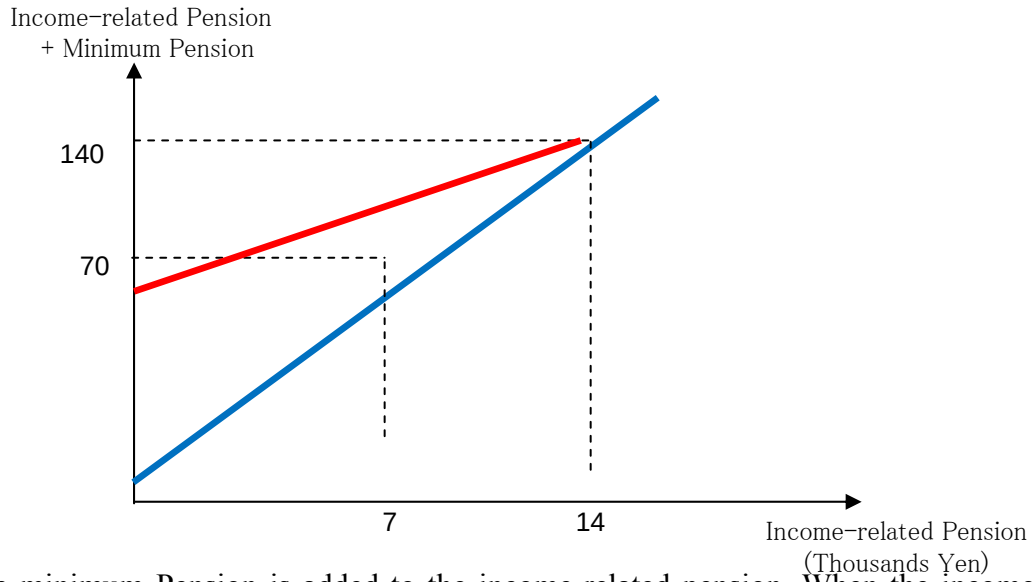
Figure 6.9 Income-related Pension (Swedish System, NDC)



Note 1: The relationship between salary and pension under the Swedish system. The notional interest rate is 2.2%, and the CPI increase rate is 1.0%.

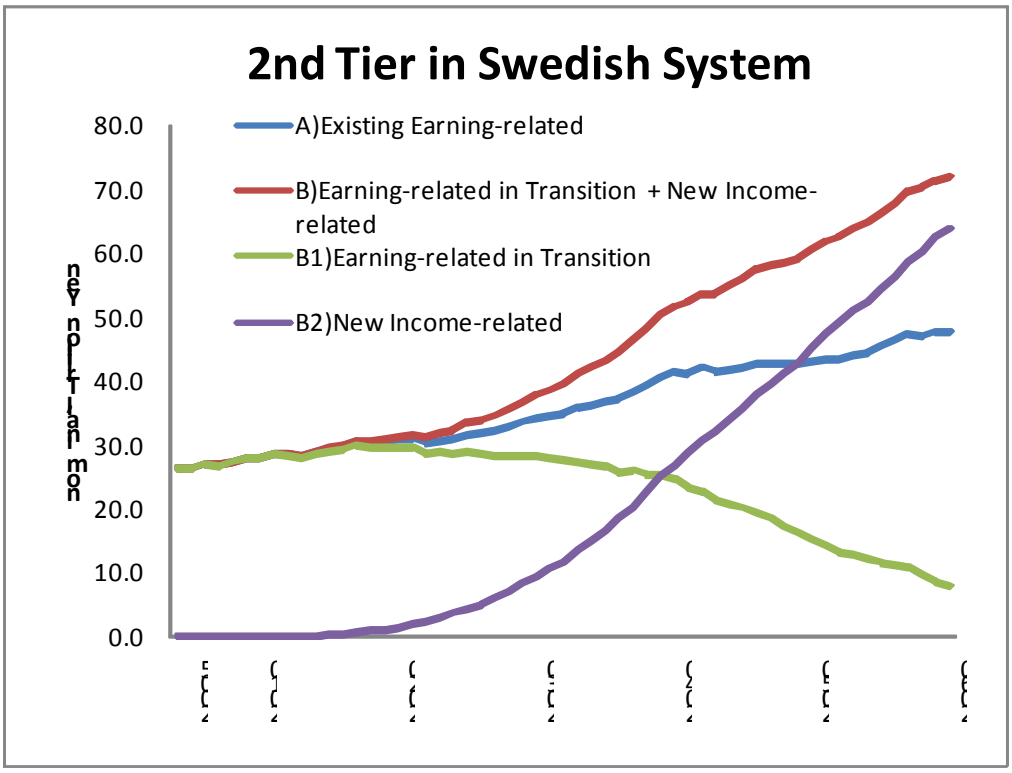
Note 2: The average worker gets a 360 thousand yen salary. The corresponding NDC's income-related pension is 187 thousand yen for employees and 40 thousand yen for the self-employed.

Figure 6.10 Minimum Pension (Swedish System, NDC)



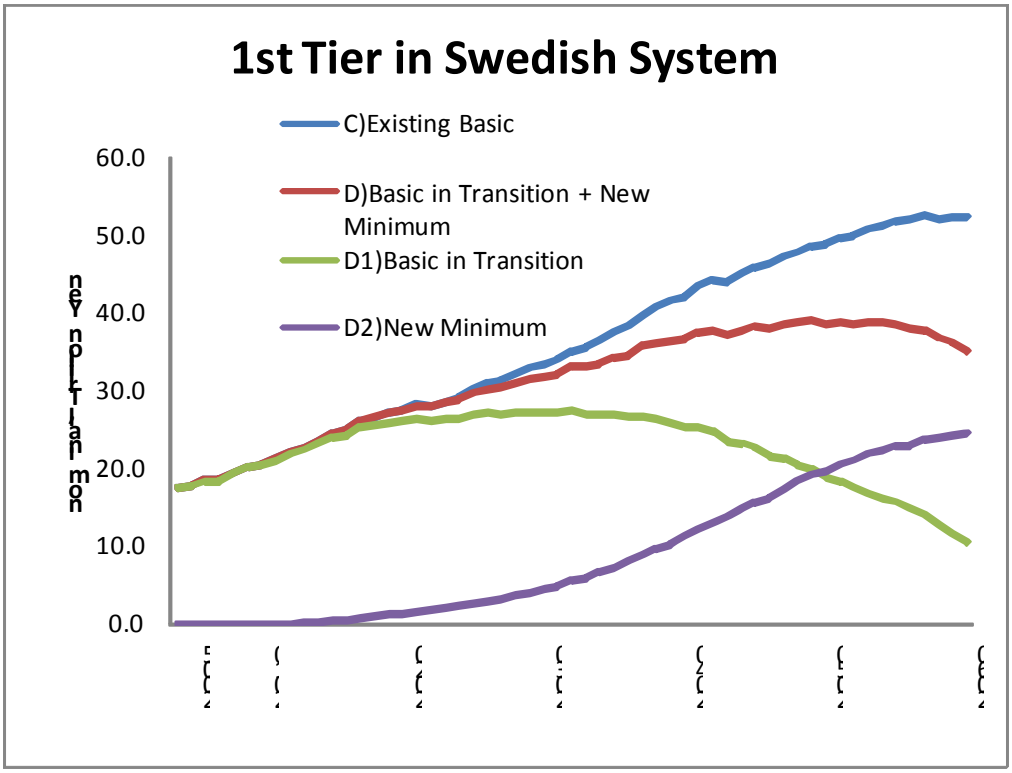
Note 1: The minimum Pension is added to the income-related pension. When the income-related pension exceeds 140 thousand yen per month, the minimum pension vanishes.

Figure 6.11 Income-related Pension (Swedish System, NDC)



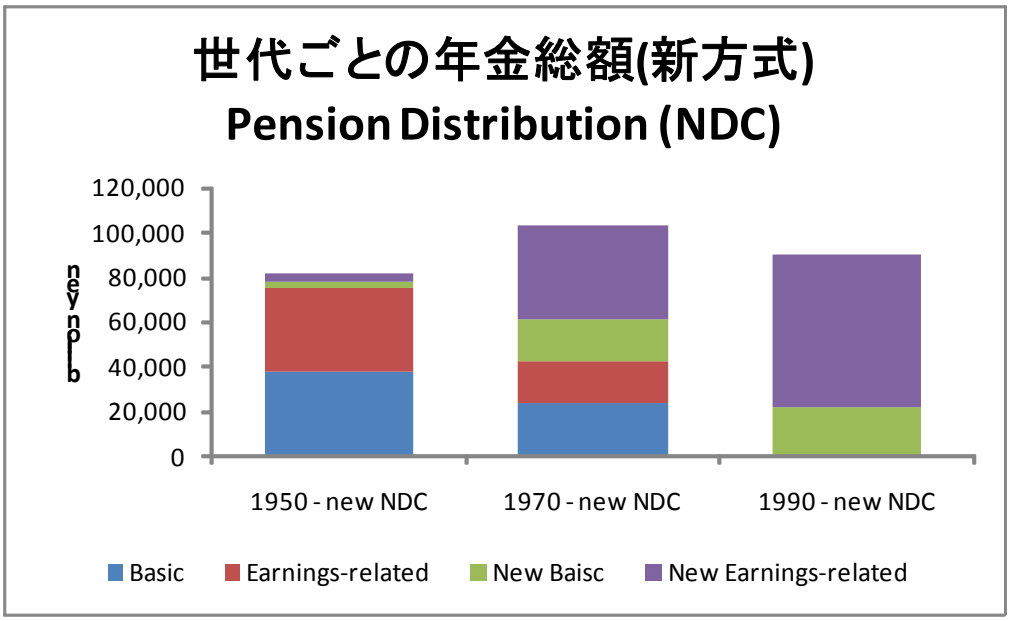
Note 1: The new income-related pension grows rapidly, while the former earning-related pension reduces gradually.

Figure 6.12 Minimum Pension (Swedish System, NDC)



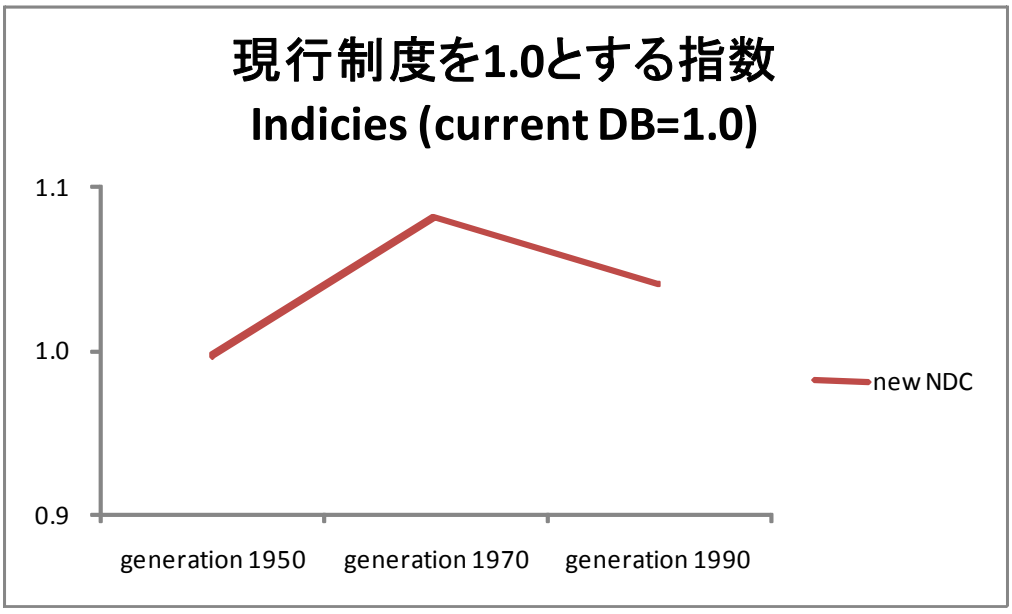
Note 1: The new first tier (minimum pension + basic pension in transition) grows moderately compared with the former basic pension.

Figure 6.13 Generational Distribution (Swedish System, NDC)



Note 1: The pension amounts in three generations
Note 2: The shares of NDC rise in younger generations

Figure 6.14 Changes in Distribution (Swedish System, NDC)



Note 1: Comparisons between the existing totals and the NDC's totals

Table 6.1 Generational Distribution (Swedish System, NDC)

billion yen	Basic	Earnings-related	New Baisc	New Earnings-related	Total	DB=1.0
1950 – current DB	41,552	40,634			82,185	1.00
1970 – current DB	49,275	46,321			95,596	1.00
1990 – current DB	43,965	42,434			86,398	1.00
1950 – new NDC	37,715	37,611	3,266	3,365	81,957	1.00
1970 – new NDC	23,406	19,238	18,469	42,232	103,345	1.08
1990 – new NDC	363	120	21,910	67,468	89,861	1.04
1950 – new NDC	46.0%	45.9%	4.0%	4.1%	100.0%	
1970 – new NDC	22.6%	18.6%	17.9%	40.9%	100.0%	
1990 – new NDC	0.4%	0.1%	24.4%	75.1%	100.0%	

Note 1: Comparisons between the existing totals and the NDC's totals

Chapter 7

Top Executive Turnover in Japanese Non-listed Firms: Causes and Consequences[63]

Abstract

We examine the pattern of top executive turnover among small non-listed businesses in Japan using a unique panel data set of about 25,000 firms for 2001-2007 and find the following. First, the likelihood of a change in top executive among non-listed firms is independent of their ex-ante performance, especially when the firms are managed by the owners themselves or by their relatives. Second, non-listed firms which experienced a top executive turnover saw an improvement in ex-post performance relative to firm without turnover. The extent of the improvement is similar between non-listed firms and listed firms. All of the above results indicate that underperforming non-listed firms do not face disciplinary executive turnover but that their top executives, once they succeed their predecessors, exert high managerial effort and thus significantly improve firms' profitability.

7.1 Introduction

One of the worrying trends for Japan's economy is that, for many years now, the number of firms exiting the market has been considerably greater than the number of firms entering. As a result, the total number of firms in Japan has dropped sharply in the past two decades: from 5.35 million in 1986 to 4.21 million in 2006. Most of the decline can be attributed to the small and medium enterprises (SMEs) sector, where the number of firms has declined from 5.33 million in 1986 to 4.20 million in 2006.

[63] Excellent research assistance was provided by Yugo Shinozuka.

One of the primary reasons for the shrinking population of SMEs is thought to be difficulties in attaining a smooth transition in management or a smooth transfer of the business from aging managers to their successors. The Small and Medium Enterprise Agency (2006) estimated that a quarter of all firm exits are explained by the failure of finding a new top executive. In order to slow down the shrinking population of firms, policy responses by the government have included reductions in the inheritance tax for stocks held by owner-managers. These policies are designed to facilitate the process of top executive turnover among small businesses.

An important question in this context, however, is whether present patterns of top executive turnover in Japan's SME sector are efficient. If poor performance is not punished by the replacement of firms' top management or if the profitability of firms with new top executives does not improve, the government's policies to promote smooth managerial transition are misguided. Against this background, the purpose of this paper is to examine the determinants of top executive turnovers and their effectiveness in improving the ex-post performance of firms focusing on small businesses in Japan. Many of the previous studies on the determinants of top executive turnover, including Kaplan and Minton (1994), Kang and Shivdasani (1995), and Denis, Denis, and Sarin (1997), find that underperforming firms are more likely to replace their top executives than well-performing firms. They also find that ownership structures affect the turnover sensitivity to a firm's performance. However, the focus of these studies is limited to large listed firms and does not cover small businesses. Another strand of literature, which includes Huson, Malatesta, and Parrino (2004), Bennendsen el al. (2007), and Perez-Gonzalez (2006), focuses on the ex-post performance of firms that experienced managerial turnovers. However, their analyses are again either limited to large public firms (Huson et al. (2004)) or to a comparison between types of management turnover rather than a comparison between firms that experienced management turnover and those that did not (Bennendsen et al. (2007) and Perez-Gonzalez (2006)).

Our study therefore represents the first attempt to comprehensively examine the causes and consequences of managerial turnover among small privately-held business and compare the results with those for large public firms. Top executive turnovers among small non-listed firms are expected to be quite different from those among large listed firms in the way turnovers are

determined and the way they affect firms' performance. First, most small non-listed firms are run by owner-managers, while only a small minority of large listed firms are owned by their managers. When there is an effective external control threat by outside shareholders, this threat is likely to raise the probability that poorly performing top executives are replaced by other more competent executives. However, managerial ownership reduces the relative importance of outside shareholders, insulates firms from such external controls, and eventually allows inefficient incumbent executives to stay in the firm. Managerial ownership may also result in insufficient performance improvements since it constrains the choice of succeeding managers to a limited pool of managerial talent.

Second, the shares of small privately-held firms are illiquid since they are not listed on the stock market and some of the external control mechanisms which require frequent market transactions are not applicable. For example, in the case of non-listed firms, there is no takeover threat which might lead directors to take disciplinary action, including the replacement of managers, since stocks of the target firm are not readily available to potential bidders. Note, however, that certain other control mechanisms are still effective for non-listed firms, such as controls by the banks that extend loans to such firms. As suggested by Diamond (1984) in his theoretical model, banks are able to provide monitoring activities as a delegated monitor and exert external controls over borrowing firms, including the replacement of incumbent managers.

Employing a unique panel data set of about 25,000 small non-listed firms for 2001-2007 as well as a panel data set of about 2,200 large listed firms for the same period, this paper provides two strands of analyses. First, we examine the determinants of top executive turnover, including firm characteristics, executive characteristics, managerial ownership, and bank-firm relationships. Second, we examine the ex-post performance of firms that experienced top executive turnover in comparison with that of firms that did not experience such turnover. We compare these two groups firms using the difference-in-differences method.

We find that the likelihood of a change in top executives among non-listed firms is independent of their ex-ante performance, especially in the case of firms that are operated by owner-managers themselves or by relatives of major shareholders. This contrasts with the finding that the management turnover likelihood among listed firms is negatively associated with their performance.

We also find that non-listed firms that experienced a top executive turnover subsequently performed better than firms with no turnover. Moreover, the extent of performance improvements following managerial replacements is similar for small non-listed firms and large listed firms. All of the above indicate that non-listed firms, most of which are operated by owner-managers, do not experience disciplinary executive turnovers when they underperform. This is in sharp contrast with listed firms, which face a significant increase in the likelihood of management replacements when they underperform. However, once new top executives assume the presidency of these non-listed firms, they exert high managerial effort and thus improve their firms' profitability, as we observe in the case of listed firms.

The paper proceeds as follows. Section 2 summarizes the previous literature and presents the empirical hypotheses. Section 3 then describes the data used for the analysis, while Section 4 presents the empirical results. Section 5 concludes.

7.2 Empirical Hypotheses

Regarding the literature on top executive turnovers, one strand of research examines the determinants of these turnovers. Previous studies focus on disciplinary events such as a downturn of firms' business and examine if the probability of executive turnover is higher among underperforming firms. Many previous studies, concentrating on variety of countries including the United States, Germany, and Japan, point to a significant association between poor performance and a higher incidence of management replacements.[64] The pioneering studies on Japanese firms are Kaplan and Minton (1994) and Kang and Shivdasani (1995). Analyzing the likelihood of outside board member appointments, Kaplan and Minton found that outside members previously employed by banks or other, non-financial firms are more frequently appointed as board members when the firm's stock performance is poor. They also found that these appointments subsequently increase the turnover of top executives within the firm. Meanwhile, Kang and Shivdasani examined the relationship between top executive turnover and firm performance and found that the likelihood of

[64] For studies on the United States and Germany, see Denis, Denis, and Sarin (1997) and Kaplan (1994), respectively.

turnover is significantly related to industry-adjusted returns on assets, excess stock returns, and negative operating income.

Unfortunately, not only in the case of studies on Japan but also those on other countries, the scope of the analysis of the determinants of executive turnover is limited to large listed firms and small non-listed enterprises are not included. From the disciplinary point of view, small privately-held enterprises differ from large listed firms in two ways. First, most small non-listed firms are operated by owner-managers, while only a small minority of large listed firms are run by the owner-mangers. Managerial ownership has a positive aspect in that it increases the power of top executives with sizable voting power and better aligns the interest of the two different groups of top managers and shareholders. Since agency problems are alleviated by managerial ownership, the value of the firm is expected to rise. On the other hand, managerial equity ownership has negative implications for external control over the firm. Firms with owner-managers are insulated from external controls and thus can keep underperforming incumbent executives. Second, private firms whose shares are not traded on the stock market are less likely to face the threat of external controls than public firms. Shares issued by private firms are illiquid and some of the means to gain external control of a firm including takeover bids are difficult to exercise. Therefore, private firms are less likely to be pressured into replacing their management even when they underperform. In sum, for small non-listed firms, which are in most cases managed by their owners, we arrive at the following hypothesis on top executive turnover.

Hypothesis 1: Top executive turnover for small non-listed firms is less sensitive to their performance than for large publicly listed firms.

A related empirical hypothesis regarding the determinants of executive turnover concerns the effect of firms' governance mechanism. Denis, Denis, and Sarin (1997) report that the probability of top executive turnover is inversely related with the ownership stake of officers and directors. Although the majority of non-listed firms are owned by managers, what Denis, Denis and Sarin found among large listed firms in the United States may also apply to non-listed firms with outside

managers. Along similar vein, Kang and Shivdasani, focusing on the role of large shareholders and banks, found that the sensitivity of turnovers to firms' performance is higher for firms with ties to main banks than those without such ties. In addition, they found that successors are more likely to come from outside when firms have large shareholders and main bank relationships. Further, Kaplan and Minton (1994) also emphasize the role played by banks and corporate shareholders by showing that underperforming firms are more likely to appoint outside board members from banks and non-financial corporations. The role played by banks and corporate shareholders is also emphasized by Kaplan and Minton (1994), who showed that underperforming firms are more likely to appoint outside board members from banks and non-financial corporations. What all these studies suggest is that large shareholders and main banks provide external control mechanisms for the governance of firms. Thus, these studies suggest the following hypothesis regarding the role of outside shareholders and main banks.

Hypothesis 2: A separation of ownership and management as well as close bank-firm relationships increase the sensitivity of top executive turnover to firm performance.

Another strand of literature concerns firms' performance after managerial turnovers. The issue we are interested in is the one by Huson, Malatesta and Parrino (2004), although their analysis is limited to publicly listed firms. They examine the relationship between CEO turnover and firms' financial performance and contrast two hypotheses regarding firms' ex-post performance: the improved management hypothesis and the scapegoat hypothesis. The former states that management turnovers are likely to improve managerial quality and therefore ex-post performance. In contrast, the latter holds that firm performance has little to do with managerial quality and that managerial turnovers make no difference in ex-post firm performance. Comparing turnover and non-turnover firms, Huson, Malatesta, and Parrino find a greater subsequent improvement in performance for turnover than for non-turnover and infer that improved managerial quality positively contributed to firm performance. However, we should note that there are possible differences in terms of the available pool of managerial talent between large listed firms and small

non-listed businesses. Partly due to small firm size and partly due to the implicit constraint that succeeding executives must come from the family of the owner, non-listed firms may be limited in the extent to which they can improve the quality of their management following executive turnover. Based on the above discussion, we posit the following hypothesis.

Hypothesis 3: The ex-post performance of small non-listed firms experiencing management turnover improves relative to that of firms experiencing no such turnover. However, the extent of improvement is less sizable among small non-listed firms than among large public firms.

7.3 Data Set and Empirical Approach

7.3.1 Data

We construct a firm-level panel data set to analyze the determinants of top executive turnover and the ex-post performance of firms that experienced executive turnover. Our data set consists of firms that responded to the Surveys of the Financial Environment (SFE) implemented by the Small and Medium Enterprise Agency (SMEA) of Japan in 2001-2003. For each SFE, a representative sample of 15,000 firms was randomly selected and sent questionnaires. The number of responding firms for each of the years was 7656, 8446, and 8040, respectively. For each of these firms, we then added data from the Financial Information Database (FID) which covers the years 2001-2007 and is collated by Tokyo Shoko Research, Inc., a commercial credit research firm. The FID contains the balance sheet and income statements of firms as well as information on other firm characteristics. These include the name and age of the representative of a firm, the year/month that he/she assumed the presidency, the names of major stockholders, the names of the banks each firm transacted with, and whether the firm is listed or not.

For our analysis, we need information for at least three periods in order to examine the determinants of top executive turnover and the effect of turnovers on firms' ex-post performance. That is, we need to know whether the top executive of a firm changed between period $t-1$ and t and the development of the firm's performance between periods t and $t+1$. In practice, in order to

measure firms' ex-post performance, it may be preferable to use more data points than *t+1,* and we actually have data *t+2* and *t+3* for the analysis. Using this information, we estimate a probit model that takes account of the various factors that are likely to affect whether firms replace their top executives. Further, using the data for periods *t* and *t+i*, where *i*=1, 2, 3, we measure the effect of top executive turnover on firms' ex-post performance by observing the difference between firms that experienced executive turnover and those that did not.

Using seven years of data, we construct three panel data sets for the years 2001-2005, 2002-2006, and 2003-2007. We then concatenate these three data sets into one panel data set. The initial year of each panel data set is labeled year *t-1*, the second year is year *t*, and the final year is year *t+3*. We add dummies representing the initial year in order to distinguish these three panel data sets with different starting years. For our analysis, we exclude the following observations from our data set. First, observations where any of the variables calculated as ratios in the analysis (described in the next subsection) fall into either the upper or lower 1 percentile of the total distribution were omitted from the sample. Next, based on the information on each firm's status in stock markets in the year 2004, the data set is divided into two: a data set consisting of non-listed privately-held firms and a data set consisting of listed firms. Note that our main focus is on the non-listed firms and the information on listed firms is mainly used for comparison with non-listed firms.

After screening our data as aforementioned, we are left with 25,299 observations of private firms and 2,201 observations of publicly listed firms. Among them, 1,549 and 290 firms respectively experienced a top executive turnover in the years 2002-2004. This implies that the top executive of the rest of the firms was unchanged. Note here that turnover rates differ significantly depending on whether firms are run by owner-managers or not. The turnover rate is high in the case of firms managed by outside top executives, while it is low in the case of firms run by owner-managers.

Table 7.1 shows the numbers of turnovers and the corresponding turnover rates for our data set. For the sample of non-listed firms, the turnover rate within one year is 6.1 percent, while for the sample of listed firms the rate is 13.2 percent. Furthermore, the most significant differences in terms of the turnover rate exist between firms governed by outside executives and those by

owner-managers. We generate a dummy variable in order to proxy managerial ownership of a firm, which is unity if the last name of the firm's top executive matches at least one of the last names of major shareholders and is zero otherwise. For firms with managerial ownership, the rate is 3.5 percent, while in the case of firms run by owner managers, the figure becomes much higher, 19.0 percent.

7.3.2 Variables

The variables we use are detailed as follows and their definitions are summarized in Table 7.2. First, in order to distinguish whether a firm replaces its top executive or not in a year, we use a binary variable labeled *TURNOVER*. Turning to explanatory variables, the first category measures firms' performance and includes the return on assets (*ROA*) and the capital ratio (*CAP*). The second category also measures firms performance, but focuses on whether a firms is in financial distress. Variables in this category are a dummy for a negative ROA (*ROA_NG*), meaning that the firm is in deficit, a dummy for interest coverage being less than or equal to unity (*ICOVER_SM*), meaning that the operating profit is insufficient to cover interest expenses, and a dummy for a negative capital ratio (*CAP_NG*), that is, the firm has negative net worth. The third category measures the credit availability for a firm using the ratio of long-term loans (*LONG*) and short-term loans (*SHORT*) to the total asset amount. In addition, to measure firms' liquidity, the ratio of cash and deposits to the total asset amount (*CASH*) is used. In addition, the ratio of interest payments to the total loan amount outstanding (*RATE*) is used, with a higher ratio indicated that credit is more limited. Note, however, that these variables are also affected by the demand for credit and do not necessarily represent the availability of funds. The fourth category consists of variables that control for firm age (*FIRMAGE*), firm size (*LnSALES*), and the demand for funds for capital investment (*FIXED*). The fifth category is made up of variables representing the characteristics of top executives in terms of their age (*AGE*) and tenure (*TENURE*), i.e., the number of years they have served in their current managerial position. The final category of variables measures the extent of external control of a firm. As a proxy for managerial ownership, a binary variable representing

whether a family member of the top executive is a major shareholder (*OWNERSHIP*) is used. Managerial ownership is expected to reduce the external pressure to the incumbent management. In addition, to consider another source of external control of firms, that is, financial institutions, another binary variable is used, which indicates whether the bank listed first by a particular company is also a major shareholder (*MAINBANK*). Most of the firms in the sample have established lending relationships with banks. However, a certain number of firms in the sample receive not only loans but also equity from these banks, suggesting a certain degree of outside control.

7.3.3 Empirical Approach

Using the data set just described, we proceed to examine the three hypotheses stated in Section 7.2. The procedure is as follows:

(i) We first implement probit estimations that model the probability of top executive turnover for a firm in year *t* conditional on covariates observed in year *t-1*. We focus on privately-held firms and implement baseline estimations. We also implement another set of estimations for public firms, which we call reference estimations.

(ii) Next, we implement another set of probit estimations including cross terms multiplied by the variables measuring the extent of external control of a firm, *MAINBANK* and *OWNERSHIP*. We implement estimations not only for non-listed firms but also for public firms. Estimations of (i) and (ii) are used to examine Hypotheses 1 and 2.

(iii) Finally, we compare the ex-post performance of firms that experienced top executive turnover in 2002-2004 and those that did not. We label the former firms as the treatment group and the latter as the non-treatment group. We compare the change (yearly difference) in the ex-post performance variables of the treatment and the non-treatment group from year *t* to years *t+1*, *t+2*, and *t+3*. The variables included in the analysis are the firm performance, financial distress, and

credit availability variables presented in Table 7.2. To be precise, to test Hypothesis 3, we use the difference-in-difference (DID) estimator regarding firms' ex-post performance variables described above, where the DID estimator is defined as $\Delta Y_{t+1}^{T} - \Delta Y_{t+1}^{NT}$ where Y indicates the performance variable and uppercase T and NT stand for the treatment and the non-treatment group, respectively.

7.4 Results

7.4.1 Determinants of Top Executive Turnovers

We start from the baseline probit estimation. Tables 7.3 lists the means of the variables we use in this estimation.

(Insert Table 7.3)

In the probit estimation we obtain conditional probabilities of a firm changing its top executive in year *t* given the values of observed firm performance, financial distress, credit availability, and other firm characteristics in year *t-1*. The dependent binary variable represents a turnover of the top executive in year *t* ($TURNOVER_t$). Explanatory variables are as follows. First, we employ the following firm performance variables: the return on total assets (ROA_{t-1}) in order to measure firm's annual profitability, the capital-asset ratio (CAP_{t-1}) in order to measure the net worth. Considering the possibility that managerial turnovers may occur more frequently in times of financial distress, we use one dummy variable indicating whether the capital ratio is negative (CAP_NG_{t-1}). The next set of explanatory variables is on firms' credit availability. We have the long-term borrowing ratio ($LONG_{t-1}$), the short-term borrowing ratio ($SHORT_{t-1}$), liquidity as measured by the cash and deposit to asset ratio ($CASH_{t-1}$), the interest payment rate ($RATE_{t-1}$). In addition, we have variables on other firm characteristics as well including firm age ($FIRMAGE_{t-1}$), firm size in terms of logged annual sales amount ($LnSALES_{t-1}$), and ratio of fixed tangible assets to total assets ($FIXED_{t-1}$). We also have variables on the characteristics of top executives including the age of top executive (AGE_{t-1}) and his/her tenure years ($TENURE_{t-1}$). Finally, we have the proxy for the managerial ownership ($OWNERSHIP_{t-1}$).

(Insert Table 7.4)

The probit estimation results on top executive turnovers are presented in Table 7.4. In the baseline estimation for non-listed firms, there are several significant coefficients. First, the performance variable of ROA_{t-1} is negative and significant, while the other performance variable CAP_{t-1} is not significant. These indicate that less profitable non-listed firms are more likely to change their top executives than profitable firms. Next, one of the credit availability variables of $LONG_{t-1}$ is negative and significant, which indicates that financially constrained firms with limited availability of long-term loans are more likely to change their top executives. $LnSALES_{t-1}$ has a positive and significant coefficient indicating that larger firms tend to replace their managers more frequently than others. The age of preceding top executive AGE_{t-1} and his/her tenure years $TENURE_{t-1}$ are positive and significant. These indicate that older top executives who assume the presidency for many years are more likely to be replaced.

In order to compare with the results for non-listed private firms, we also have the reference estimation results for publicly listed firms in the right column of Table 8.4. It should be noted that there are only a few variables with significant coefficients including ROA_{t-1} , AGE_{t-1} , and $OWNERSHIP_{t-1}$. The coefficient on ROA_{t-1} is significantly negative and its marginal effect on the turnover probability is more sizable than the effect on the equivalent probability for non-listed firms. For AGE_{t-1} and $OWNERSHIP_{t-1}$, the signs of coefficients are the same as those for non-listed firms. Thus far, although the turnover probability is more sensitive to firm performance (ROA_{t-1}) among listed firms than among non-listed private firms, we have found the same sign for the performance variable in both estimations. This suggests that even among non-listed firms top executive turnovers are significantly affected by firm performance, which seems to contradict the theoretical prediction of Hypothesis 1. We will examine this point more in detail in the next estimation.

(Insert Table 7.5)

In the next probit estimation, we introduce cross terms in which each of the explanatory variables in the previous estimation are multiplied by $OWNERSHIP_{t-1}$ in order to examine if parameters are significantly affected by firms' managerial ownership. Estimation results for non-listed and listed firms are shown on the left and right columns of Table 7.5, respectively. There

are important differences between Tables 7.4 and 7.5 in terms of the results on the non-listed firm performance variables. ROA_{t-1} becomes insignificant in Table 7.5 while it was negative and significant in Table 7.4, implying that the decreasing profitability has no significant impact on the probability of top executive turnovers. Moreover, the sign of coefficient on CAP_{t-1} is significantly negative, while the sign of coefficient on $CAP_{t-1} * OWNERSHIP_{t-1}$ is significantly positive in Table 7.5, indicating that the decreasing capital ratio does not increase the likelihood of management turnovers among firms with managerial shareholdings.

In contrast, the introduction of cross terms does not significantly affect estimation results for listed firms. We observe the negative and significant coefficient for ROA_{t-1} in Table 7.5 as we found in Table 7.4, indicating that the top executive turnover likelihood increases among underperforming listed firms. Hence, by introducing additional explanatory variables, we find a significant difference between non-listed firms and listed firms in terms of the response to the firm's performance.

(Insert Table 7.6)

The estimations whose results are shown in Tables 7.4 and 7.5 include one of the two governance variables, $OWNERSHIP_{t-1}$, which represents an external control through equities. Here, we employ another governance variable of $MAINBANK_{t-1}$ for analysis. If the bank listed first by a firm is a major shareholder the value of this binary variable becomes unity, and thus indicating close bank-firm relationships.[65] Estimation results are shown in Table 7.6.[66] Note first that the variable $MAINBANK_{t-1}$ does not significantly affect the probability of top executive turnovers by itself in either of the samples of non-listed or listed firms. Also note that some of the coefficients on the cross terms wildly fluctuate due to the very limited number of observations with $MAINBANK_{t-1}$ being unity. With these caveats, we find mixed results on the relationship between the performance of non-listed firms and the probability of top executive turnovers. *ROA* has a negative and significant coefficient, while *ROA*MAINBANK* has a positive and weakly significant coefficient. This indicates that non-listed firms with the main bank relationship face lighter pressure to change

[65] The variable is similar to the one employed in Kang and Shivdasani (1995) to measure the degree of bank monitoring.
[66] Note that the sample is different from the one used for previous probit estimations in Tables 4 and 5 and summary statistics are shown in Appendix Table.

their management even when they underperform. In contrast, both *CAP* and *CAP*MAINBANK* have negatively significant coefficients, indicating that a decrease of net worth of non-listed firms triggers their managerial turnovers. For listed firms, none of the coefficients on firm performance variables is significant.

On balance, regarding the relationship between performance and top executive turnover among non-listed firms, disciplinary pressure seems to be weaker among non-listed firms than listed firms. Furthermore, for non-listed firms with managerial ownership, the disciplinary pressure becomes even weaker. The only exception in which poor performance triggers managerial turnovers is the case firms with outside management decrease its net worth. These contrast with the listed firms whose managerial turnovers are sensitive to their performance. Hence, the predictions of Hypotheses 1 and 2 are in general consistent with our empirical results.

7.4.2 Effects on Ex-post Firm Performance

The next issue is the effect of top executive turnovers on firms' ex-post performance. In order to examine this issue, we first have two different groups of non-listed firms: firms that experienced top executive turnovers and those that did not. Then we have the difference-in-difference estimators for a number of variables regarding the performance, incidence of financial distress, credit availability, and other characteristics of firms.

(Insert Table 7.7)

The results are demonstrated in Table 7.7. Since we have four data points from t to $t+3$, we are able to identify the treatment effect on three intervals: t to $t+1$, t to $t+2$, and t to $t+3$. In our estimation of DID, we tend to have more sizable treatment effects when the interval is from t to $t+3$. Therefore, we mainly focus on this interval to examine the treatment effects. For non-listed firms, many of the performance variables as well as financial distress variables improve more in the treatment group that experienced turnovers than in the non-treatment group that did not experience turnovers. For example, an improvement of *ROA* in the treatment group is about 1.1 percentage points between t and $t+3$, while an improvement of *ROA* in the non-treatment group during the period is about 0.8 percentage points. Thus, the effect of top executive turnovers among non-listed

firms is measured as the difference between 1.1 percentage points and 0.8 percentage points, that is, 0.4 percentage points. With the similar calculations, treatment effects are positively significant for *CAP* by 0.2 percentage points. Regarding some financial distress probabilities for *ROA_NG* and *ICOVER_SM*, the treatment effect indicates that the probability of falling into financial distress decline more among treatment group than among non-treatment group. Although many are insignificant, the treatment effects for listed firms are in many cases positive. For example, the treatment effect in terms of ROA among listed firms is 1.0 percentage points. Therefore, at least in terms of treatment effect ROA, non-listed and listed firms both observe significant ex-post improvements.

The most conspicuous difference between non-listed and listed firms in terms of the treatment effect concerns the sales amount and the number of employees. Non-listed turnover firms observe a larger decrease in both of these two variables than non-listed firms without managerial turnovers. In contrast, listed turnover firms observe a large increase of these two variables than those without turnovers.

In sum, what we predicted in Hypothesis 3 may not hold true. That is, we fail to find convincing evidence that managerial turnovers improve the firm performance more among large listed firms than among small non-listed firms. Instead, we find that both non-listed firms and listed firms observe a significant improvement in their profitability when they experience top executive turnovers. One of the few differences among these firms is that non-listed firms significantly downsize their sales amount and employment after top executive turnovers.

7.5 Conclusion

We examined the process of top executive turnovers of Japan's small non-listed businesses using a unique panel data set of about 25,000 firms in 2001-2007. Consistent with our first and second hypotheses, the likelihood of a change in top executives of non-listed firms is independent of their ex-ante performance, especially when the firms are operated by the owners themselves or by their relatives. Also, non-listed firms which experienced top executive turnovers improve ex-post

performance relative to those without turnovers. Not necessarily consistent with our third hypothesis, the extent of the improvements is similar between non-listed firms and listed firms. All of the above indicate that underperforming non-listed firms are not faced with the disciplinary executive turnovers but that their top executives, once they assume firms' presidency after their predecessors, exert high managerial efforts and thus significantly improve firms' profitability.

The increase of ex-post firm performance among non-listed firms that experienced managerial turnovers provides some evidence that these firms may receive policy assistance. Without the assistance, they may exit the market without utilizing their endowments or without creating further value added, which deteriorates the overall efficiency of the economy. Needless to say, in order to better design the policy for successful business transfers, we need to identify which non-listed firms are the best to improve their ex-post performance. Further, we need examinations not only on the relationship between firms' managerial turnovers and their performance, but also on how the relationship is affected by policies. These are difficult but intriguing research issues for the future.

References

Bennendsen, M., Nielsen, K., Perez-Gonzalez, F., and Wolfenson, D., 2007. Inside the Family Firm: The Role of Families in Succession Decisions and Performance. Quarterly Journal of Economics 122(2), 647-691.

Denis, D.,Denis, D., Sarin, A., 1997. Ownership Structure and Top Executive Turnover. Journal of Financial Economics 45(2), 193-221.

Huson, M., Malatesta, P., Parrino, R., 2004. Managerial Succession and Firm Performance. Journal of Financial Economics 74(2), 237-275.

Kaplan, S., 1994. Top Executives, Turnover and Firm Performance in Germany. Journal of Law, Economics and Organization 10(1), 142-59.

Kaplan, S., Minton, B., 1994. Outside Activity in Japanese Companies: Determinants and Managerial Implications. Journal of Financial Economics 36, 225-58.

Kang, J., Shivdasani, A., 1995. Firm Performance, Corporate Governance, and Top Executive Turnover in Japan. Journal of Financial Economics 38, 29-58.

Perez-Gonzalez, F.,2006. Inherited Control and Firm Performance. The American Economic Review 96(5), 1559-1588.

Small and Medium Enterprise Agency, 2006. White Paper on Small and Medium Enterprises in Japan.

Table 7.1: Number of Observations and Top Executive Turnovers

	Non-Listed			*Listed*		
	All	*OWNERSHIP=1*	*OWNERSHIP=0*	*All*	*OWNERSHIP=1*	*OWNERSHIP=0*
TURNOVER(t)						
Number of Firms	1549	726	823	290	50	240
Ratio	0.061	0.035	0.190	0.132	0.057	0.182
Number of observations	25299	20965	4334	2201	882	1319

Table 7.2: Definitions of Variables

Turnover of Firms' Top Executive	
TURNOVER	1 if a new top executive assumes presidency of the firm in the year, 0 otherwise.
Firm Performance	
ROA	Ratio of pre-tax operating profits to total assets.
CAP	Ratio of capital to total assets.
Financial Distress	
ROA_NG	1 if *ROA* is negative (the borrower is in deficit), 0 otherwise.
ICOVER_SM	1 if *ICOVER* is less than or equal to one, 0 otherwise.
CAP_NG	1 if *CAP* is negative (the borrower has negative net worth), 0 otherwise.
Credit Availability	
LONG	Ratio of long-term loans (loans with more than 1 year maturity) to total assets.
SHORT	Ratio of short-term loans (loans with less than 1 year maturity) to total assets.
CASH	Ratio of cash and deposit holdings to total assets.
RATE	Ratio on interest expenses to total loan amount.
Other Firm Characteristics	
FIRMAGE	Number of years since the establishment of the firm.
LnSALES	Log of the annual sales amount.
FIXED	Ratio of fixed tangible assets to total assets.
Characteristics of Top Executive	
AGE	Age of the top executive.
TENURE	Number of years the incumbent top executive has been president of the firm.
Governance	
OWNERSHIP	1 if a family member of the CEO of the firm is a major shareholder, 0 otherwise.
MAINBANK	1 if the bank listed first by the firm is a major shareholder, 0 otherwise.

Note: Dummy variables for the industry of the firm are also included in the empirical analysis.

Table 7.3: Summary Statistics

	Non-Listed			*Listed*		
	All	*OWNERSHIP=1*	*OWNERSHIP=0*	*All*	*OWNERSHIP=1*	*OWNERSHIP=0*
ROA(t-1)	0.018	0.017	0.020	0.035	0.049	0.026
	0.056	0.057	0.053	0.047	0.053	0.040
CAP(t-1)	0.236	0.238	0.226	0.389	0.423	0.368
	0.214	0.214	0.214	0.193	0.186	0.194
CAP_NG(t-1)	0.062	0.062	0.061	0.003	0	0.004
	0.241	0.242	0.239	0.052		0.066
LONG(t-1)	0.251	0.267	0.176	0.098	0.106	0.092
	0.200	0.199	0.189	0.105	0.107	0.103
SHORT(t-1)	0.160	0.155	0.179	0.116	0.105	0.122
	0.160	0.157	0.170	0.118	0.111	0.122
CASH(t-1)	0.171	0.179	0.134	0.115	0.149	0.092
	0.125	0.127	0.112	0.091	0.103	0.075
RATE(t-1)	0.025	0.026	0.021	0.020	0.020	0.019
	0.012	0.012	0.012	0.011	0.012	0.010
FIXED(t-1)	0.303	0.301	0.312	0.306	0.305	0.307
	0.204	0.199	0.225	0.186	0.183	0.188
lnSALES(t-1)	20.999	20.776	22.021	24.145	23.506	24.564
	1.499	1.383	1.585	1.470	1.164	1.499
FIRMAGE(t-1)	39.658	39.856	38.756	50.263	42.676	55.187
	22.286	22.582	20.865	24.402	23.204	23.901
AGE(t-1)	58.767	58.032	62.116	60.653	56.876	63.104
	9.493	9.693	7.680	8.410	9.897	6.152
TENURE(t-1)	12.567	14.145	5.387	8.295	14.314	4.388
	10.578	10.588	6.934	9.309	10.460	5.758
Number of observations	25299	20965	4334	2201	882	1319

Table 7.4: Results of Probit Estimation

	Dependent Variable: TURNOVER	
	Non-listed	*Listed*
ROA	-0.720 **	-1.902 *
	(0.285)	(0.985)
CAP	-0.117	0.063
	(0.106)	(0.281)
CAP_NG	0.029	
	(0.069)	
LONG	-0.449 ***	-0.218
	(0.108)	(0.473)
SHORT	-0.158	0.411
	(0.103)	(0.399)
CASH	-0.032	-0.345
	(0.140)	(0.563)
RATE	-1.343	1.297
	(1.271)	(3.448)
FIXED	0.121	-0.282
	(0.086)	(0.264)
lnSALES	0.079 ***	0.005
	(0.011)	(0.030)
FIRMAGE	0.000	0.000
	(0.001)	(0.002)
AGE	0.037 ***	0.041 ***
	(0.002)	(0.006)
TENURE	0.004 ***	0.002
	(0.001)	(0.005)
OWNERSHIP	-0.727 ***	-0.459 ***
	(0.035)	(0.116)
Constant	-4.234 ***	-3.316 ***
	(0.746)	(1.194)
Industry Dummies	Yes	Yes
Number of observations	25299	2201
Pseudo R-sq	0.155	0.093
Log Likelihood	-4871.810	-767.620

Table 7.5: Results of Probit Estimation including OWNERSHIP and Its Cross Terms

	Dependent Variable: TURNOVER				
	Non-Listed	*Listed*		*Non-Listed(continued*	*Listed(continued)*
ROA	-0.585	-2.644 **	*ROA*OWNERSHIP*	-0.225	2.864
	(0.478)	(1.221)		(0.593)	(2.017)
CAP	-0.336 **	0.004	*CAP*OWNERSHIP*	0.392 *	0.517
	(0.159)	(0.337)		(0.211)	(0.575)
CAP_NG	0.070		*CAP_NG*OWNERSHIP*	-0.106	
	(0.110)			(0.145)	
LONG	-0.484 ***	-0.261	*LONG*OWNERSHIP*	0.140	0.636
	(0.169)	(0.528)		(0.219)	(1.110)
SHORT	-0.339 **	0.210	*SHORT*OWNERSHIP*	0.290	1.141
	(0.160)	(0.466)		(0.211)	(0.937)
CASH	-0.290	-0.511	*CASH*OWNERSHIP*	0.390	0.497
	(0.240)	(0.739)		(0.295)	(1.133)
RATE	-6.181 ***	-0.157	*RATE*OWNERSHIP*	8.190 ***	5.166
	(2.024)	(4.317)		(2.530)	(6.850)
FIXED	0.063	-0.233	*FIXED*OWNERSHIP*	0.100	-0.317
	(0.127)	(0.309)		(0.170)	(0.552)
lnSALES	0.055 ***	-0.020	*lnSALES*OWNERSHIP*	0.040 *	0.195 **
	(0.017)	(0.034)		(0.022)	(0.077)
FIRMAGE	-0.001	-0.002	*FIRMAGE*OWNERSHIP*	0.002	0.005
	(0.001)	(0.002)		(0.001)	(0.004)
AGE	0.027 ***	0.042 ***	*AGE*OWNERSHIP*	0.013 ***	-0.004
	(0.003)	(0.008)		(0.004)	(0.013)
TENURE	-0.001	0.005	*TENURE*OWNERSHIP*	0.005	-0.006
	(0.003)	(0.007)		(0.003)	(0.011)
OWNERSHIP	-2.998 ***	-5.611 **	*Constant*	-2.323 ***	-2.582 **
	(0.562)	(2.304)		(0.802)	(1.317)
			Industry Dummies	Yes	Yes
			Number of observations	25299	2201
			Pseudo R-sq	0.159	0.100
			Log Likelihood	-4848	-762

Table 7.6: Results of Probit Estimation including *MAINBANK* and Its Cross Terms

	Dependent Variable: TURNOVER				
	Non-listed	*Listed*		*Non-listed(contd.)*	*Listed(contd.)*
ROA	-0.885 ***	-1.404	*ROA*MAINBANK*	2.810 *	-4.009
	(0.308)	(1.166)		(1.483)	(4.743)
CAP	-0.322 ***	-0.027	*CAP*MAINBANK*	-0.925 *	2.797
	(0.103)	(0.329)		(0.502)	(2.425)
CAP_NG	-0.046		*CAP_NG*MAINBANK*	0.283	
	(0.077)			(0.316)	
LONG	-0.783 ***	-0.488	*LONG*MAINBANK*	0.423	4.514
	(0.108)	(0.551)		(0.491)	(3.047)
SHORT	-0.300 ***	0.452	*SHORT*MAINBANK*	-0.460	0.263
	(0.105)	(0.471)		(0.502)	(3.247)
CASH	-0.359 **	-0.861	*CASH*MAINBANK*	0.887	-14.135 ***
	(0.146)	(0.683)		(0.655)	(5.349)
RATE	-3.069 **	5.357	*RATE*MAINBANK*	-0.818	-6.703
	(1.317)	(3.890)		(5.704)	(15.283)
FIXED	0.112	-0.372	*FIXED*MAINBANK*	-0.015	-4.435 **
	(0.088)	(0.307)		(0.417)	(2.126)
lnSALES	0.120 ***	0.014	*lnSALES*MAINBANK*	-0.040	-0.313
	(0.010)	(0.034)		(0.048)	(0.226)
FIRMAGE	-0.002 ***	0.001	*FIRMAGE*MAINBANK*	0.007 **	-0.017
	(0.001)	(0.002)		(0.003)	(0.012)
AGE	0.042 ***	0.046 ***	*AGE*MAINBANK*	-0.001	0.149 **
	(0.002)	(0.007)		(0.007)	(0.066)
TENURE	-0.007 ***	-0.009 *	*TENURE*MAINBANK*	-0.007	0.021
	(0.001)	(0.005)		(0.006)	(0.041)
MAINBANK	0.662	-0.014	*Constant*	-4.814 ***	-4.210 ***
	(1.190)	(5.263)		(0.791)	(1.169)
			Industry Dummies	Yes	Yes
			Number of observations	25906	1615
			Pseudo R-sq	0.1125	0.0959
			Log Likelihood	-5002	-566

Table 7.7: Treatment Effects of Top Executive Turnovers

		Non-listed				*Listed*			
	Period	*TURNOVER R(t)=1*	*TURNOVER R(t)=0*	*Difference in Difference*		*OWNERSHIP=1*	*OWNERSHIP=0*	*Difference in Difference*	
ROA	*t*	0.018	0.019			0.023	0.035		
	t+1	0.022	0.024	-0.001		0.027	0.040	0.000	
	t+2	0.027	0.026	0.002		0.035	0.042	0.006	
	t+3	0.029	0.027	0.004	**	0.040	0.042	0.010	**
CAP	*t*	0.246	0.244			0.374	0.397		
	t+1	0.258	0.254	0.001	*	0.372	0.404	-0.009	**
	t+2	0.263	0.262	-0.001		0.390	0.410	0.003	
	t+3	0.271	0.268	0.002	**	0.397	0.414	0.006	
ICOVER	*t*	15.038	12.739			24.081	38.918		
	t+1	19.600	14.496	2.805		28.480	41.924	1.393	
	t+2	20.046	12.674	5.073	**	21.217	30.402	5.652	
	t+3	16.084	11.113	2.672	*	13.173	20.232	7.778	
p(DEFAULT)	*t*	0.002	0.000			0.000	0.000		
	t+1	0.003	0.001	0.000		0.000	0.000	0.000	
	t+2	0.001	0.003	-0.003		0.015	0.001	0.014	***
	t+3	0.004	0.003	-0.001		0.000	0.001	-0.001	
p(ROA_NG)	*t*	0.223	0.224			0.183	0.134		
	t+1	0.185	0.185	0.001		0.178	0.085	0.044	
	t+2	0.172	0.170	0.003		0.110	0.068	-0.006	
	t+3	0.152	0.170	-0.017	*	0.097	0.078	-0.030	
p(ICOVER_SM)	*t*	0.178	0.168			0.153	0.105		
	t+1	0.145	0.135	0.000		0.158	0.069	0.041	
	t+2	0.125	0.129	-0.014	*	0.090	0.063	-0.021	
	t+3	0.125	0.136	-0.021	**	0.082	0.075	-0.042	
p(CAP_NG)	*t*	0.045	0.058			0.000	0.003		
	t+1	0.051	0.051	0.013	**	0.020	0.002	0.021	***
	t+2	0.047	0.046	0.014	**	0.010	0.001	0.012	**
	t+3	0.043	0.039	0.018	**	0.005	0.003	0.005	
LONG	*t*	0.190	0.248			0.092	0.096		
	t+1	0.184	0.244	-0.002		0.096	0.095	0.006	
	t+2	0.175	0.241	-0.007	***	0.094	0.091	0.008	
	t+3	0.174	0.235	-0.003	**	0.080	0.089	-0.004	
SHORT	*t*	0.173	0.158			0.132	0.114		
	t+1	0.158	0.153	-0.009	***	0.126	0.103	0.005	
	t+2	0.151	0.147	-0.011	***	0.106	0.093	-0.006	
	t+3	0.138	0.141	-0.017	***	0.099	0.086	-0.006	
CASH	*t*	0.146	0.170			0.094	0.115		
	t+1	0.144	0.168	0.000		0.096	0.116	0.002	
	t+2	0.144	0.167	0.001		0.098	0.115	0.005	
	t+3	0.144	0.164	0.004	*	0.096	0.110	0.008	
RATE	*t*	0.022	0.025			0.019	0.019		
	t+1	0.022	0.024	0.001	**	0.020	0.019	0.002	**
	t+2	0.021	0.024	0.001	**	0.020	0.018	0.003	***
	t+3	0.021	0.023	0.001	***	0.019	0.017	0.003	***
FIXED	*t*	0.312	0.305			0.302	0.309		
	t+1	0.312	0.306	-0.002		0.296	0.306	-0.003	
	t+2	0.310	0.305	-0.003		0.281	0.298	-0.010	**
	t+3	0.309	0.304	-0.002	**	0.268	0.289	-0.013	***
SALES	*t*	13600	5460			192000	129000		
	t+1	13600	5770	-310	***	191000	127000	1000	
	t+2	13500	6340	-980	***	192000	131000	-2000	
	t+3	14100	7200	-1240	**	207000	136000	8000	
EMP	*t*	230.904	95.693			2032.153	1443.066		
	t+1	195.749	97.636	-37.098	***	1973.837	1380.190	4.560	
	t+2	187.251	102.234	-50.194	***	1871.120	1407.534	-125.501	
	t+3	192.388	107.814	-50.638	***	2244.760	1321.983	333.690	*

*Note: ***,**,* indicate a significance level of 1, 5, 10%, respectively.*

Appendix Table: Number of Observations and Summary Statistics including *MAINBANK* as a Variable

	Non-Listed			*Listed*		
	All	*MAINBANK =1*	*MAINBANK =0*	*All*	*MAINBANK =1*	*MAINBANK =0*
TURNOVER(t)						
Number of Firms	1489	67	1422	216	10	206
Ratio	0.057	0.054	0.058	0.134	0.161	0.133
Number of observations	25906	1236	24670	1615	62	1553
ROA(t-1)	0.019	0.021	0.019	0.036	0.041	0.036
	(0.054)	(0.055)	(0.054)	(0.049)	(0.055)	(0.048)
CAP(t-1)	0.238	0.234	0.238	0.390	0.410	0.389
	(0.211)	(0.203)	(0.211)	(0.194)	(0.194)	(0.194)
CAP_NG(t-1)	0.058	0.050	0.058	0.004	0.000	0.004
	(0.233)	(0.218)	(0.234)	(0.060)		(0.061)
LONG(t-1)	0.252	0.255	0.252	0.098	0.080	0.098
	(0.199)	(0.195)	(0.200)	(0.105)	(0.095)	(0.106)
SHORT(t-1)	0.157	0.160	0.157	0.114	0.120	0.114
	(0.156)	(0.155)	(0.156)	(0.117)	(0.121)	(0.117)
CASH(t-1)	0.167	0.168	0.167	0.114	0.109	0.114
	(0.122)	(0.119)	(0.122)	(0.091)	(0.083)	(0.092)
RATE(t-1)	0.025	0.025	0.025	0.020	0.021	0.020
	(0.012)	(0.012)	(0.012)	(0.011)	(0.014)	(0.011)
FIXED(t-1)	0.305	0.299	0.306	0.305	0.291	0.305
	(0.201)	(0.199)	(0.201)	(0.185)	(0.190)	(0.185)
lnSALES(t-1)	21.079	21.056	21.080	24.172	23.933	24.182
	(1.542)	(1.503)	(1.544)	(1.480)	(1.628)	(1.474)
FIRMAGE(t-1)	40.577	40.244	40.593	49.877	52.629	49.769
	(22.137)	(23.047)	(22.092)	(24.501)	(23.745)	(24.531)
AGE(t-1)	58.937	58.814	58.943	60.707	59.661	60.748
	(9.503)	(9.633)	(9.496)	(8.232)	(8.802)	(8.209)
TENURE(t-1)	12.726	12.786	12.723	8.293	8.694	8.277
	(10.643)	(10.828)	(10.633)	(9.378)	(8.609)	(9.409)
Number of observations	25906	1236	24670	1615	62	1553

Chapter 8

EITC in Japan: A Preliminary Approach

8.1 Introduction

The Japanese government referred to an introduction of the income tax credit at the Mid-term Economic Programs in December 2008. The National Tax Commission also proposed tax credit in recent years. The deduction method has been the main tax rule and the credit method would be exceptional under the existing Japanese income taxation. However, increasing economic disparity and the pressing need for more income redistribution have become major policy issues. The tax credit method contributes to relieving the burden of the low-income groups.

The Earned Income Tax Credit (EITC), which has been implemented in the US and other countries, will be one of the policy options for the income tax reform in Japan. This chapter conducts a preliminary estimation for the EITC. Tajika and Yashio (2006a), Tajika and Yashio (2006b), and Abe (2008) already examined the fixed amount of tax credit. On the other hand, the EITC has an income-proportional credit with negative income tax. This tax credit is designed to minimize the adverse labor supply effect. The existing Japanese public assistance is set as a minimum safety net to maintain living standards. The EITC proposes an alternative concept to the existing Japanese system.

The purpose of this study is to examine how tax burdens will change by introducing a US- type EITC in Japan. The preliminary estimation directly applies the U.S. EITC to the Japanese income taxation. Section 8.2 provides an overview of the JPITC (Japan Income Tax Credit). JPITC is a static tax transfer model with the microsimulation method. Section 8.3 presents simulation results. Section 8.4 concludes this chapter.

8.2 An Overview of JPITC

JPITCis a static microsimulation model that deals with income tax. The model composes the dataset of Japanese 1/5,000 population, and it applies the current Japanese income tax rule for each

sample (i.e. the baseline estimation). JPITC simulates an introduction of the EITC in Japan, and its policy effect will be examined.

8.2.1 Data Source

JPITC makes its dataset from the *Basic Survey of the Living Conditions of People on Health and Welfare (BSLC)* conducted by the Ministry of Health, Labour and Welfare, Japan. In the 2004 survey of the BSLC, the household survey and the income survey collected 25,091 household records. The household survey includes information of each household such as the number of household members, family type, each member's sex, age, and occupation etc. The income survey presents information of each household member's income with its components.

Building the dataset is as follows. First, the new data set is generated from the 2004 BSLC samples. The sample size is 1/5,000 of the Japanese population. The number of households is about 10 thousands and the number of individuals is about 26 thousands. The BSLC equips the selection multiplier for each sample and JPITC uses this number to develop the initial dataset. Second, two dataset tables – the household table and the individual table – are prepared and the necessary data like household ID, individual ID, sex, age, husband-wife relation ID, parent-child relation ID, and income types and its amounts will be stored in these two tables.

8.2.2 Static Tax Transfer Model

Income Tax Estimation

Since the EITC is a credit system that subtracts credit amounts from the income tax payment, JPITC has to estimate income tax for each individual as the baseline scenario. Our calculation follows the 2007 Japanese tax provisions[67].

(i) Amount of earnings: Taxable earnings are calculated from the dataset. The earnings are broadly defined, including not only salary, but also business income, property rent etc.

(ii) Deduction from earnings: As for the salary earnings, the employment income deduction is applied. JPITC calculates the employment income deduction. As for business income and property rent, the necessary expenses have already been deducted in the original BSLC dataset.

(iii) Amount of taxable income (taxation base): Tax allowances are calculated in JPITC, including the basic exemption (380 thousands yen), exemption for dependents, special

[67] Between 2004 and 2007, the Japanese income taxation experienced two major reforms; (i) tax transfer from the central government to the local governments, (ii) 2 trillion tax increases. We take into account these tax reforms to elaborate the estimation.

exemption for spouses etc. JPITC estimates the number of dependents for each individual by using information of BSLC dataset.

(iv) Amount of income tax: The respective tax rate is applied to each amount of taxable income to determine the amount of income tax.

=== Figure 8.1 ===

EITC Estimation

As a starting point of this study, we directly apply the U.S. EITC provisions to the Japanese dataset. The U.S. EITC is a tax credit for certain people who work and have earned income under $37,783 in 2007. The EITC reduces the amount of tax payment and it can also offer a refund. The main EITC rules in this study are as follows.

(i) Age: a qualified person should be at least 25 but under 66.

(ii) Earnings: same with the earnings in a broad sense as stated above, not including public assistance and unemployment benefits.

(iii) Qualifying EITC child: The EITC child is same with the dependent in the Japanese income tax provisions. The dependent's age is under 19.

=== Figure 8.2 ===

8.3 Simulation Results

Shares of the EITC Individuals and Households

According to the simulation results, the share of the EITC individuals in the total number of the sample is 10.6%, while the share rises up to 26.0% in the household basis.[68] The EITC aims to deliver tax refund especially to the low-income households. Under this EITC schedule, around one quarter households can receive the EITC. The U.S. rule admits the employment income deduction; on the other hand, the EITC in this study does not offer the deduction to the salary income because the existing Japanese employment income deduction is large in absolute terms. The share of the EITC households might increase with applying the employment income deduction.

The share of the zero-child households reaches 48% of the total EITC households and this means that the EITC can contribute to the adequate income maintenance for the low-income households

[68] For example, a husband can receive the EITC, but his wife and children cannot receive it.

with no-children. The share of one-child and the share of two-children households are 20% and 24% respectively. The EITC can also serve to the child care in Japan.

=== Table 8.1 ===

=== Figure 8.3 ===

=== Figure 8.4 ===

ETIC Expenditure

The total amount of annual EITC expenditure is 1.02 trillion yen in this simulation scenario. The child benefit is 0.98 trillion yen at the 2007 fiscal year in Japan. The simulation results suggest the EITC will require the same amount of funding.

The total 1.02 trillion yen is divided into (i) the EITC credit only (0.12 trillion yen, 12%), and (ii) the EITC benefit (0.90 trillion yen, 88%). The result shows that EITC is mostly not a tax credit but a tax refund. This is an expected outcome because the EITC is a negative income tax for the poor. The income tax revenue will be consequently decreased from 12.4 trillion yen to 12.3 trillion yen by the EITC tax credit of 0.12 trillion yen.

=== Table 8.2 ===

=== Figure 8.5 ===

=== Figure 8.6 ===

EITC by Age Group

The average EITC amount is 75 thousands yen for the EITC individuals. Those of age 35-39 enjoy the largest amount of EITC and the average EITC for them is 107 thousands yen. The average income for those of age 35-39 is 1,429 thousands yen and the EITC-Income ratio (i.e. effective EITC rate) is 7.5% (=107/1,429). The average EITC and income are almost same for those of age 30-34, age 40-49, and age 45-49. This result suggests that the EITC will help the age groups in 30s and 40s.

=== Table 8.3 ===

=== Figure 8.7 ===

=== Figure 8.8 ===

EITC by Income Group

The EITC has three stages as income increases; (i) phase-in, (ii) plateau, and (iii) phase-out. This policy design aims to induce the labor supply incentives at the phase-in, to offer sufficient tax refund at the plateau, and to evade the labor supply disincentive at the phase-out. The income group of 1,500-2,000 thousands yen receive the largest EITC amount of 331 thousands yen and their EITC-Income ratio reaches 17.5% (=331/1,892). The EITC decreases gradually among the income groups of 2,000-4,000 thousand yen, and it vanishes over 3,778 thousands yen.

=== Table 8.4 ===

=== Figure 8.9 ===

=== Figure 8.10 ===

The simulation results are almost the same as those when we see the EITC estimation at the household basis.

=== Table 8.5 ===

=== Figure 8.11 ===

=== Figure 8.12 ===

EITC by Children Group

The EITC is not applied to individuals with no children whose income is over 1,260 thousands yen. The average EITC is 32 thousands yen for this zero-child group at income of the 500-1,000 thousands yen bracket. Their EITC-Income ratio is just 3.8%.

The EITC payments will increase as the number of children increases. The EITC reaches up to 300-400 thousands yen for each EITC individual and ETIC-Income ratio becomes over 30% for those individuals with one or more children. This result suggests that the EITC can serve as income assistance for the low-income individuals with one or more children.

=== Table 8.6 ===

=== Table 8.7 ===

=== Table 8.8 ===

=== Figure 8.13 ===

=== Figure 8.14 ===

=== Figure 8.15 ===

EITC by Family Type

The shares of the EITC recipients in each family sub-group are as follows. Their share for the single person household is just 7.3%. This means that just one-fourteenth of the total single person households will receive the EITC because the income limit is relatively low for this sub-group. The share of the EITC at the family nuclei is 27.4% and the share reaches 35.7% for married couple with one or more children. The share will increase as the number of children increases. As for the occupational types of households, the share of the EITC recipients in households where both husband and wife are employed is 46.1%; on the other hand, the share will decrease to 23.4% for one-earner couples. Households with a full-time housewife receive relatively high income in Japan and this is the reason why the EITC share is smaller in this group.

=== Figure 8.16 ===

The EITC-Income ratio reaches the highest value at 7.5% for the mother-less or father-less households. Since there is only one parent in this family type, they usually cannot get sufficient income. The simulation results suggest that the EITC can do some help to them.

=== Figure 8.17 ===

8.**4 Concluding Remarks**

Due to the lost decade in 1990s and the weak economic recovery in 2000s, the Japanese employment income did not grow enough and the future prospect cannot help being grim because of the world-wide economic recession from 2008. This study shows that the US-type EITC could serve as income assistance to low-income persons.

Many studies still remain. Among others, further international comparative studies are required to propose a new tax design in Japan. Second, possible policy options should be examined together. For example, abolishing the exemption for dependents will offer the required fund. Third, the effect on the labor supply should be explored. The complicated tax design of the EITC aims to affect the labor incentives. The behavioral model that considers the labor supply issue is the next step in this academic field.

References

English

Erissa, N. (1998), "The Earned Income Tax Credit and the Labor Supply of Married Couple," *NBER Working Paper #6856.*

Hots, V.J, and J.K. Scholz (2001), "The Earned Income Tax Credit," *NBER Working Paper #8078.*

Liebman, J.B.(1998), "The Impact of the Earned Income Tax Credit on Incentives and Income Distribution," *Tax Policy and the Economy, vol.12.*

Japanese

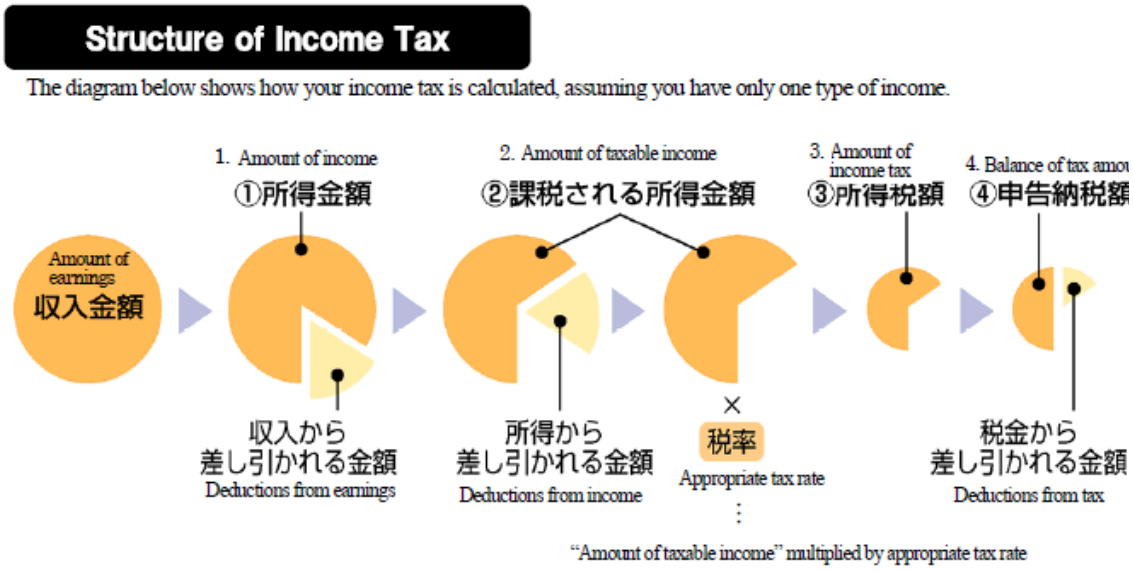
Abe, A. (2008), "Income Tax Credit – A Microsimulation Study" in Morinobu ed. *Income Tax Credit*, chapter 4, Tokyo, Chuo Keizai Press.

Tajika, E. and H. Yashio (2006a), "Income Redistribution through Tax System," in Oshio, Fukawa, and Tajika ed. *Income Distribution in Japan*, chapter 4, Tokyo, University of Tokyo Press.

Tajika, E. and H. Yashio (2006b), "Current Situation and the Reform Options for the Income Tax and Local Income Tax in Japan," *Study on the Economic Disparity*, chapter 7, Tokyo, Chuo Keizai Press.

Yamashita, A. (2007), "Major Problems on choice of Child Tax Credit – Support for families with children through Income Tax system," *ESRI Discussion Paper #190*, Tokyo, Cabinet Office.

Figure 8.1 Structure of Income Tax in Japan



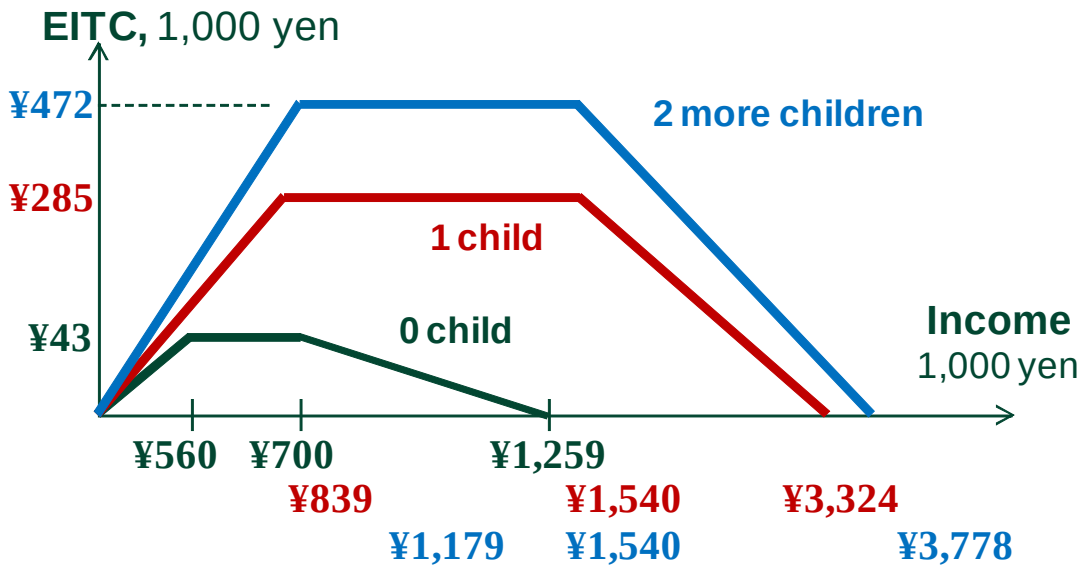
Note: 1. **"Amount of earnings"** includes the following:
- ○ Sales and miscellaneous revenue made by retailers
- ○ Property or land rent in the case of leasing real estate
- ○ Salary, etc. in the case of salaried workers
- ○ Lump-sum payments derived from life insurance policies, etc.

2. **"Deductions from earnings"** includes the following:
- ○ Necessary deductible expenses (in the case of business income)
- ○ Employment income deduction, etc.
- ○ Deduction for social insurance premiums, etc.

3. **"Deductions from income"** (refer to "Deductions from income" on page 8 and 33)
4. **"Appropriate tax rates"** are divided into 6 levels, from 5% through to 40%.
5. **"Deductions from tax"** (refer to "Deductions from tax" and "Calculating your tax" respectively on page 8 and 46)

Source: National Tax Agency

Figure 8.2 EITC Design



Note 1: We apply the U.S. EITC to the Japanese income taxation directly. The exchange rate is 1 USD = 100 JPY.

Figure 8.3 Shares of the EITC Households

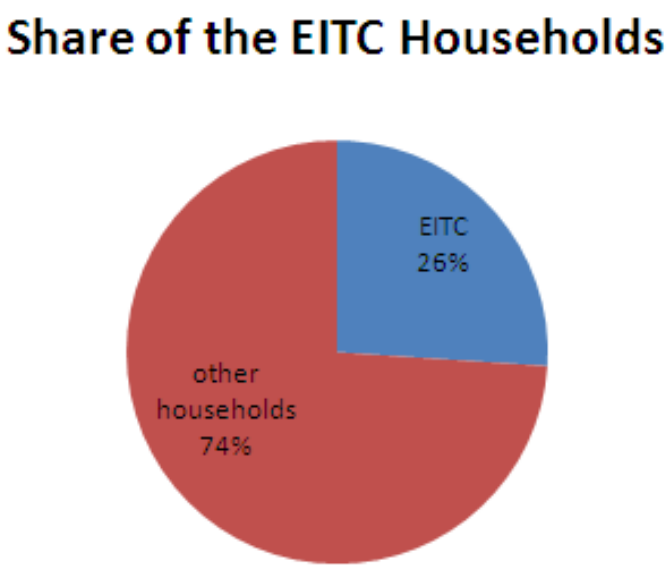
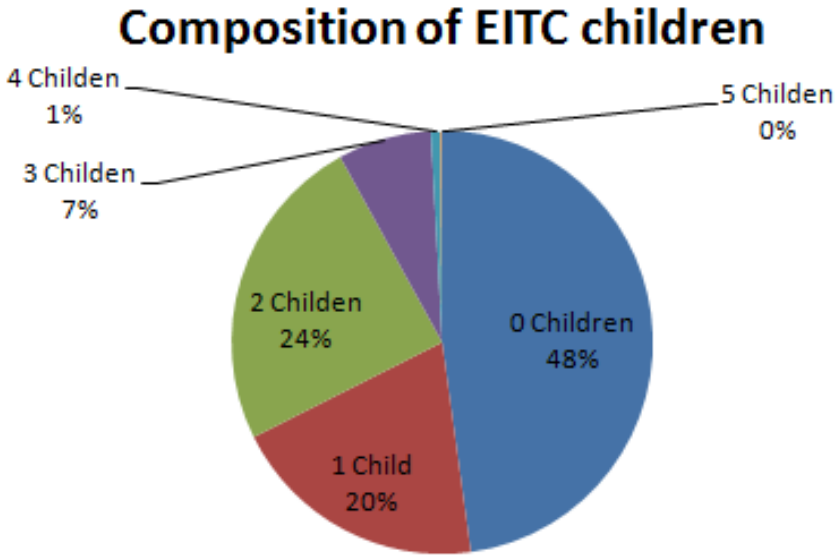


Figure 8.4 Compositions of the EITC Households



Note 1: Simulation results of the JPITC model

Figure 8.5 Income Tax and the EITC Expenditure

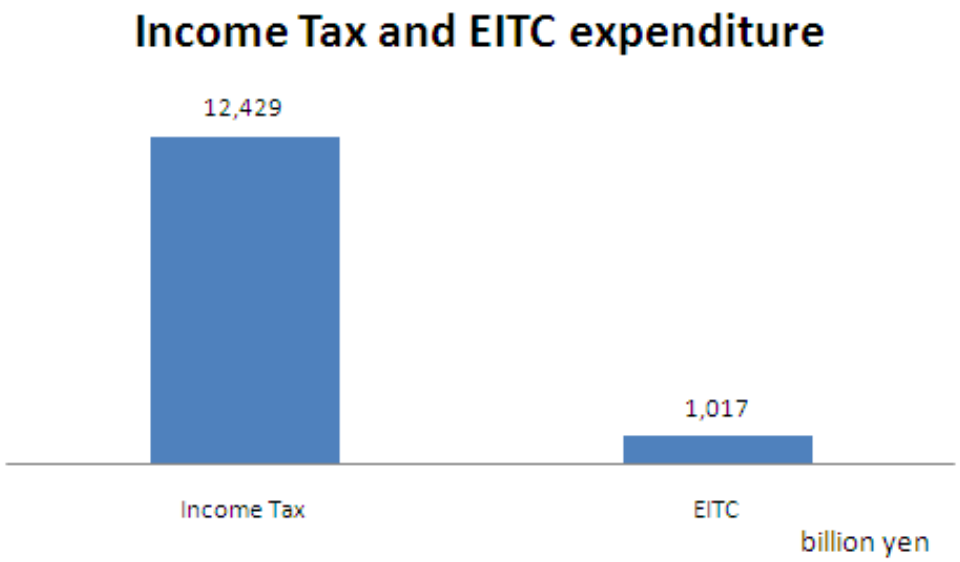
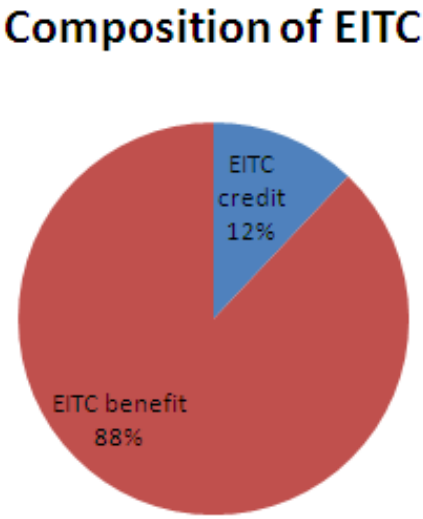


Figure 8.6 Compositions of the EITC



Note 1: Simulation results of the JPITC model

Figure 8.7 Income Tax and EITC, by Age Group

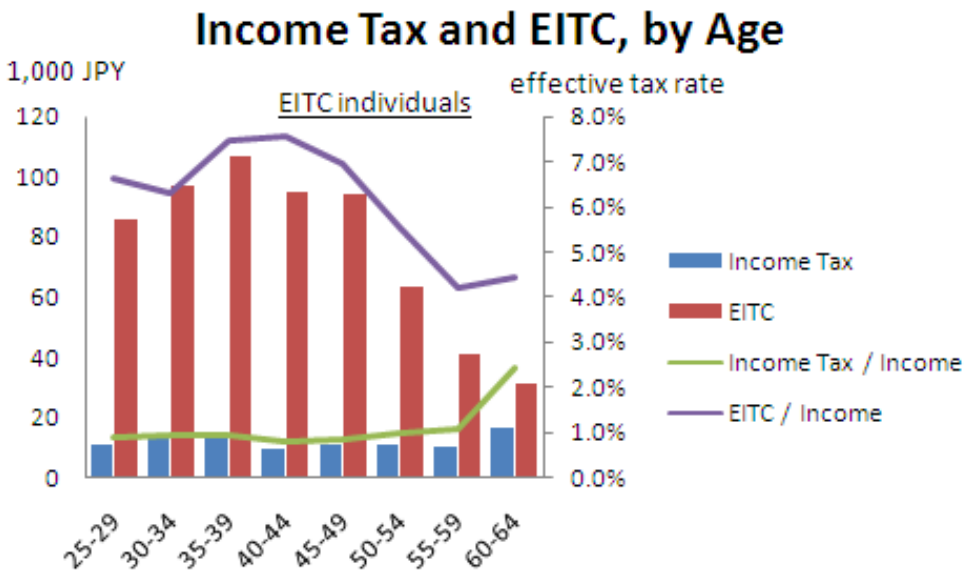
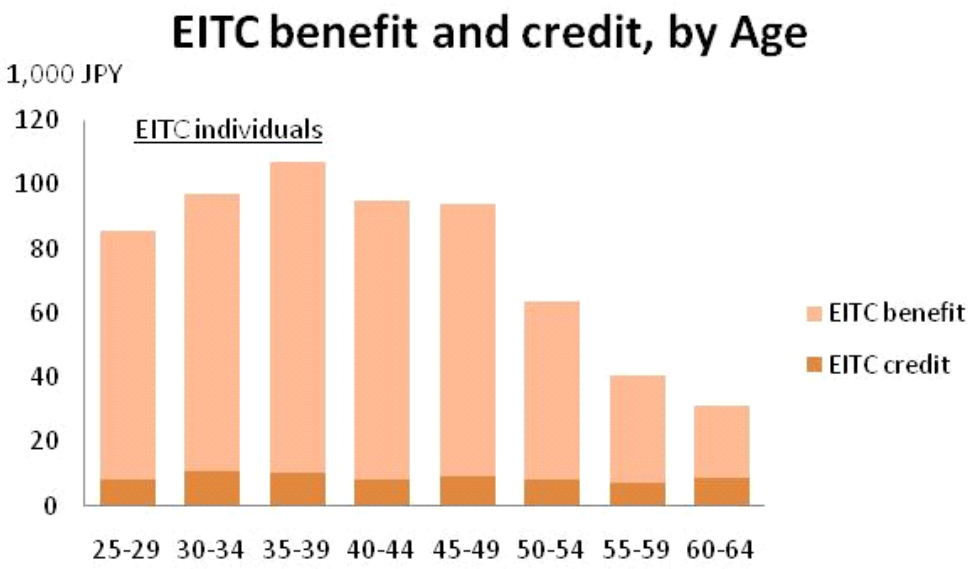


Figure 8.8 EITC Benefit and Credit, by Age Group



Note 1: Simulation results of the JPITC model

Figure 8.9 Income Tax and EITC, by Income Group

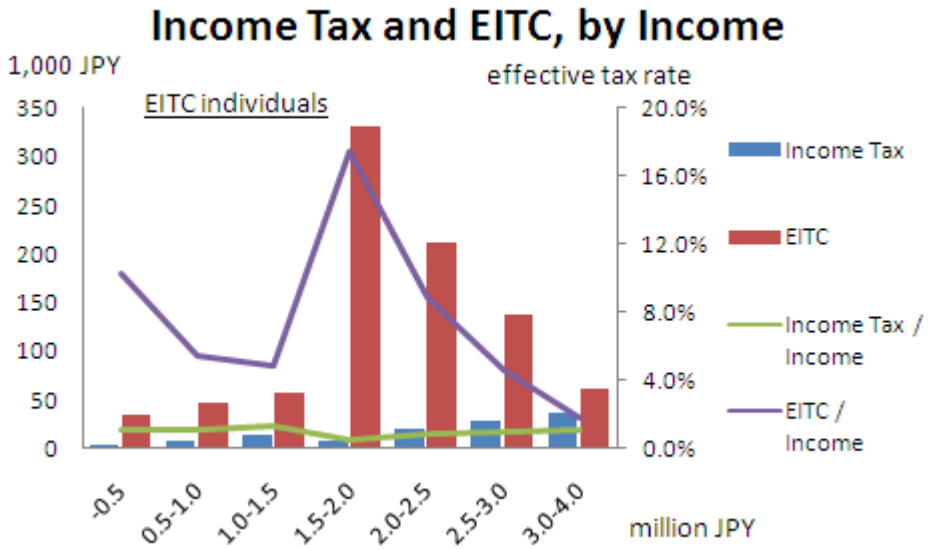
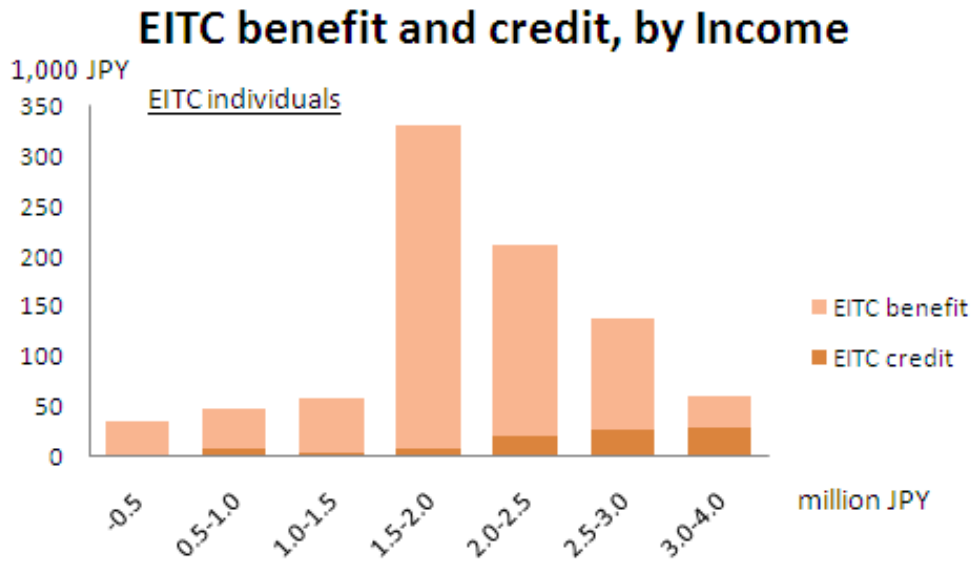


Figure 8.10 EITC Benefit and Credit, by Income Group



Note 1: Simulation results of the JPITC model

Figure 8.11 Income Tax and EITC, by Income Group at the Household Basis

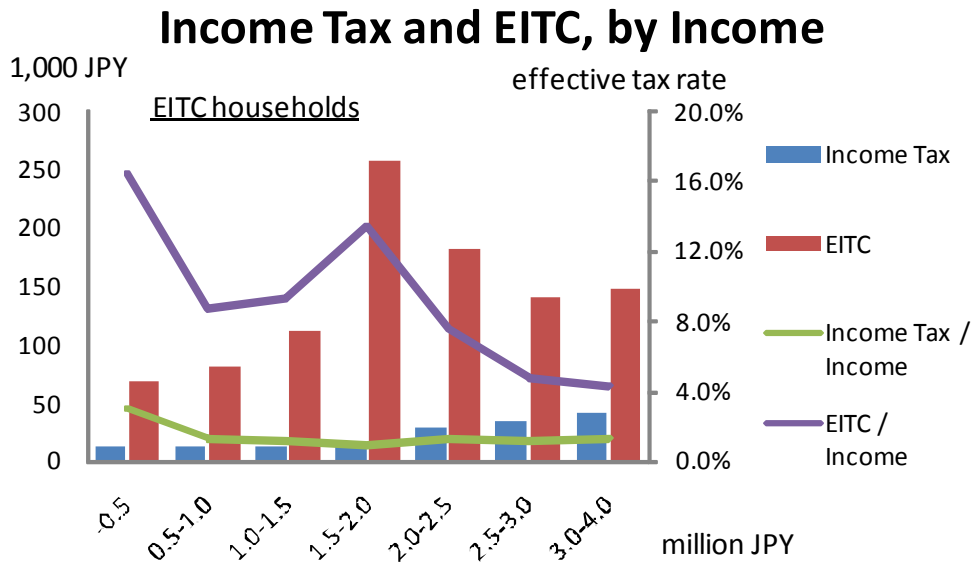
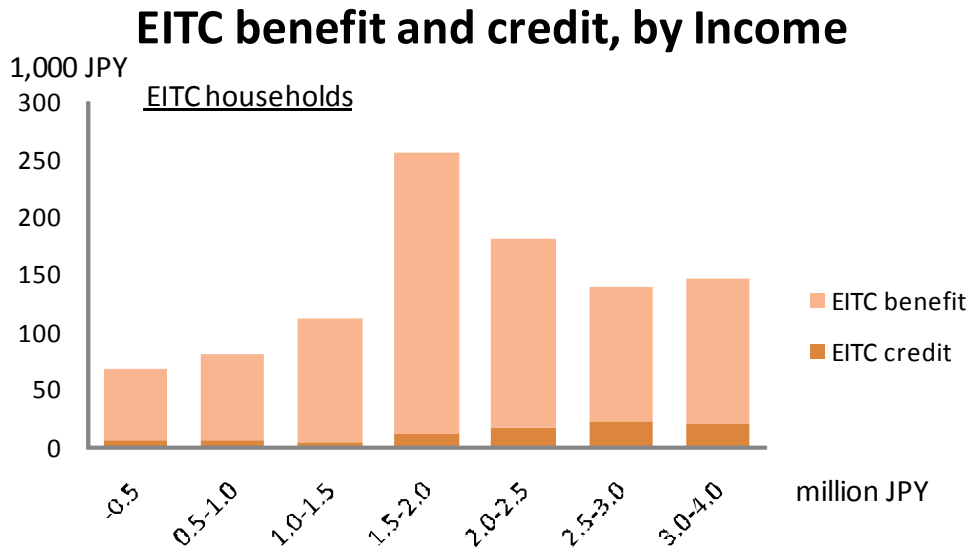


Figure 8.12 EITC Benefit and Credit, by Income Group at the Household Basis



Note 1: Simulation results of the JPITC model

Figure 8.13 Income Tax and EITC, by Income Group with 0 children

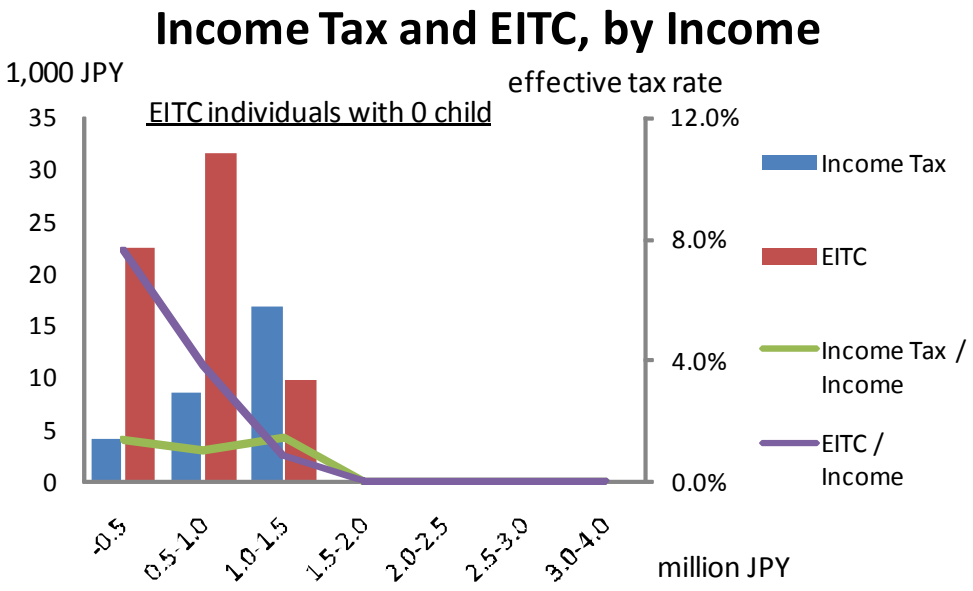
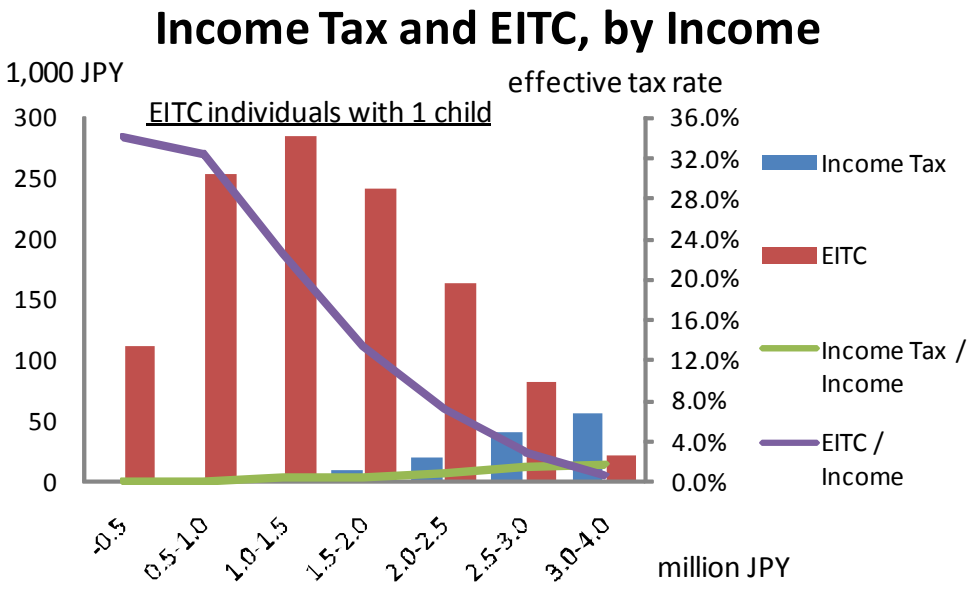
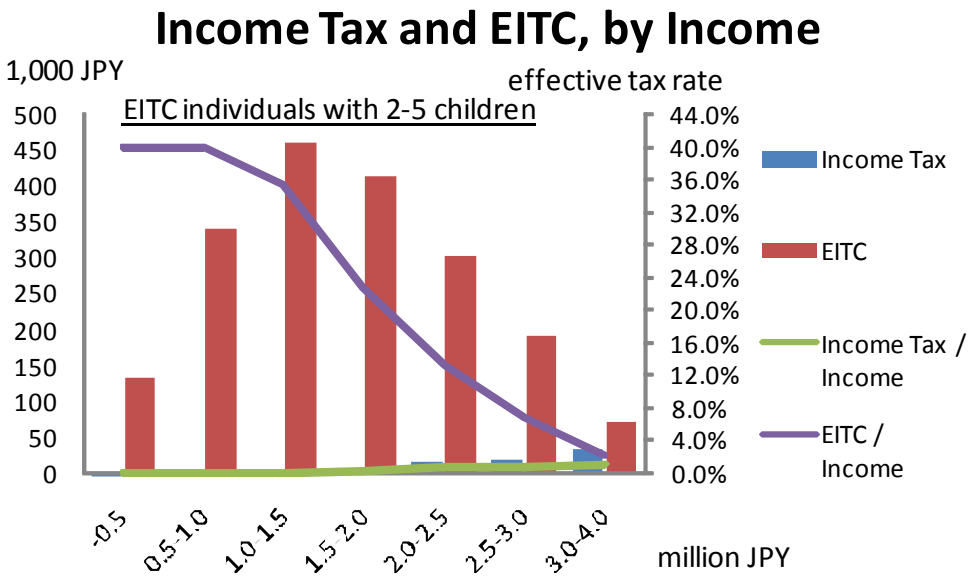


Figure 8.14 EITC Benefit and Credit, by Income Group with 1 child



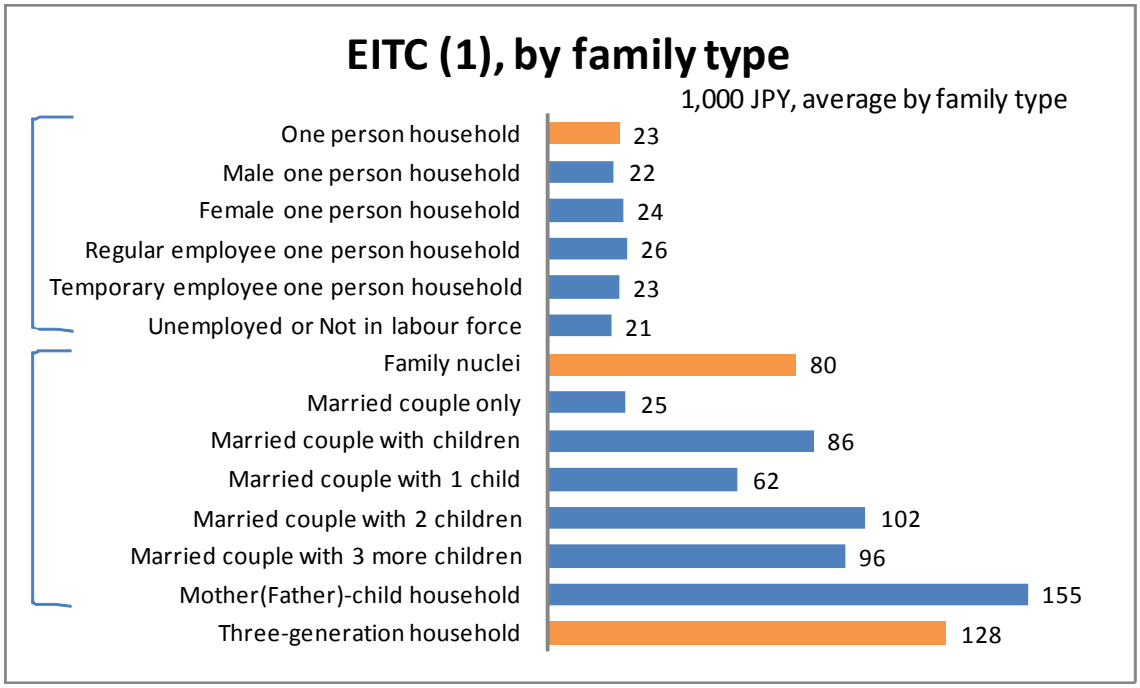
Note 1: Simulation results of the JPITC model

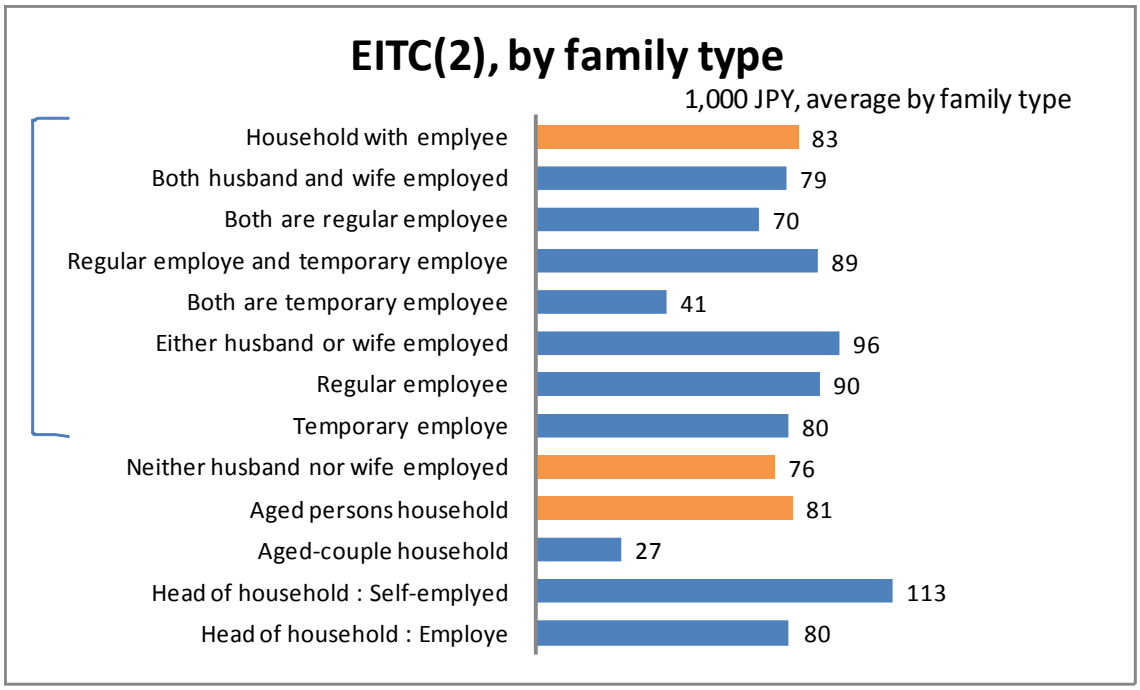
Figure 8.15 EITC Benefit and Credit, by Income Group with 2-5 children



Note 1: Simulation results of the JPITC model

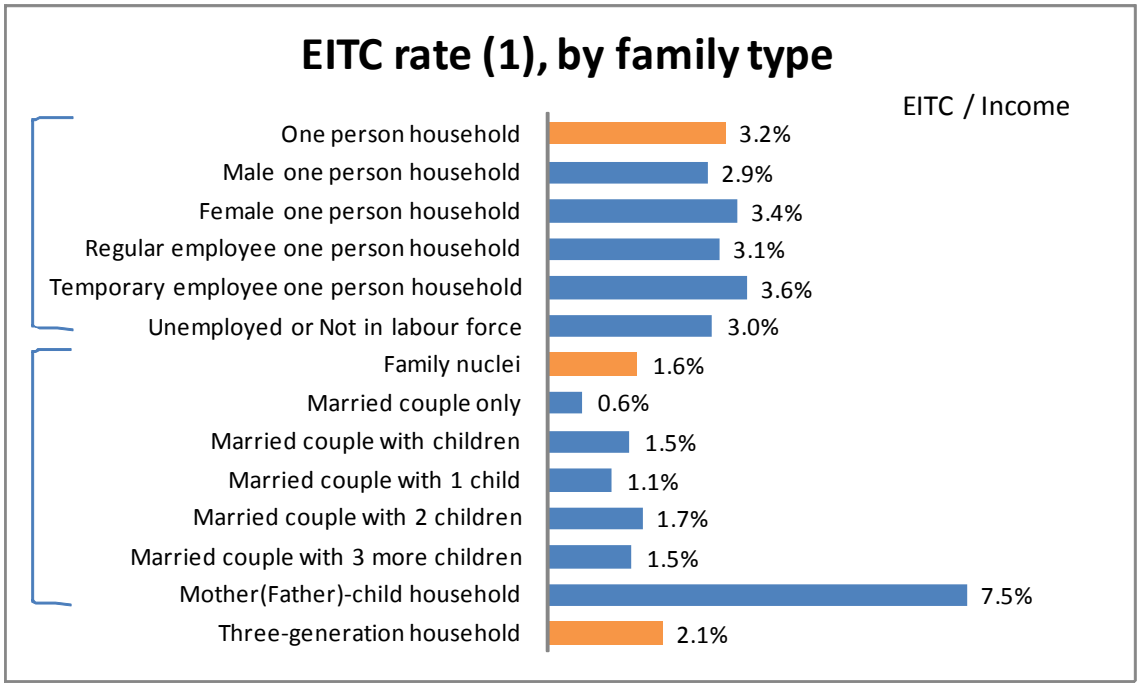
Figure 8.16 EITC Receipt Ratio, by family type

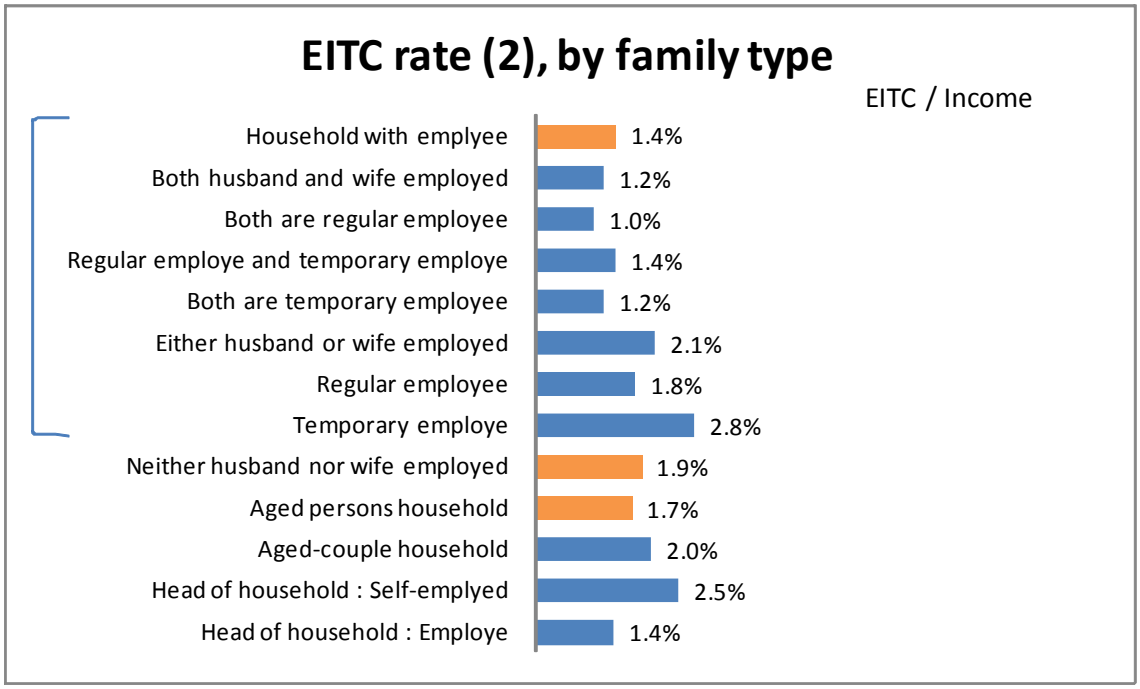




Note 1: Simulation results of the JPITC model

Figure 8.17 EITC-Income Ratio, by family type





Note 1: Simulation results of the JPITC model

Table 8.1 Numbers of Households and Individuals

	Households		Individuals	
Total	9,390	100.0%	26,483	100.0%
EITC	2,446	26.0%	2,820	10.6%
0 Children	1,170	12.5%	2,038	7.7%
1 Child	483	5.1%	330	1.2%
2 Childen	597	6.4%	354	1.3%
3 Childen	175	1.9%	89	0.3%
4 Childen	18	0.2%	7	0.0%
5 Childen	3	0.0%	2	0.0%
EITC Benefit	2,098	22.3%	2,363	8.9%
EITC Credit only	348	3.7%	457	1.7%

Note 1: Simulation results of the JPITC model

Table 8.2 Fiscal Expenditures of the EITC

	total (billion yen)	ratio
Income tax (base)	12,429	5.7%
Income tax (after)	12,306	5.6%
EITC	1,017	0.5%
EITC credit	122	0.1%
EITC benefit	895	0.4%
Total income	218,670	100.0%
Local income tax	13,103	
Social insurances	25,876	
Pension	13,375	
Health	9,740	
Care	2,043	

Note 1: Simulation results of the JPITC model

Table 8.3 EITC by Age (Five-Year Groups), EITC Individuals only

	所得	所得税		EITC			社会保険料	実効税率				
		控除前	控除後	算定額	税額控除	給付		所得税(前)	所得税(後)	EITC	EITC控除	EITC給付
(1,000 yen)	Income	Income tax		EITC total			Social	Tax rate		Credit rate		
Individuals		Base	After		EITC credit	EITC benefit	insurance	Base	After	Total	Credit	Benefit
Age	(a)	(b)	(c)	(d)	(e)	(f)		(b/a)	(c/a)	(d/a)	(e/a)	(f/a)
25-29	1,294	11	3	86	9	77	153	0.9%	0.2%	6.6%	0.7%	5.9%
30-34	1,542	14	3	97	11	86	159	0.9%	0.2%	6.3%	0.7%	5.6%
35-39	1,429	13	3	107	11	96	138	0.9%	0.2%	7.5%	0.7%	6.7%
40-44	1,256	10	1	95	8	87	132	0.8%	0.1%	7.6%	0.7%	6.9%
45-49	1,347	11	2	94	9	85	145	0.8%	0.1%	7.0%	0.7%	6.3%
50-54	1,143	11	3	64	8	55	128	1.0%	0.3%	5.6%	0.7%	4.8%
55-59	977	10	3	41	7	34	129	1.1%	0.3%	4.2%	0.7%	3.5%
60-64	699	17	8	31	9	22	91	2.4%	1.2%	4.4%	1.3%	3.2%
65-69	615	18	9	29	9	20	149	3.0%	1.5%	4.7%	1.5%	3.2%

Note 1: Simulation results of the JPITC model

Table 8.4 EITC by Income Groups, EITC Individuals only

	所得	所得税		EITC			社会保険料	実効税率				
		控除前	控除後	算定額	税額控除	給付		所得税(前)	所得税(後)	EITC	EITC控除	EITC給付
(1,000 yen)	Income	Income tax		EITC total			Social	Tax rate		Credit rate		
Individuals		Base	After		EITC credit	EITC benefit	insurance	Base	After	Total	Credit	Benefit
Income	(a)	(b)	(c)	(d)	(e)	(f)		(b/a)	(c/a)	(d/a)	(e/a)	(f/a)
-500	350	4	1	36	2	34	72	1.1%	0.4%	10.3%	0.7%	9.6%
500-1,000	872	9	2	47	7	40	74	1.0%	0.2%	5.4%	0.9%	4.6%
1,000-1,500	1,186	15	10	58	5	53	129	1.3%	0.9%	4.9%	0.4%	4.5%
1,500-2,000	1,892	9	0	331	9	322	193	0.5%	0.0%	17.5%	0.5%	17.0%
2,000-2,500	2,380	21	0	211	21	191	243	0.9%	0.0%	8.9%	0.9%	8.0%
2,500-3,000	2,958	29	2	138	27	110	325	1.0%	0.1%	4.7%	0.9%	3.7%
3,000-4,000	3,421	38	9	62	29	33	390	1.1%	0.3%	1.8%	0.8%	1.0%

Note 1: Simulation results of the JPITC model

Table 8.5 EITC by Income Groups, EITC Households only

	所得	所得税		EITC			社会保険料	実効税率				
		控除前	控除後	算定額	税額控除	給付		所得税(前)	所得税(後)	EITC	EITC控除	EITC給付
(1,000 yen)	Income	Income tax		EITC total			Social	Tax rate		Credit rate		
Households		Base	After		EITC credit	EITC benefit	insurance	Base	After	Total	Credit	Benefit
Income	(a)	(b)	(c)	(d)	(e)	(f)		(b/a)	(c/a)	(d/a)	(e/a)	(f/a)
-500	412	12	6	67	6	62	265	3.0%	1.5%	16.4%	1.4%	14.9%
500-1,000	932	12	6	81	6	75	149	1.3%	0.6%	8.7%	0.6%	8.1%
1,000-1,500	1,198	13	9	112	4	108	202	1.1%	0.8%	9.3%	0.3%	9.0%
1,500-2,000	1,917	17	5	256	11	245	276	0.9%	0.3%	13.4%	0.6%	12.8%
2,000-2,500	2,410	29	12	181	17	164	276	1.2%	0.5%	7.5%	0.7%	6.8%
2,500-3,000	2,990	33	12	140	21	118	416	1.1%	0.4%	4.7%	0.7%	4.0%
3,000-4,000	3,455	42	22	147	20	127	389	1.2%	0.6%	4.2%	0.6%	3.7%

Note 1: Simulation results of the JPITC model

Table 8.6 EITC by Income Groups, 0 Children only

	所得	所得税控除前	控除後	EITC算定額	税額控除	給付	社会保険料	実効税率 所得税(前)	所得税(後)	EITC	EITC控除	EITC給付
(1,000 yen)	Income	Income tax		EITC total			Social	Tax rate		Credit rate		
Individuals		Base	After		EITC credit	EITC benefit	insurance	Base	After	Total	Credit	Benefit
Income	(a)	(b)	(c)	(d)	(e)	(f)		(b/a)	(c/a)	(d/a)	(e/a)	(f/a)
-500	294	4	2	22	2	20	71	1.4%	0.7%	7.6%	0.8%	6.9%
500-1,000	825	9	1	32	7	24	70	1.1%	0.2%	3.8%	0.9%	2.9%
1,000-1,500	1,130	17	10	10	7	3	112	1.5%	0.9%	0.9%	0.6%	0.2%
1,500-2,000	0	0	0	0	0	0	0					
2,000-2,500	0	0	0	0	0	0	0					
2,500-3,000	0	0	0	0	0	0	0					
3,000-4,000	0	0	0	0	0	0	0					

Note 1: Simulation results of the JPITC model

Table 8.7 EITC by Income Groups, 1 Child only

	所得	所得税控除前	控除後	EITC算定額	税額控除	給付	社会保険料	実効税率 所得税(前)	所得税(後)	EITC	EITC控除	EITC給付
(1,000 yen)	Income	Income tax		EITC total			Social	Tax rate		Credit rate		
Individuals		Base	After		EITC credit	EITC benefit	insurance	Base	After	Total	Credit	Benefit
Income	(a)	(b)	(c)	(d)	(e)	(f)		(b/a)	(c/a)	(d/a)	(e/a)	(f/a)
-500	332	0	0	113	0	113	100	0.0%	0.0%	34.0%	0.0%	34.0%
500-1,000	783	0	0	253	0	253	120	0.0%	0.0%	32.3%	0.0%	32.3%
1,000-1,500	1,275	5	0	285	5	280	184	0.4%	0.0%	22.4%	0.4%	22.0%
1,500-2,000	1,812	10	0	242	10	232	218	0.5%	0.0%	13.3%	0.5%	12.8%
2,000-2,500	2,298	22	0	164	22	143	259	0.9%	0.0%	7.1%	0.9%	6.2%
2,500-3,000	2,811	42	2	82	39	43	301	1.5%	0.1%	2.9%	1.4%	1.5%
3,000-4,000	3,181	57	37	23	20	3	398	1.8%	1.2%	0.7%	0.6%	0.1%

Note 1: Simulation results of the JPITC model

Table 8.8 EITC by Income Groups, 2-5 Children only

	所得	所得税控除前	控除後	EITC算定額	税額控除	給付	社会保険料	実効税率 所得税(前)	所得税(後)	EITC	EITC控除	EITC給付
(1,000 yen)	Income	Income tax		EITC total			Social	Tax rate		Credit rate		
Individuals		Base	After		EITC credit	EITC benefit	insurance	Base	After	Total	Credit	Benefit
Income	(a)	(b)	(c)	(d)	(e)	(f)		(b/a)	(c/a)	(d/a)	(e/a)	(f/a)
-500	338	0	0	135	0	135	113	0.0%	0.0%	40.0%	0.0%	40.0%
500-1,000	856	0	0	343	0	343	117	0.0%	0.0%	40.0%	0.0%	40.0%
1,000-1,500	1,311	1	0	463	1	462	186	0.1%	0.0%	35.3%	0.1%	35.2%
1,500-2,000	1,811	6	0	414	6	408	221	0.3%	0.0%	22.9%	0.3%	22.6%
2,000-2,500	2,329	17	0	305	17	288	263	0.7%	0.0%	13.1%	0.7%	12.4%
2,500-3,000	2,857	21	0	194	21	174	326	0.7%	0.0%	6.8%	0.7%	6.1%
3,000-4,000	3,428	34	7	74	28	46	396	1.0%	0.2%	2.2%	0.8%	1.4%

Note 1: Simulation results of the JPITC model