Does Work-Life Balance Improve Life Satisfaction?
Evidence from OECD Countries

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Abstract

Work-life balance, as an effort to achieve balance between work and personal life, has been attracting attention since the 2000s. One factor contributing to this trend is the implicit assumption that implementation of a work-life balance policy increases life satisfaction. The correlation between work-life balance and life satisfaction, however, is not so self-evident. In this paper, therefore, we analyze the relation between work-life balance and life satisfaction using international cross-section data. A regression analysis revealed a positive effect of increased work-life balance on life satisfaction among both men and women. However, work-life balance elasticity of life satisfaction for men is greater than that for women. In the past, the issue of work-life balance has predominantly been thought to concern women rather than men. The results of this study suggest that institutional design adequately incorporating the work-life balance of men as well as women is important for increasing people’s life satisfaction.

Key words: work-life balance, life satisfaction, health, employment, income inequality

JEL Classification: I31, J08, J81

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1 Introduction

The Act on Equal Opportunity Between Men and Women in Employment was enacted in Japan in 1985. The work environment has changed drastically in the approximately 30 years since then. With the support of the Cabinet Office’s White Paper on Gender Equality 2007 amid such a trend, the idea of work-life balance—that is, to maintain balance between work and personal life and to achieve work practices that fit individuals’ lifestyles—has been attracting greater attention in recent years. The increasing social interest in work-life balance is a phenomenon observed not only in Japan, but throughout the developed world. The objective of this study is to explain the relationship between work-life balance and people’s life satisfaction using cross-national data.

Since the 2000s, interdisciplinary studies based on approaches from economics, sociology, law, and other fields have been conducted to assess various themes related to work-life balance, from which two general trends have emerged. One is research investigating the effects of work-life balance on companies’ productivity and organizational performance (Beauregard and Henry, 2009; Fapohunda, 2014; Yamamoto and Kuroda, 2014), and the other is research on the relation between work–life balance and the declining birthrate (Nishioka, 2009; Yamaguchi, 2009; Holthus, 2011). Yamamoto and Kuroda (2014), for instance, measured total factor productivity (TFP) at the corporate level and examined whether the TFP would increase after a work-life balance policy was implemented. According to their analysis, work-life balance policy, depending on the type, had a positive effect on the medium- to long-run TFP of companies satisfying three conditions: 1) being a medium or large company with 300 or more employees; 2) being a manufacturer; and 3) having high fixed cost of labor. Yamaguchi (2009) analyzed the effect of home and workplace environments on the motivation of married women to have children. Results revealed the importance of developing a workplace environment that incorporates work-life balance as a method of increasing the birthrate.

The studies described above were done on the implicit assumption that the promotion of work-life balance policy would increase people’s life satisfaction. The question is whether this is true. Promotion of a work-life balance policy in both the public and private sectors requires evidence backed by empirical research on the contribution of the policy to life satisfaction. To date, such research results have not been reported adequately, despite the importance of this issue. In particular, many earlier studies were based on firm-level micro-perspectives. However, research from a macro-view is scarce.

Firm-level investigations conducted in various countries are undoubtedly meaningful in the study of work-life balance. A macro-perspective approach, however, is also important to acquire new findings and to improve our understanding of work-life balance. This study therefore developed an argument from an international perspective using data from the Organisation for Economic Co-operation and Development (OECD) Better Life Index. More specifically, the
investigation sought to identify gender differences in 34 OECD member countries in the effect of work-life balance on life satisfaction. Furthermore, the study examined and compared the impact of work-life balance and other factors on life satisfaction.

The results of a cross-sectional analysis verified that balance between work and personal life had a positive effect on life satisfaction among both men and women. Focusing on the work-life balance elasticity of life satisfaction, which is measured as the percent of change in life satisfaction, divided by the percent of change in work-life balance, however, the aforementioned effect was higher among men than women. This implies how important it is to have institutional design that adequately incorporates the work-life balance not only of women, but also of men, in attempts to increase life satisfaction.

The rest of this paper is organized as follows: Section 2 reviews earlier studies. Section 3 provides an overview of the data and examines the 34 OECD member countries on four index factors: life satisfaction, work-life balance, health, and employment. The relation between life satisfaction and real GDP per capita is also noted, and a regression analysis of determinants of life satisfaction is performed. Finally, Section 4 presents a summary of key analytical results and proposes issues to be investigated in future studies.

2 Literature review

2.1 Economic approach

Studies of economic approaches to work-life balance are concentrated in the field of labor economics. This section presents a description of preceding studies in labor economics using “firm productivity” and “disincentives of work-life balance” as keywords. The following first reviews studies of firm productivity. Yamamoto and Kuroda (2014) analyzed, based on firm-level data, whether TFP might rise owing to the introduction of work-life balance policy. Detailed observations revealed no evidence of an increase in the productivity of any firm as a result of the introduction of a work-life balance policy. The analysis also revealed, however, that firms satisfying three conditions—i.e., a medium or large manufacturer with 300 or more employees and having high fixed labor cost—reported increased TFP, depending on the type of work-life balance policy. Wakisaka (2009) used two measures: 1) “family friendliness,” which indicates the condition of implementing a childcare leave policy and reduced working hours, and 2) “gender equality” for actively employing women, and concluded, based on analytical results, that firms with both higher family friendliness and higher gender equality achieved superior performance. Sakazume (2002) confirmed that work-life balance support policies affected workplace pleasantness, job satisfaction, and female employee turnover.

Omori (2010) conducted a study on the disincentives of work-life balance by categorizing disincentives into household finance factors and market factors that disrupted the work-life balance of individuals. The report then presented the argument that a collective model and
hedonic price model are useful as approaches to household finance factors and market factors, respectively. The collective model specifically examines the allocation of living hours and assumes that individuals have different utility functions within this context. The implication of the collective model is to suggest the possibility of individual-level work-life conflicts and to provide a new perspective on the formation and collapse of a family. The hedonic price model suggests that various jobs are offered in the external labor market based on free competition, which might facilitate a balance between work and personal life.

2.2 Sociological approach

Sociology is defined as the study of changes in social structures from human perspectives. General sociological approaches to work-life balance include empirical analysis based on interviews and questionnaire surveys. The key issue in the sociological studies of work-life balance is to develop an argument related to reducing working hours in light of issues in people's daily lives. The strength of sociology as a field is its large accumulation of such research achievements.

Ikeda (2010) summarizes the findings in empirical research on balancing work and personal life as follows: first, it remains difficult for women to continue working following childbirth and in the early years of childcare. Second, the importance of men’s contribution to housework and childcare has been increasing, although support for parents’ housework and childcare has been reduced. Third, the problems of work hours are associated with the continuing work for women undertaking childbirth and childcare, as well as with men’s participation in childcare and nursing care. Ikeda (2010) states that it is important to identify specific issues to modify how people work by finding problems other than those related to housework, childcare, and nursing care.

Takeishi (2006) asserts that an important key to achieving work-life balance lies in the responses and systems of the companies and organizations that establish work conditions. Work-life balance policies, however, range in variety. Some employees wish to work part-time for personal reasons, while others prefer flexible work hours despite being capable of working full-time. Some workers are more selective about the locations of their workplaces than their working hours. An effective work-life balance policy varies depending on the organization size, employee composition, and other workplace attributes, as well as external environments, such as locational conditions. Thus, it is necessary to prioritize these aspects of institutional design in the development of an effective work-life balance policy.

Yamaguchi (2009) specifically examined the significance of the effect of married women’s willingness to have a child on the birthrate, and the determinants of their motivations. The results indicated that factors such as the wives’ level of marital satisfaction, trust in their husband to support them, and the financial strength of their husband all contributed to an
increased motivation to have their first child. The study also pointed out that reduced satisfaction with their marriage after the first childbirth raised a major barrier to having a second child.

2.3 Law approach

In today’s Japan, workers are often still forced to choose between their work and personal lives. To alleviate that dilemma, the development of legal systems that enable people, irrespective of their sex and marital status, to select holidays and reduced working hours on an equal basis becomes socially important (Tsutsui, 2010). Changes in people’s financial situations in recent years have caused an increasing need to have both the husband and wife working to support their household finances and to ensure sufficient labor for the economy, particularly in light of the declining birthrate. In response, social demand for work styles more flexible than the conventional ways has also been arising.

Ouchi (2009) argues that the role of law in achieving work-life balance is to support a cooperative relationship between management and labor. Important legal systems related to work-life balance include the Child Care and Family Care Leave Act, the Act on Advancement of Measures to Support Raising Next-Generation Children, and the Basic Act for Gender-Equal Society. The Child Care and Family Care Leave Act and Act on Advancement of Measures to Support Raising Next-Generation Children play important roles in helping workers who have family responsibilities, particularly childcare and nursing care, achieve work-life balance while working for their respective companies. The Basic Act for Gender-Equal Society does not require companies to support their employees’ work-life balance directly. Instead, it presents the important viewpoint that the gender-specific division of labor, in which men spend most of their time working while women are primarily responsible for family issues such as childcare and nursing care, must be modified. The various work-life balance policies explained above have helped build the foundation for the introduction of corporate work-life balance support systems.

Despite the growth of corporate systems to support employees’ work-life balance, however, only female workers have been taking advantage of such systems, which does not stop the vicious cycle of work styles that enforce gender-specific roles and the burden of family responsibility on women. This problem must be resolved through men’s participation in household work while having a job outside their home, thereby reducing the burden of family responsibility on women. An environment that facilitates the use of such systems by both women and men must therefore be built.

Asakura (2010) has raised an opinion on work-life balance policies from the perspective of Labor Law. According to Asakura (2010), Labor Law must provide the frameworks of how people work and specify the rights and obligations related to work. How people build their personal lives, however, is based on individual discretion. Individual workers are those who
decide how they spend their personal lives, and the government and their employers are merely obligated to establish work styles that do not restrict individuals’ freedom of choice. Work-balance policy, therefore, consists of “regulation of work” and “freedom of life.” Morozumi (2008) argues that Labor Law must address work-life balance issues, including the regulation of working hours, development of laws for work and holiday systems, and expansion of the range of flexible work styles.

3 Cross-sectional analysis

3.1 Data

Below is a summary of reasons to use the OECD Better Life Index in this study. The primary reason is that the index includes widely diverse indicators related to a better life, such as work-life balance and life satisfaction. Second, the index covers the greatest number of countries among the databases of this type that allow international comparisons. Third, the OECD (2011) provides a detailed explanation of the data used for the Better Life Index, which assures data reliability.

The first Better Life Index was the 2011 edition; the latest version, as of January 2015, is the 2014 edition. Such data restrictions make it extremely difficult to perform time-series data analysis and panel data analysis. This study conducted cross-sectional analysis of the 34 countries presented in Table 1, using data from the 2014 edition.

<table>
<thead>
<tr>
<th>Australia</th>
<th>Estonia</th>
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<th>Netherlands</th>
<th>Spain</th>
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<tr>
<td>Australia</td>
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<td>Belgium</td>
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<tr>
<td>Czech Republic</td>
<td>Hungary</td>
<td>Luxembourg</td>
<td>Slovakia</td>
<td>United States</td>
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<tr>
<td>Denmark</td>
<td>Iceland</td>
<td>Mexico</td>
<td>Slovenia</td>
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</table>

The 2014 edition of the Better Life Index consists of 11 factors, including housing, income, jobs, community, education, environment, governance, health, life satisfaction, safety, and work-life balance. This study specifically addressed 4 of the 11 factors above, including “jobs,” “health,” “life satisfaction,” and “work-life balance.” Whereas “work-life balance,” “health,” and “jobs” include multiple sets of basic data, “time devoted to leisure and personal care,” “self-reported health” (percentage of people reporting their health to be good or very good), and “long-term unemployment rate” (percentage of people aged 15–64 seeking a job for over a year) were selected as the respective indicators of work-life balance, health, and jobs for the statistical
analyses conducted in this study. Basic data for life satisfaction came from the “average self-evaluation of life satisfaction.” The respondents were asked to rate their current life on a scale of 0 (the worst conceivable life) to 10 (the best conceivable life), and the average was calculated from the weighted sum in each answer category (OECD, 2011).

Both the overall data of the Better Life Index, including both men and women, and data of each sex have been published. This study analyzed each sex separately, taking advantage of the available data. Table 2 presents the descriptive statistics of data on “life satisfaction,” “time devoted to leisure and personal care,” “self-reported health,” and “long-term unemployment rate” for men and women.

<table>
<thead>
<tr>
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<th>Mean</th>
<th>SD</th>
<th>Min.</th>
<th>Max.</th>
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</thead>
<tbody>
<tr>
<td>Life satisfaction (men)</td>
<td>6.606</td>
<td>0.901</td>
<td>4.6</td>
<td>7.7</td>
</tr>
<tr>
<td>Life satisfaction (women)</td>
<td>6.688</td>
<td>0.905</td>
<td>4.8</td>
<td>7.8</td>
</tr>
<tr>
<td>Time devoted to leisure and personal care (%, men)</td>
<td>62.620</td>
<td>2.309</td>
<td>56.708</td>
<td>68.375</td>
</tr>
<tr>
<td>Time devoted to leisure and personal care (%, women)</td>
<td>61.029</td>
<td>2.536</td>
<td>54.708</td>
<td>66.917</td>
</tr>
<tr>
<td>Self-reported health (%, men)</td>
<td>71.559</td>
<td>13.081</td>
<td>32</td>
<td>90</td>
</tr>
<tr>
<td>Self-reported health (%, women)</td>
<td>66.706</td>
<td>14.576</td>
<td>29</td>
<td>89</td>
</tr>
<tr>
<td>Long-term unemployment (%, men)</td>
<td>3.443</td>
<td>3.308</td>
<td>0.01</td>
<td>12.370</td>
</tr>
<tr>
<td>Long-term unemployment (%, women)</td>
<td>3.410</td>
<td>3.606</td>
<td>0.01</td>
<td>17.429</td>
</tr>
</tbody>
</table>

The facts suggested by the indicators in Table 2 can be summarized as follows: first, differences exist between men and women. Whereas the mean values of women are higher than those of men, the values of men on all other indicators are higher than those of women. Care should be taken in the interpretation of long-term unemployment rates, however, because the lower the value, the better. All standard deviations of women are greater than those of men. The coefficients of variation used to compare the dispersion of different indicators reveal that the value of “long-term unemployment rate” for women is the highest at 1.057, and the value of “time devoted to leisure and personal care” for men is the lowest at 0.037. Therefore, the international dispersion of women’s long-term unemployment rate is the largest and the international dispersion of men’s time devoted to leisure and personal care is the smallest among the 34 OECD member countries.

The OECD Better Life Index indicates data on “time” devoted to leisure and personal care rather than “percentage of time” devoted to leisure and personal care. In this study, the data were divided by 24 and converted to data that would express the percentages of time devoted to leisure and personal care in one day. The term “leisure” in this report includes sports activities, participating in and attending events, visiting or entertaining friends, watching TV or listening to the radio at home, and other leisure activities. The term “personal care” is defined as activities such as sleeping; eating and drinking; personal, household, and medical services; and travel related to personal care (OECD, 2011).
Figures 1–8 show graphs for the international comparison of men and women reporting their “life satisfaction,” “time devoted to leisure and personal care,” “self-reported health,” and “long-term unemployment rate,” respectively. The positions of Japan among the 34 OECD member countries in 2014 are indicated as follows: The “life satisfaction” graphs (Figures 1 and 2) show Japanese men ranked 27th and women ranked 24th. The graphs for “time devoted to leisure and personal care” (Figures 3 and 4) reveal that Japanese men are ranked 22nd, and women are ranked 12th. Both Japanese men and women are ranked 34th, i.e., the lowest spot, in the “self-reported health” graphs (Figures 5 and 6). In the “long-term unemployment rate” graphs (Figures 7 and 8), Japanese men are ranked 17th, while women are ranked 9th. When categorizing, the countries ranked 1st to 11th were considered the high-ranking group, and those ranked 12th to 23rd the middle-ranking group. Those in the 24th to 34th positions fell in the low-ranking group. Both Japanese men and women fell into the low-ranking group for “life satisfaction,” the middle-ranking group for “time devoted to leisure and personal care,” and the low-ranking group for “self-reported health.” For “long-term unemployment rate,” Japanese men fell into the middle-ranking group, while Japanese women were in the high-ranking group. That is, Japan is in a low position on indices of health, life, and work, except in terms of women’s employment.
Figure 1: Life satisfaction (Men, 2014)

Figure 2: Life satisfaction (Women, 2014)
Figure 3: Time devoted to leisure and personal care (Men, 2014)

Figure 4: Time devoted to leisure and personal care (Women, 2014)
Figure 5: Self-reported health (percentage of people reporting their health to be good or very good)  
(Men, 2014)

Figure 6: Self-reported health (percentage of people reporting their health to be good or very good)  
(Women, 2014)
Figure 7: Long-term unemployment rate (Men, 2014)

Figure 8: Long-term unemployment rate (Women, 2014)
3.2 Preliminary consideration

We now examine the relation between GDP per capita and life satisfaction as a preliminary consideration for an empirical study of work-life balance and life satisfaction. Figure 9 portrays a scatter diagram of data related to real GDP per capita and life satisfaction in the 34 OECD member countries in 2013.

As reported by the OECD (2011) and Oshio (2014), no strong, positive correlation is evident between real GDP per capita and life satisfaction. In fact, the correlation coefficient between 2013 real GDP per capita and life satisfaction is 0.592. It is noteworthy that a correlation coefficient represents the measure of strength of a linear relation between two variables, and not of any relation other than linear ones. Even if a nonlinear relation prevails between two variables, the correlation coefficient might be a low value.

Considering the limitation of correlation coefficients described above, the following analysis uses a nonparametric regression technique for a detailed analysis of the relationship between
real GDP per capita and people’s life satisfaction. More specifically, nearest-neighbor local-linear regression is performed on real GDP per capita and life satisfaction data. An important benefit of this technique is that a narrow bandwidth makes use of small data movements in a dense data area; a wide bandwidth cancels small movements in a sparse data area. Figure 10 shows the local regression (LOESS) curve, i.e., the red line, based on the values estimated through nearest-neighbor local-linear regression.

Figure 10: LOESS curve

The shape of the LOESS curve in Figure 10 suggests a complex relationship between real GDP per capita and life satisfaction that cannot be explained as a simple linear relation. An increase in real GDP per capita therefore does not necessarily raise life satisfaction. The next subsection further examines the determinants of life satisfaction. It seems growth in real GDP per capita is not synonymous with greater satisfaction with one’s daily life.

3.3 Estimation of the basic model

The primary interest of this study is to verify the realistic relevance of the hypothesis that work–life balance has a positive effect on life satisfaction. It also examines the hypotheses that health indicators have a positive effect on life satisfaction and that a decline in employment has a negative effect on life satisfaction. The analysis begins with a model, henceforth referred to as “the basic model” in this article, which considers the indicators of work-life balance, health, and employment to be determinants of life satisfaction. The indicator of work-life balance (time

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2 Refer to Hitomi et al. (2005) for the basic concepts of nonparametric regression.
devoted to leisure and personal care) is represented by $x_1$, the indicator of health (self-reported percentage of people reporting their health to be good or very good) by $x_2$, the indicator of employment (long-term unemployment rate) by $x_3$, and the indicator of life satisfaction by $y$, and the set of the $i$-th value observed from these indicators is expressed as $(x_{i1}, x_{i2}, x_{i3}, y_i)$. In this case, the following multiple regression model having explanatory variables $\log x_1, \log x_2, \log x_3$, and the explained variable $\log y$ for a sample of size $N$ is developed.

$$\log y_i = \alpha + \beta_1 \log x_{i1} + \beta_2 \log x_{i2} + \beta_3 \log x_{i3} + u_i, \quad (i = 1, 2, \ldots, N) \quad (1)$$

In the basic model of Eq. (1), the terms $\alpha, \beta_1, \beta_2,$ and $\beta_3$ are unknown parameters that express regression coefficients. Term $u_i$ is an error term, which is assumed to be an independent random variable that follows a normal distribution with mean 0 and variance $\sigma^2$.

First, the case using the data of men from the OECD member countries is presented. Estimation of the model parameters uses the ordinary least squares (OLS) method. The parameter estimation using OLS led to the following estimated regression equation:

$$\log \hat{y}_i = -4.985 + 1.251 \log x_{i1} + 0.407 \log x_{i2} - 0.061 \log x_{i3},$$

$$\begin{align*}
(2.297) &\quad (0.538) &\quad (0.088) &\quad (0.015) \\
N = 34, &\quad R^2 = 0.465, &\quad SER = 0.107, &\quad AIC = -1.525.
\end{align*} \quad (2)$$

In Eq. (2), the values in the parentheses are standard errors of the regression coefficients. Term $N$ is the sample size, $R^2$ is an adjusted coefficient of determination, $SER$ is the standard error of regression, and $AIC$ is the Akaike information criterion (AIC). Significance tests of the regression coefficients reveal that the constant term is statistically significant at the 5% significance level. All other regression coefficients are statistically significant at the 1% significance level.

Each of the estimated regression coefficients other than the constant term, i.e., the estimated coefficients of $\log x_{i1}, \log x_{i2},$ and $\log x_{i3}$ has an important meaning in the sense of economics. More specifically, the estimated coefficient of $\log x_{i1}$ indicates what percentage of life satisfaction is added by a 1% increase in time devoted to leisure and personal care (i.e., work–life balance elasticity of life satisfaction). The estimated coefficient of $\log x_{i2}$ represents the percentage of change in life satisfaction for a 1% rise in self-reported health (i.e., health elasticity of life satisfaction). The absolute value of the estimated coefficient of $\log x_{i3}$ expresses the reduced percentage of life satisfaction as a result of a 1% increase in long-term

\[ AIC = -\frac{2LL}{N} + \frac{2k}{N} \]

where $N$ is the sample size.
unemployment (i.e., unemployment elasticity of life satisfaction). The work-life balance elasticity of life satisfaction of men in the OECD member countries is 1.251, health elasticity of life satisfaction is 0.407, and unemployment elasticity of life satisfaction is 0.061. The OLS estimation of the model parameters using the data of women in the OECD member countries leads to the following estimated regression equation.

\[
\log \hat{y}_i = -3.793 + 1.062\log x_{ui} + 0.326\log x_{2i} - 0.064\log x_{3i},
\]

\[
(1.533) \quad (0.376) \quad (0.062) \quad (0.011)
\]

\[
N = 34, \quad R^2 = 0.629, \quad SER = 0.088, \quad AIC = -1.918.
\]

The meanings of all symbols in Eq. (3) are the same as those in Eq. (2). Significance tests of the regression coefficients reveal that the constant term is statistically significant at the 5% significance level. All other regression coefficients are statistically significant at the 1% significance level. The work-life balance elasticity of life satisfaction of women in the OECD member countries is 1.062, health elasticity of life satisfaction is 0.326, and unemployment elasticity of life satisfaction is 0.064.

### 3.4 Estimation of a model that considers income inequality

The basic model focused on three indicators, including work-life balance (time devoted to leisure and personal care), health (self-reported health), and employment (long-term unemployment rate) as determinants of people’s life satisfaction. Changes in these three determinants alone do not fully explain the fluctuations in life satisfaction. Other factors that might affect people’s life satisfaction, then, must be considered. Income disparity and unequal income distribution, for instance, are often considered an issue that might cause social unrest. An example from recent works is *Capital in the Twenty-First Century* by Thomas Piketty, a bestseller following its publication in 2013 that has drawn considerable global attention to the issue of income inequality. Considering such conditions, this study examines a model developed by adding income inequality as an explanatory variable to the basic model, henceforth called “the extended model” in this article.

Major indicators for measuring the level of income inequality include the Gini coefficient, Theil index, and mean logarithmic deviation (MLD). In this section, the decomposition formula will be derived first; an overview of past changes in world’s income inequality will be given based on MLD. This will be followed by a cross-sectional analysis of the extended model that includes the Gini coefficient as an additional explanatory variable.

Assuming \( N \) households in the world, the income of the first household is expressed as \( y_1 \), that of the second household is \( y_2, \ldots \), and that of the \( N \)-th household is \( y_N \). When the mean of all these households is represented by \( \mu \), the following equation holds:
\[ \mu = \frac{1}{N} \sum_{j=1}^{N} y_j \]

The MLD in this case is defined by the following equation.

\[ MLD = \frac{1}{N} \sum_{j=1}^{N} \log \left( \frac{\mu}{y_j} \right). \] (4)

This equation expresses the income inequality in all households of the world. Eq. (4) can be rewritten as shown below.

\[
MLD = \frac{1}{N} \sum_{j=1}^{N} \left( \log \mu - \log y_j \right) \\
= \frac{1}{N} \sum_{j=1}^{N} \log \mu - \frac{1}{N} \sum_{j=1}^{N} \log y_i \\
= \frac{1}{N} N \log \mu - \frac{1}{N} \sum_{j=1}^{N} \log y_i \\
= \log \mu - \frac{1}{N} \sum_{j=1}^{N} \log y_i. 
\]

The MLD defined above can be decomposed into the part representing domestic income inequality (“Within-country MLD”) and “the part representing international income inequality (“Between-country MLD”). Assuming now that there are \( m \) number of countries in the world, the number of households in the \( k \)-th country \((k = 1, 2, \ldots, m)\) is expressed as \( N_k \). Because there are \( N \) households in the entire world based on the assumption, the equation below holds:

\[ N = \sum_{k=1}^{m} N_k. \]

When the income of household \( j \) in the \( k \)-th country is \( y_{kj} \), the mean income of the \( k \)-th country is \( \mu_k \), and the MLD of the \( k \)-th country is \( MLD_k \), \( MLD_k \) is given by the next equation:

\[
MLD_k = \frac{1}{N_k} \sum_{j=1}^{N_k} \log \left( \frac{\mu_k}{y_{kj}} \right) \\
= \frac{1}{N_k} \sum_{j=1}^{N_k} \left( \log \mu_k - \log y_{kj} \right) \\
= \log \mu_k - \frac{1}{N_k} \sum_{j=1}^{N_k} \log y_{kj}. \] (5)
If the percentage of the number of households of the $k$-th country $N_k$ in the total number of households in the entire world $N$ is $\nu_k$, then $\nu_k$ is given by the following relation:

$$\nu_k = \frac{N_k}{N}.$$ 

Multiplying both sides of Eq. (5) by $\nu_k$ and totaling all countries result in the next equation:

$$\sum_{k=1}^{m} \nu_k MLD_k = \sum_{k=1}^{m} \nu_k \log \mu_k - \sum_{k=1}^{m} \frac{N_k}{N} \sum_{j=1}^{N} \log y_{kj}$$

$$= \sum_{k=1}^{m} \nu_k \log \mu_k - \frac{1}{N} \sum_{k=1}^{m} \sum_{j=1}^{N} \log y_{kj}. \quad (6)$$

Considering that the relation

$$\sum_{k=1}^{m} \log y_{i} = \sum_{k=1}^{m} \sum_{j=1}^{N} \log y_{kj}$$

holds at this stage, Eq. (6) can be rewritten as

$$\sum_{k=1}^{m} \nu_k MLD_k = \sum_{k=1}^{m} \nu_k \log \mu_k - \frac{1}{N} \sum_{j=1}^{N} \log y_{i}.$$ 

Consequently, the following equation is obtained:

$$-\frac{1}{N} \sum_{j=1}^{N} \log y_{i} = \sum_{k=1}^{m} \nu_k MLD_k - \sum_{k=1}^{m} \nu_k \log \mu_k. \quad (7)$$

Furthermore, substituting Eq. (7) for Eq. (4) results in the following equation:

$$MLD = \log \mu - \frac{1}{N} \sum_{j=1}^{N} \log y_{i}$$

$$= \log \mu + \sum_{k=1}^{m} \nu_k MLD_k - \sum_{k=1}^{m} \nu_k \log \mu_k$$

$$= \sum_{k=1}^{m} \nu_k MLD_k + \left( \log \mu - \sum_{k=1}^{m} \nu_k \log \mu_k \right). \quad (8)$$

The part in the parentheses in Eq. (8) can be rewritten as
The decomposition formula of MLD is therefore derived in the following form by substituting Eq. (9) for Eq. (8):

\[
\log \mu - \sum_{k=1}^{m} v_k \log \mu_k = \sum_{k=1}^{m} v_k \log \mu - \sum_{k=1}^{m} v_k \log \mu_k = \sum_{k=1}^{m} v_k (\log \mu - \log \mu_k) = \sum_{k=1}^{m} v_k \frac{\mu}{\mu_k}.
\]

The decomposition formula of MLD is therefore derived in the following form by substituting Eq. (9) for Eq. (8):

\[
MLD = \sum_{k=1}^{m} v_k MLD_k = \sum_{k=1}^{m} v_k \log \left( \frac{\mu}{\mu_k} \right),
\]

The first half of right-hand side of Eq. (10) shows “Within-country MLD,” and the latter half indicates “Between-country MLD.” Additionally, dividing both sides of Eq. (10) by \( MLD \) and rewriting the equation as

\[
1 = \frac{\sum_{k=1}^{m} v_k MLD_k}{MLD} + \frac{\sum_{k=1}^{m} v_k \log(\mu/\mu_k)}{MLD},
\]

the percentages of “Within-country MLD” and “Between-country MLD” in the income inequality of the entire world can be estimated based on Eq. (11).

Changes in the actual world MLD are presented by Anand and Segal (2015). Table 3 presents the level of global income inequality in terms of MLD, domestic income inequality (Within-country MLD), and international income inequality (Between-country MLD) in the years 1988, 1993, 1998, 2002, and 2005.

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4 Among the numerous empirical studies on income inequality done in the past, examples of major studies published in journals after the 2000s include Bourguignon and Morrison (2002) and Sala-i-Martin (2006). These studies examine, in detail, the unequal distribution of personal income on a global scale, based on various indicators. Helpman (2004) and World Bank (2005) conducted simple and concise surveys about the empirical research on income inequality. The surveys have been beneficial for developing prospects for studies on income inequality.
Table 3: Decomposition of income inequality based on MLD

<table>
<thead>
<tr>
<th>Year</th>
<th>MLD</th>
<th>Between-country MLD</th>
<th>Within-country MLD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988</td>
<td>1.136</td>
<td>0.886 (78)</td>
<td>0.250 (22)</td>
</tr>
<tr>
<td>1993</td>
<td>1.142</td>
<td>0.836 (73)</td>
<td>0.306 (27)</td>
</tr>
<tr>
<td>1998</td>
<td>1.093</td>
<td>0.780 (71)</td>
<td>0.314 (29)</td>
</tr>
<tr>
<td>2002</td>
<td>1.133</td>
<td>0.830 (73)</td>
<td>0.303 (27)</td>
</tr>
<tr>
<td>2005</td>
<td>1.156</td>
<td>0.806 (70)</td>
<td>0.349 (30)</td>
</tr>
</tbody>
</table>

Source: Anand and Segal (2015, Table 11.3, with top incomes).

2) Total populations in the datasets for 1988, 1993, 1998, 2002, and 2005 are, respectively, 4.45 billion, 5.06 billion, 5.32 billion, 5.78 billion, and 5.98 billion.
3) Values in the parentheses represent the percentages (%) of MLD in the factors concerned.

The values presented in Table 3 suggest the following trends in income inequality based on MLD. First, the international income inequality (Between-country MLD) remained above 70% and domestic income inequality (Within-country MLD) below 30% of the global income inequality (MLD) throughout the period between 1988 and 2005. A comparison between 2002 and 2005 indicates an increase in global income inequality from 1.133 to 1.156. With background, the international income inequality decreased from 0.830 to 0.806, although domestic income inequality rose from 0.303 to 0.349. These changes imply, therefore, that the growth in the global income inequality between 2002 and 2005 was attributable to the rise in domestic income inequality.

Figure 11 depicts the changes in domestic and international income inequality, based on the values in Table 3.

Figure 11: Changes in income inequality
Figure 11 provides a visual representation of the fact that, whereas the percentage of international income inequality remains high (above 70%) in global income inequality, domestic income inequality has been causing an increase in global income inequality since the 2000s.

The discussion now returns to the regression analysis using the extended model. The Gini coefficients used in the regression analysis in this study resulted from the measurement of the disposable income of all citizens of each country, which is available in the OECD Income Distribution and Poverty database. Because of data constraints, the 2009 data are used for the Gini coefficients of five countries, including Chile, Hungary, Japan, New Zealand, and Switzerland; 2010 data are used for the Gini coefficients of the other 29 countries.

The indicator of work-life balance (time devoted to leisure and personal care) is represented by $x_1$, the indicator of health (self-reported health) by $x_2$, the indicator of employment (long-term unemployment rate) by $x_3$, the indicator of income inequality (Gini coefficient) by $x_4$, the indicator of life satisfaction by $y$, and the set of the $i$-th value observed from these indicators is expressed as $(x_{1i}, x_{2i}, x_{3i}, x_{4i}, y_i)$. In this case, the following multiple regression model having explanatory variables $\log x_1, \log x_2, \log x_3, \log x_4$ and the explained variable $\log y$ for a sample of size $N$ is developed:

$$
\log y_i = \alpha + \beta_1 \log x_{1i} + \beta_2 \log x_{2i} + \beta_3 \log x_{3i} + \beta_4 \log x_{4i} + \nu_i, \quad (i = 1, 2, \ldots, N) \tag{12}
$$

In the extended model of Eq. (12), terms $\alpha, \beta_1, \beta_2, \beta_3,$ and $\beta_4$ are unknown parameters that express regression coefficients. Term $\nu_i$ is an error term, which is assumed to be an independent random variable that follows a normal distribution with mean 0 and variance $\sigma^2$.

The OLS estimation of the model parameters using the data of the men in the OECD member countries engenders the following estimated regression equation:

$$
\log \hat{y}_i = -3.619 + 0.891 \log x_{1i} + 0.398 \log x_{2i} - 0.059 \log x_{3i} - 0.136 \log x_{4i},
$$

$$(2.604) \quad (0.628) \quad (0.088) \quad (0.015) \quad (0.123) \tag{13}
$$

$N = 34, \quad R^2 = 0.469, \quad SER = 0.106, \quad AIC = -1.507.$

Significance tests of the regression coefficients reveal that the estimated coefficients of $\log x_2$ and $\log x_3$ are statistically significant at the 1% significance level. The estimated values of the constant term, coefficient of $\log x_1$, and coefficient of $\log x_4$, however, are not statistically significant at the 5% significance level. The result of the estimated coefficients of $\log x_1$ and $\log x_4$ not being statistically significant at the 5% significance level means that the null hypothesis (i.e., the indicators of work-life balance and income inequality have no effects on life satisfaction) cannot be rejected at the 5% significance level.

The OLS estimation of the model parameters using the data of the women in the OECD member countries engenders the following estimated regression equation:
In this case, the estimated coefficients of \( \log x_{i1} \) and \( \log x_{i3} \) are statistically significant at the 1% significance level, while the estimated coefficients of \( \log x_{i4} \) are statistically significant at the 5% significance level. The estimated values of the constant term and coefficient of \( \log x_{i4} \), however, are not statistically significant at the 5% significance level. That is, the null hypothesis (i.e., the indicator of income inequality has no effects on life satisfaction) cannot be rejected at the significance level of 5% or less.

From the analytical results presented above, there is no clear relationship between income inequality based on the Gini coefficients and life satisfaction in both men and women.

### 3.5 Results and discussion

The results of the regression analysis from the basic model and extended model were presented, respectively, in Subsections 3.3 and 3.4. Subsequently, the most appropriate model must be determined to interpret the analytical results. This study uses the AIC to select the model. The AIC values of each model for each sex are presented in Table 4.

<table>
<thead>
<tr>
<th></th>
<th>Data for Men</th>
<th>Data for Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Basic Model</td>
<td>Extended Model</td>
</tr>
<tr>
<td></td>
<td>Basic Model</td>
<td>Extended Model</td>
</tr>
<tr>
<td>AIC</td>
<td>-1.525</td>
<td>-1.507</td>
</tr>
<tr>
<td></td>
<td>-1.918</td>
<td>-1.861</td>
</tr>
</tbody>
</table>

Table 4 shows that the AIC values of the basic model are smaller than those of the extended model for both men and women. The comparison reveals that the basic model is the “better model” when compared with the extended model. Accordingly, the results of the regression analysis of the basic model are explained below.

From Eqs. (2) and (3), we find that work-life balance, in terms of time devoted to leisure and personal care, has a positive effect on the life satisfaction of both men and women. Men, however, show higher work-life balance elasticity than women do. This result signifies that time devoted to leisure and personal care is more important to men than it is to women. In the past, the issue of work-life balance has predominantly been thought to concern women rather than men. In contrast, the analytical results in this study encourage the government and companies to take adequate measures that allow the work-life balance of men to increase their life satisfaction.

Next is the health elasticity of life satisfaction. A comparison shows a value of estimated
health elasticity smaller than that of work-life balance elasticity for both men and women. We might conclude that the importance of health is be lower than that of work-life balance. However, that would be a misinterpretation. One reason for the estimation showing that improved health condition would not notably increase life satisfaction might be that the public health of the 34 OECD member countries has already reached, in general, a relatively high level. In other words, many people in economically developed countries might be taking the environment of good public health, in which they were born and raised, for granted. Some improvement from the already high level is unlikely to facilitate increased satisfaction.

Finally, the unemployment elasticity of life satisfaction can be summarized as follows. When other factors are constant, a higher unemployment rate can be expected to affect people’s satisfaction with their daily life negatively. The negative sign of the estimated value of unemployment elasticity was therefore predictable. The estimated values of the unemployment elasticity for men and women being nearly the same, however, is an interesting finding. Unemployment is not a problem that is solvable only through economic policies. The reason is that structural and frictional unemployment are caused by a mismatch between recruiters and job seekers or long time periods expended for job search activities. Structural and frictional factors compose a large part of unemployment, particularly in Japan in recent years. How such factors should be reduced is an imminent challenge in policy making.5

4 Conclusion

Cross-sectional analysis of determinants of life satisfaction was performed using the OECD Better Life Index in the above section of this article, which revealed the following findings. First, an increase in the indicator of work-life balance, in terms of time devoted to leisure and personal care, raises the life satisfaction of both men and women. The effect is greater for men. This result suggests that men desire to have additional time for leisure and personal care more strongly than women do. Generally, “work-life balance” is perceived to apply more to women than men. Based on the analytical results of this study, however, the work-life balance of men also should not be overlooked when aiming to increase people’s satisfaction with their daily lives. A “balanced” perspective, one which incorporates the effects on men as well as on women comprehensively, is required when governments and companies implement their work-life balance policies. In modern Japan, adjusting working hours to different living environments and working more flexibly can be difficult because of the constraints imposed by some companies. A system that increases both the work-life balance of people and productivity of companies must be developed.

As for the other explanatory variables, the analytical results suggest that an increase in the

5 According to Kyo et al. (2013), the structural and frictional factors represented approximately 60% of overall unemployment in Japan, in terms of the average of the period between January 2010 and January 2011.
indicator of health, in terms of self-reported health, promotes higher satisfaction with daily life. The indicator of employment, in terms of the long-term unemployment rate, works to reduce life satisfaction. Income disparity based on the Gini coefficient, however, indicated no apparent effect on life satisfaction.

Although the cross-sectional analysis in this study specifically addressed the 34 OECD member countries, the importance of work-life balance is likely to also increase in economically developing countries. Analysis conducted from a global perspective, based on a dataset that includes developing countries as well as developed countries, is expected to generate new findings. Education, the environment, governance, and other factors should be examined through analysis of the world economy, including both developed and developing countries. Such empirical studies should be conducted in the future.

References


