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# Leisure time and labor productivity: A new economic view rooted from sociological perspective

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## Leisure time and labor productivity: a new economic view rooted from sociological perspective

*Dan Cui, Xiang Wei, Dianting Wu, Nana Cui, and Peter Nijkamp*

### Abstract

Most economists measure labor productivity based on activities conducted at places of work and do not consider leisure time in their calculations. In contrast, psychologists and sociologists argue that leisure has a positive role in the production process: leisure can improve individuals' labor productivity by affecting their self-development. Using empirical data from 21 OECD countries, this study finds that leisure time has a dual effect on labor productivity in terms of per capita per hour GDP. Moreover, leisure time is nonlinearly associated with labor productivity (inverted U-shaped). When leisure time reaches the optimal level (5813 hours), leisure has a compensatory effect on work and can positively influence labor productivity, but when leisure time exceeds the optimal value, leisure has a substitution effect on work and can negatively influence labor productivity.

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**Keywords** Leisure time; labor productivity; per capita per hour GDP; dual effect; curvilinear relationship

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## 1 Introduction

Labor productivity, is the workforce productivity, and refers to actual labor output per labor hour(Hu, 2001; Koch and Mcgrath, 1996). The growth of labor productivity is directly attributed to the fluctuation of physical capital, new technology and human capital. Human capital, is the quality of labor force, and refers to the knowledge, skills and physical strength (health status) that labors intend to invest in improving their quality, ability and productivity(Nie, 2017; Schultz, 1961; Stiglitz, 2001). Human capital as a determinant of labor productivity growth includes education, health, and aspects of “social capital”(Barro and Lee, 2001). Hanushek and Kimbo (2000)suggested that labor force quality has a stable, strong and consistent relationship with labor productivity growth. Economists are concerned about the quality of workforce, however, too much attention has been paid to how formal schooling affects the quality of human capital and labor productivity(Dolton, 2010; Grossman *et al.*, 2017; Klinov, 2005; Lucas, 1988; Rangazas, 2002). Indeed, leisure can also indirectly account for the human capital quality, and thus affect labor productivity.

Leisure has impacts on the formation and accumulation of human capital(Wei *et al.*, 2016). Leisure as a context can help individuals to realize and utilize their strengths and resilience, and more important is to help people to improve their quality and pursue for a meaningful life(Iwasaki, 2007). Beatty and Torbert (2003)proposed that leisure is associated with ongoing personal development during adulthood through intentional awareness-expanding inquiry, not just growing older and losing attraction. And leisure is intrinsically rewarding, due to its promotion of personal transformations and increasing extrinsic economic value.

However, most economists assume that leisure time has no influence on the quality of human capital. For example, the neoclassical inter-temporal substitution model(Eichenbaum *et al.*, 1985; Ioannides and Taub, 1992; Keane, 2011; Mankiw *et al.*, 1985) considers leisure time as a pure substitute for working hours and has no influence on labor productivity. As a result, they took more account of the negative impact of leisure on productivity and economy(Buchanan and Yoon, 1994a; Hende, 1971; Kydland and Prescott, 1982; Mankiw *et al.*, 1985) but ignores the possibility that leisure time could have positive effects on labor productivity.

Fortunately, most psychologists and socialists argue that individuals’ happiness and labor productivity tend to increase along with their self-esteem, self-awareness, determination, creativity, and exploration of various leisure activities (Csikszentmihalyi, 1975; Gould *et al.*, 2008; Hills and Argyle, 1998; Nimrod, 2007; Xie *et al.*, 2018). This implies that leisure activities can create positive externalities and improve the human capital accumulation of individuals, which will enhance their labor productivity when they return to work(Eschleman *et al.*, 2014; Monte., 2008; Psarianos, 2007; Suarez, 2007).

This leads to the following question: Does leisure have a dual effect on labor

productivity? To enrich the literature on the effects of leisure, this study investigates the relationship between leisure and labor productivity. Specifically, the study extends the classic endogenous growth model (Lucas, 1988; Mankiw *et al.*, 1992) by including leisure in the assessment of production and examines the role of leisure in determining labor productivity both theoretically and empirically.

Furthermore, this study differs from most previous studies (Gould *et al.*, 2008; Kirchmeyer, 1992; Melamed *et al.*, 1995; Nimrod, 2007; Pagano *et al.*, 2006; Spreitzer and Snyder, 1974; Xie *et al.*, 2018) by considering leisure at the time level instead of taking leisure as activities. Leisure time, is the time when the individual does not work (Robinson and Godbey, 1998). Due to its objective, and neutral definition, leisure time is amenable to quantitative testing, although its loopholes lead to ambiguity (Beatty and Torbert, 2003). Using a sample of 21 OECD countries, this study conducts empirical tests on the impact of leisure time on labor productivity at the national level. The results have the potential to enable generalizations about the relationship between leisure and work, specifically the contribution of leisure time to labor productivity.

The rest of this paper is organized as follows. First, the relevant literature is reviewed. And then the theoretical model is laid out to investigate the relationship between leisure time and labor productivity. Subsequently, the database is described and the empirical analysis is present to estimate the model. Finally, the study's major findings and limitations are discussed and concluded in the last two sections.

## 2 Literature

Few researches have specifically studied the relationship between leisure time and labor productivity, although some have analyzed the indirectly impact of leisure on human capital and labor productivity. Economists have developed several methodologies to create a formal framework to deal with leisure, human capital and labor productivity. For example, Ladrón-de-Guevara *et al.* (1999) have constructed a model in which leisure time had no effect on the quality of human capital, but personal productivity would improve when education time increases. Eichenbaum *et al.* (1985) and Ioannides and Taub (1992) using the inter-temporal substitution model found that leisure time “crashes out” working time and have no contribution to enhance human capital and improve labor productivity. In addition, Kydland (1995) and Pintea (2010) assumed that technological shocks have a significant negative impact on leisure time based on the classic real business cycle model (RBC), and they suggested that aggregate production is notably negative correlated with leisure time in the long run. Therefore, the literature in the traditional economics reflects the viewpoint that leisure time has no positive effects on labor productivity.

However, the studies of psychology and sociology have demonstrated that

individuals with high feelings of well-being perform better than those with low feelings of well-being, and leisure participation can improve personal competency and work performance, which will then enhance their labor productivity. Firstly, some studies have reported a positive correlation between leisure and psychological well-being and health (Chen, 2014; Coleman, 1993; Fernandez-Ballesteros *et al.*, 2001; Laukka, 2007; Liu *et al.*, 2016; Reich and Zautra, 2010). The more important concern is that to some extent leisure can improve quality of life of individuals. Iwasaki (2007) reviewed studies of major pathways or mechanisms through which leisure can facilitate meaning-making and enhance quality of life, including (1) happiness and positive emotions brought by leisure, (2) self-respect and positive identity obtained from leisure, (3) social and cultural ties and harmonious development promoted through leisure, and (4) the contribution of leisure to human's learning and human's development throughout human life. Hills and Argyle (1998) found that sports, music, church, and watching soap operas are four common leisure activities that can bring positive emotions. Therefore, people who participate in more leisure activities are happier than those who do not (Vogel *et al.*, 2016; Zhao and Fang, 2013). However, there is some evidence that TV can produce a drowsy and passive state (Kubey and Csikszentmihalyi, 1990; Wei *et al.*, 2015). Also, people who watch more TV are less happy than those who watch less TV (Böhnke, 2005; Lu and Argyle, 1993; Smeets *et al.*, 2018).

Additionally, Li and Tsai (2013) explored the relevance between specific leisure activities and particular personality traits. They argued that individual personality differences may affect leisure choices. Hills and Argyle (1998) also found that these personality differences could also influence the degree of happiness experienced. Melamed *et al.* (1995) elucidated the differences in the benefits individuals gain from different types of activities, assuming that the choices of leisure activity are the manifestation of an individual's personality. Additionally, Xie *et al.* (2018) investigated the leisure participation of knowledge workers and found the compensatory effect of leisure congruence on individual well-being and people engaged in congruent leisure activities exhibiting significantly better profiles with higher work satisfaction, less burnout, and so forth. And individuals' labor productivity tends to increase along with their self-esteem, self-awareness (Gould *et al.*, 2008; Nimrod, 2007; Xie *et al.*, 2018).

Furthermore, researchers have examined the role of leisure as compensation for and recuperation from work. Leisure and work are main parts of a person's life (Snir and Harpaz, 2002; Waring, 2008). Leisure experiences have attributes such as aesthetic appreciation, companionship, enjoyment, escape, and relaxation (Ji, 2017; Pan, 2013), whereas work experiences have attributes of accomplishment, responsibility, external rewards, boredom, and stress (Cohen, 2010; Watkins and Subich, 1995). According to the compensation model, workers who experience deprivation at work would compensate for this when they choose non-work activities (Miller and Weiss, 1982; Wilensky, 1960). Blekesaune

(2005) examined a sample of people who were employed full-time in 100 occupations and found that leisure participation in non-work domains (e.g. family and recreation) can help individuals buffer the strains of work and develop useful working skills and perspectives. These positive outcomes of leisure may enhance a person's ability to satisfy the work requirements and his or her importance to the organization.

Despite the plethora of literature on the effects of leisure activities on personal performance and human capital, but few focuses on the relationship between leisure time and labor productivity. In this paper, we will use the leisure time to explore its influence on labor productivity. The estimated production functions are used to investigate the impact of leisure time on OECD countries' labor productivity. As most economic growth models investigate the impact on per capita GDP or growth rate, this study uses the per capita per hour GDP to measure productivity. The hypothesis is that leisure time has a significant positive effect on labor productivity.

### 3 Theory

Labor productivity is increased through two channels: the first is applying advanced technology to tasks during work hours; and the second is the possibility that the self-fulfillment and self-realization individuals establish through leisure will positively affect their productivity (Farahani *et al.*, 2016; Fogel, 2000). Assuming that leisure time has a positive impact on human capital, growth, and labor productivity, we include it as an input to the calculation of the production function.

Using Lucas (1988) production function and treating education time as exogenous (Mankiw *et al.*, 1992)<sup>1</sup>, we specify the production function as follows:

$$Y = AK^\beta (uH)^{1-\beta} \quad (1)$$

where  $K$  is aggregate capital,  $H$  is human capital,  $\beta$  is the output elasticity of physical capital,  $u$  is education time (total time volume is normalized to 1), and  $A$  represents the technical level. When considering the positive effects of leisure time, the accumulation path for  $A$  is

$$A = \bar{A} K^\alpha l^{1-\alpha} \quad (2)$$

where  $\bar{A}$  is the parameter of the technical level and  $l$  denotes leisure time.

Equation (2) shows that technical accumulation combines two processes: the

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<sup>1</sup> By treating human capital as an endogenous variable (Lucas, 1988), we can measure an endogenous accumulating path of human capital. This treatment does not affect the main conclusion about the optimal path of labor productivity in our study. For simplicity, we do not pursue this issue here.

process of “learning by doing” ( $K^\alpha$ ) and the process of “learning through leisure” ( $l^{1-\alpha}$ )<sup>2</sup>, as we call it. The former process has been clearly elaborated by Romer (1986). The latter implies that “creative” leisure produces technological externalities for society. In other words, if activities performed during leisure time are enjoyable and constructive, they benefit individuals’ and their counterparts’ physical strength, willpower, and creativity. Although the effect of an individual’s participation in such leisure on the whole economy may be too weak to notice, the accumulated aggregate effect can be a huge and “unexpected” knowledge accumulation that generates further positive externalities and increases the overall level of technology in the economy (Romer, 1990). Assuming that human capital accumulation follows an exponential path (Mankiw *et al.*, 1992), after introducing leisure time into the model, the new path takes the following form:

$$H = e^{\psi_1 u + \psi_2 (\varepsilon l)} L \quad (3)$$

where  $L$  represents the untrained labor force and  $\psi_1$  denotes the magnitude of education time’s ( $u$ ) effect on the formation of human capital ( $d \ln H / du = \psi_1$ ). Similarly,  $\psi_2$  denotes the magnitude of leisure time’s ( $l$ ) effect on the formation of human capital ( $d \ln H / dl = \psi_2$ ), which is termed the “advancing through leisure” effect. In other words, various instructive leisure activities will increase individuals’ self-fulfillment and self-realization, creativity, exploration, and productivity (Barnett, 2006; Csikszentmihalyi, 1975; Nimrod, 2007). Note that  $\varepsilon$ , as a parameter, denotes the proportion of leisure time involved in the formation of human capital,  $0 < \varepsilon < 1$ .

Substituting Equation (2) into Equation (1), we obtain the production function with leisure time:

$$Y = \bar{A} K^{\alpha+\beta} (uH)^{1-\beta} l^{1-\alpha} \quad (4)$$

To measure the labor productivity, we divide both sides of Equation (4) by  $(325 * 24 - u - l) \times L$ . As  $\hat{x}$  represents the variable  $x$  divided by “per capita per hour”, we obtain

$$\hat{y} = \bar{A} \hat{k}^{\alpha+\beta} (\hat{u} \hat{h})^{1-\beta} \hat{l}^{1-\alpha} (325 * 24 - u - l)^\alpha L^\alpha \quad (5)$$

where  $\hat{y}$  measures the labor productivity, defined as the output per capita per hour worked.

Equation (5) shows that physical capital per capita and human capital per

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<sup>2</sup>  $1-\alpha$  is the technological elasticity of leisure time. Leisure time has a decreasing marginal return to the technological level, i.e.,  $0 < 1-\alpha < 1$ . However, there are two situations in which  $1-\alpha < 0$ . First, if leisure time has not been constructively used (i.e., there are sharp increases in such leisure activities as crime, drug use, and illegal sex activities), the formation of new knowledge and creativity will be inhibited (Fogel, 2000). Second, when the income of laborers in low-income countries increases, the substitute effects of leisure time may offset the positive effect of “learning by leisure.” In these two cases,  $1-\alpha < 0$ .

capita per hour have a direct ratio relationship with labor productivity. Thus, increasing capital accumulation can improve productivity (e.g., advanced technology, “learning by doing”). Moreover, increasing the size of L with an elasticity of  $\alpha$  has a positive effect on  $\hat{y}$  (per capita per hour GDP), as more people means more human capital.

Based on Equation (5), the theoretical proposition is reformulated as two components, as empirical test hypotheses in this study:

**H1:** leisure time has a positive effect on human capital and labor productivity (“learning by playing”), as studied in sociology and psychology literature;

**H2:** leisure time also has a negative effect on education time and work hours (“crashing out” the working hours), which could lead to a decline in production and have a negative effect on productivity.

These hypotheses are tested by assessing whether the impact of leisure time in each OECD country is significant and positive. In addition, the linear, and quadratic terms of leisure time were included in the regression test equations to explore the potential curve relationship between leisure time and labor productivity.

#### 4 Data and variables

This study’s sample includes 21 OECD countries: Australia, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Italy, Japan, Korea, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Turkey, the United Kingdom, and the United States. The 21 countries spread all over the world, from North America to Europe to the Asia-Pacific region. They include not only many of the most developed countries in the world, but also some emerging countries, such as Turkey.

Data from all 21 countries for the 1980-2013 period (34 years) are taken from the database of the World Bank ([www.OECD.org](http://www.OECD.org)) and the Barro-Lee Educational Attainment Dataset. Thus 714 sample observations (21 countries multiplied by 34 years) can be used for the main analysis of this study.

In this study, the dependent variable is labor productivity, measured by per capita per hour GDP (GDPpp):

$$GDPpp = \frac{\text{per capita GDP}}{\text{average annual worked hours}} \quad (6)$$

The most important independent variable is annual average leisure time per capita  $l$ , which is computed by subtracting average worked hours and schooling hours from total hours in a year:



$$l=365 \times 24 - (\text{average annual schooling hours}) - (\text{average annual worked hours}) \quad (7)$$

The other independent variables, according to the theoretical framework, are total population  $L$ , fixed capital per capita  $\hat{k}$ , and average annual schooling hours  $u$ .

The variable  $\hat{k}$  is computed as follows:

$$\hat{k} = \frac{\text{Gross fixed capital}}{(\text{Total population}) \times (\text{average annual worked hours})} \quad (8)$$

In addition,  $u$  measured as average annual schooling time of the population over 25 years, is another control variable.

**Table 1: Summary statistics**

|           | $GDP_{pp}$ | $L$        | $\hat{k}$ | $u$     | $l$     |
|-----------|------------|------------|-----------|---------|---------|
| Mean      | 16.27      | 43,581,462 | 3.83      | 1083.61 | 5806.84 |
| Maximum   | 47.22      | 3.16E+08   | 11.22     | 1509.96 | 6401.60 |
| Minimum   | 1.78       | 364,100    | 0.32      | 432.72  | 4803.61 |
| Std. Dev. | 7.13       | 59,916,127 | 1.97      | 218.52  | 296.96  |

The summary statistics of all of the variables used in this study are reported in Table 1.  $GDP_{pp}$  ranges from 1.78 to 47.22, and has a mean of 16.27;  $l$  ranges from 4803.61 to 6401.60 with a mean of 5916.84 and a standard deviation of 296.96. And while  $L$  is varying from 364,100 to 316,000,000, and has a high standard deviation of 59,916,127.  $u$  is ranging from 432.72 to 1509.96 and also has a high standard deviation of 218.52.  $\hat{k}$  ranges from 0.32 to 11.22 with mean of 3.83 and a standard deviation of 1.97.

## 5 Empirical Analysis

This study uses a panel data test to explore the impact of leisure time on labor productivity. As a panel data set can contain both cross-sectional and time series dimensions, it can not only reflect the differences between subjects (cross-sectional), but also reflect the changes of subjects over time (time-series)(Chen, 2015). The regression equation is as follows:

$$GDP_{pp} = a_1 + a_2 l + a_3 L + a_4 u + a_5 \hat{k} + e_1 \quad (9)$$

Thus, the linear relationship between the independent variables and labor productivity exists only if  $a_i$  ( $i=2 \dots 5$ ) are obviously different from zero. For instance, if the coefficient of  $l$  on  $GDP_{pp}$  is different from zero ( $a_2 \neq 0$ ), there is a linear relationship between  $l$  and  $GDP_{pp}$ , and  $l$  has a significant effect on  $GDP_{pp}$ .

As the theoretical model indicates a potential curvilinear relationship between leisure and labor productivity, we also examine this prediction. The curvilinear regression equation is given as follows:

$$GDP_{pp} = b_1 + b_2l + b_3l^2 + b_4L + b_5u + b_6\hat{k} + \varepsilon_1 \quad (10)$$

Here, Equation (10) indicates a curvilinear relationship between  $l$  and labor productivity if the coefficient of  $l^2$  on  $GDP_{pp}$  is obviously different from zero ( $b_3 \neq 0$ ).

Generally, three methods can be used to estimate panel data models: pooled OLS, the fixed-effects (FE) and the random-effects (RE) methods (Asteriou and Hall, 2013). Accordingly, three models are considered in this study: (a) a model with a common intercept, (b) a FE model, and (c) a RE model.

**Table 2:** The results of F-Test and Hausman specification test

| A: The null hypothesis is that the RE model is more appropriate than the FE model | Hausman specification test               | Test results  | B: The null hypothesis is that the OLS is more appropriate than the FE model | F-statistic                      | Test results  |
|---|--|---------------|--|----------------------------------|---------------|
| GDPpp (Equation 9)  | $\chi^2(3)=14.19^{***}$<br>( $p=0.003$ ) | Fixed effects | GDPpp (Equation 9)   | $F=74.30^{***}$<br>( $p=0.000$ ) | Fixed effects |
| C: The null hypothesis is that the RE model is more appropriate than the FE model | Hausman specification test               | Test results  | D: The null hypothesis is that the OLS is more appropriate than the FE model | F-statistic                      | Test results  |
| GDPpp (Equation 10)   | $\chi^2(2)=17.97^{***}$<br>( $p=0.000$ ) | Fixed effects | GDPpp (Equation 10)  | $F=79.59^{***}$<br>( $p=0.000$ ) | Fixed effects |

*Notes: \*\*\* Significant at the 1% level*

The Hausman (1978) test can effectively determine whether the RE model is more appropriate than the FE model. The results of the Hausman specification test (Table 2, A and C) show that panel data regressions based on Equations (9) and (10) are positively significant at the 1% level for the dependent variable  $GDP_{pp}$ . Therefore, the FE model is more appropriate for analyzing the dependent variable  $GDP_{pp}$  in Equations (9) and (10). Note that after establishing that the FE model is more appropriate than the RE model, it is essential to use the F-test to examine whether the FE or OLS method can be used to perform the panel data regressions. As a result, the null hypothesis of the test is that holding all other things constant, the OLS method is appropriate. The F-test results in Table 2 (B and D) indicate that panel data regressions based on Equations (9) and (10) are positively significant at the 1% level for the dependent variable  $GDP_{pp}$ , and reject the null hypothesis. Overall, these results indicate that the FE model is more appropriate for our data structure than the OLS or RE approaches.

The regression analyses are conducted using the Stata 12. However, in the estimation process, the disturbances are both heteroskedastic (Modified Wald test) and contemporaneously correlated (Breusch-Pagan LM test) across panels, with autocorrelation (Wooldridge test). In this condition, Stata provides two methods: panel-corrected standard error (PCSE) estimates and full feasible generalized least

squares (FGLS) estimates. Beck and Katz (1995) argued that the full FGLS variance–covariance estimates are generally unacceptably optimistic (anti-conservative) when used for the analysis of data types of 10–40 periods per panel. They suggested that the Prais–Winsten estimates with PCSEs or OLS have closer nominal coverage probabilities. PCSE refers to heteroskedastic and cross panel contemporaneous correlation models, with or without autocorrelation.

In Table 3 we report the results for the two different estimation methods for Equations (9) and (10).

**Table3:** Results of the panel data regression

| Variables              | Equation (9)                     |                        | Equation (10)                    |                        | Equation (11)                     |
|------------------------|----------------------------------|------------------------|----------------------------------|------------------------|-----------------------------------|
|                        | FE                               | PCSE                   | FE                               | PCSE                   | PCSE                              |
| $l$                    | 0.007***<br>(3.01)               | 0.010***<br>(14.47)    | -0.062*<br>(-2.01)               | 0.013*<br>(1.66)       | 0.231***<br>(16.55)               |
| $l^2$                  |                                  |                        | 6.20e-06**<br>(2.18)             | -1.92e-06**<br>(-2.75) | -<br>0.0000199*<br>**<br>(-16.36) |
| $L$                    | 3.76e-08**<br>(2.59)             | 1.18e-08***<br>(4.09)  | 3.74e-08***<br>(2.96)            | 9.57e-09***<br>(3.21)  |                                   |
| $u$                    | 0.014***<br>(4.98)               | 0.020***<br>(16.13)    | 0.017***<br>(6.22)               | 0.021***<br>(16.71)    |                                   |
| $\hat{k}$              | 2.542***<br>(6.83)               | 1.421***<br>(14.28)    | 2.50***<br>(7.40)                | 1.408***<br>(14.16)    |                                   |
| Constant               | -53.778***<br>(-3.32)            | -68.510***<br>(-14.37) | 136.786<br>(1.69)                | -3.115<br>(-0.15)      | -<br>653.696***<br>(-16.49)       |
| F or Wald statistic    | $F=142.62$ ***                   | $\chi^2(4)=715.89$ *** | $F=220.240$ **<br>*              | $\chi^2(5)=856.68$ *** | $\chi^2(2)=90.56$ ***             |
| $R^2$                  | 0.828                            | 0.930                  | 0.816                            | 0.933                  | 0.156                             |
| Wald Test              | $\chi^2(21)=7569.52$ ***         |                        | $\chi^2(21)=5403.52$ ***         |                        |                                   |
| Wooldridge Test        | $F=186.02$ ***                   |                        | $F=188.10$ ***                   |                        |                                   |
| LM Test                | $\text{Chibar2}(01)=1359.52$ *** |                        | $\text{Chibar2}(01)=1307.23$ *** |                        |                                   |
| Number of observations | 714                              | 714                    | 714                              | 714                    | 714                               |
| Number of countries    | 21                               | 21                     | 21                               | 21                     | 21                                |

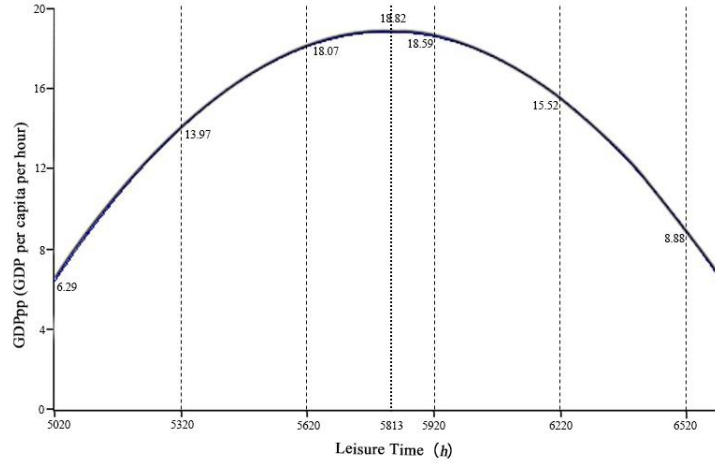
Notes: (1) Figures in parentheses are t-statistics (FE) and z-statistics (PCSE)  
(2) \*\*\* Significant at the 1% level; \*\* significant at the 5% level; \* significant at the 10% level  
(3) Modified Wald test for group heteroskedasticity in FE regression model  
(4) Wooldridge test for autocorrelation of panel data  
(5) Breusch-Pagan LM test of independence

The results for Equation (9), presented in Table 3, show that the coefficient of  $l$  on GDPpp is obviously different from zero at the 1% level ( $z=14.47$ ,  $p \leq 0.001$ ), which indicates that  $l$  has a significantly positive effect on labor productivity. In other words, one percentage point increase in leisure time can raise labor productivity in terms of per capita per hour GDP by 0.01%.

Moreover, the total population  $L$  also has a significantly positive impact on GDPpp ( $z=4.09, p \leq 0.001$ ), but the coefficient of  $L$  indicates that an increasing population has a weak influence on labor productivity. However, both education time  $u$  and fixed capital per capita per hour  $\hat{k}$  have stronger positive effects on GDPpp, and one percentage point increase in  $u$  and  $\hat{k}$  would lead to an increase in GDPpp by 0.02% and 1.421%, respectively.

Additionally, the results of the panel data regression for the effects of  $l$  and  $l^2$  on labor productivity are also summarized in Table 3. The curvilinear relationship between  $l$  and GDPpp (labor productivity) exists only when the coefficients for both  $l$  and  $l^2$  are statistically different from zero. The results for Equation (10) show that the coefficients of both  $l$  and  $l^2$  are 0.013 and  $-1.92e-06$  respectively, which are significantly different from zero. Specifically, the coefficient of  $l$  on GDPpp is positively significant at the 1% level ( $z=1.66, p \leq 0.1$ ), while the coefficient of  $l^2$  is negatively significant at the 5% level ( $z=-2.75, p<0.05$ ). These results indicate that the relationship between  $l$  and GDPpp is an inverted U-shaped, which implies that there is an optimal point of  $l$  in relation to GDPpp.

**Figure1:** Curvilinear Relationship Between  $l$  and GDPpp



Notes: Figure 1 is a curve representing  $l$  and GDPpp based on Equation (11)

Figure 1 plots the inverted U-shaped relationship between  $l$  and GDPpp. GDPpp initially increases with  $l$ , but this positive effect reverses after  $l$  reaches the optimal level of leisure time. When  $l$  exceeds the optimal level, GDPpp begins to decline. The results of the regressions of  $l$  and  $l^2$  on GDPpp, showed in last two columns of Table 3, give the curvilinear relationship between  $l$  and GDPpp as follows:

$$GDPpp = -653.6955 + 0.2313696 * l - 0.0000199 * l^2 \quad (11)$$

$$\frac{dGDPpp}{dl} = 0.2313696 - 2 * 0.0000199 * l = 0 \quad (12)$$

By using the derivative of the equation with respect to  $l$ , this study computes

the value of  $l$  that maximizes GDPpp as in Equation (12), and the value of  $l$  that maximizes GDPpp is about 5813 hours.

## 6 Discussion

Before discussing the results of our empirical test, we convert the results into a ranked list of countries to highlight the dual effect of leisure time on labor productivity and economic development.

**Table 4:** Rankings of average GDP, per capita GDP, per capita per hour GDP(GDPpp), and leisure time of OECD countries in the 1980-2013 period.

| Country        | Ranking | GDP (billion dollars) | Ranking | per capita GDP (dollars) | Ranking | GDPpp (dollars) | Ranking | Leisure time (hours) |
|----------------|---------|-----------------------|---------|--------------------------|---------|-----------------|---------|----------------------|
| Australia      | 10      | 651.20                | 6       | 33,062.31                | 10      | 19.02           | 16      | 5732.72              |
| Belgium        | 13      | 367.30                | 11      | 31,276.98                | 7       | 19.85           | 9       | 6048.63              |
| Canada         | 7       | 1,076.50              | 5       | 33,645.06                | 9       | 19.27           | 15      | 5765.84              |
| Denmark        | 16      | 247.95                | 7       | 32,034.93                | 5       | 22.21           | 4       | 6167.74              |
| Finland        | 18      | 186.33                | 13      | 29,219.45                | 13      | 17.00           | 11      | 6016.38              |
| France         | 5       | 2082.93               | 14      | 29,045.08                | 11      | 18.99           | 3       | 6203.14              |
| Germany        | 3       | 2827.83               | 8       | 31,966.98                | 6       | 22.07           | 7       | 6104.63              |
| Greece         | 17      | 216.76                | 19      | 22,226.38                | 19      | 10.72           | 18      | 5692.88              |
| Italy          | 6       | 1758.61               | 15      | 28,090.64                | 15      | 15.40           | 10      | 6022.84              |
| Japan          | 2       | 4426.70               | 12      | 29,631.70                | 14      | 16.46           | 17      | 5728.57              |
| Korea          | 9       | 830.44                | 18      | 22473.63                 | 20      | 9.56            | 21      | 5029.63              |
| Luxembourg     | 21      | 33.79                 | 1       | 61,427.67                | 1       | 37.39           | 12      | 5964.70              |
| Netherlands    | 11      | 642.10                | 4       | 35,672.75                | 3       | 25.30           | 6       | 6124.22              |
| New Zealand    | 20      | 103.85                | 17      | 23,599.54                | 17      | 13.11           | 19      | 5640.28              |
| Norway         | 15      | 283.23                | 2       | 44,290.79                | 2       | 30.77           | 8       | 6074.86              |
| Portugal       | 19      | 185.42                | 20      | 21,017.15                | 18      | 11.76           | 1       | 6235.52              |
| Spain          | 8       | 1046.46               | 16      | 25,625.01                | 16      | 15.07           | 5       | 6125.24              |
| Sweden         | 14      | 361.64                | 9       | 31,733.53                | 8       | 19.57           | 13      | 5947.36              |
| Turkey         | 12      | 448.38                | 21      | 10,713.03                | 21      | 5.64            | 2       | 6218.27              |
| United Kingdom | 4       | 2213.60               | 10      | 31,683.66                | 12      | 18.81           | 14      | 5927.38              |
| United States  | 1       | 11992.28              | 3       | 41,157.61                | 4       | 22.75           | 20      | 5482.89              |

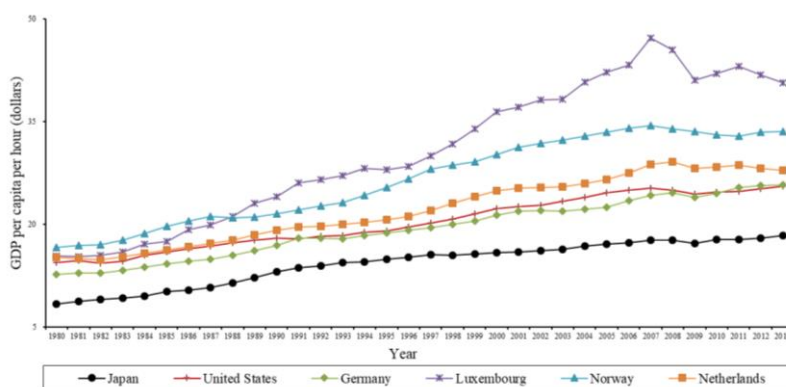
*Note:* Data are in constant 2005 U.S. dollars and computed with Comprehensive PPP (Purchasing Power Parity).

The rankings include 21 countries that have been ranked separately by GDP, per capita GDP, per capita per hour GDP, and leisure time. According to Table 4, the country with the highest GDP is the United States, followed by Japan and Germany. The GDP of these three countries account for 60% of the total GDP of all OECD countries. It is interesting to examine whether a higher GDP always means higher per capita GDP and labor productivity. Table 4 reports that United

States and Germany are ranked 3<sup>rd</sup> and 8<sup>th</sup> in per capita GDP and 4<sup>th</sup> and 6<sup>th</sup> in labor productivity (per capita per hour GDP) respectively. However, Japan is ranked 12<sup>th</sup> in per capita GDP and 14<sup>th</sup> in labor productivity. Figure 2 also shows that the labor productivity of the top three GDP countries is far lower than that of Luxemburg, Norway and Netherlands.

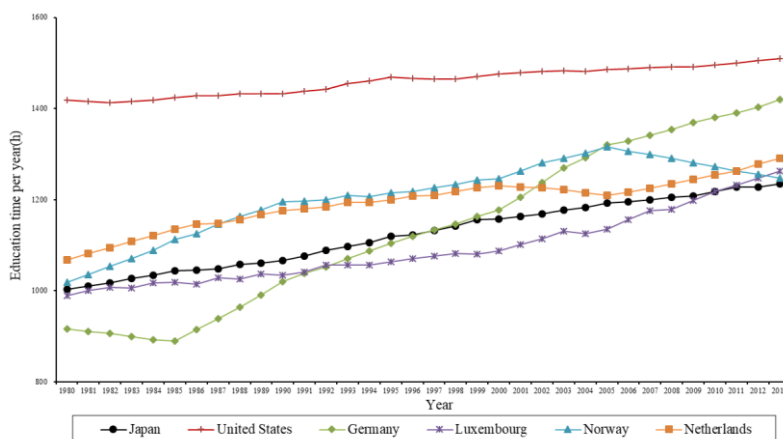
The higher labor productivity can be increased by two types of processes: (1) working and learning process—“learning by doing” (Romer, 1986) and (2) allocating leisure time to improve production—“learning through leisure”(Wei *et al.*, 2016). Apparently, the process of learning by doing plays a crucial role in the improvement of labor productivity in the United States, Germany, and Japan. The education time in the United States is much higher than that of other countries (See Figure 3). The educational time in Germany has increased year by year since 1985, and the most striking increases were from 888.95 hours in 1985 to 991.02 hours in 1989 and from 1177.34 hours in 2000 to 1237.56 hours in 2002. This is mainly attributable to the educational reforms in Germany in 1970 and the end of 1990. For example, the comprehensive education program was issued in 1973. In the late of 1990s, Germany has established the e-learning research center throughout the country(Li and Yang, 2004). The increase of German education time has played a crucial role in the improvement of German labor productivity(Chen, 2016; Liu and Wang, 2005). For Japan, it has vigorously developed education after World War II, and the total investment in education has exceeded the proportion of gross national product and national income growth(Institute of Local Administration of the Empire, 1962). This has led to the rapid development of technology and economy in Japan(Liang, 1979; Lv, 2017).

**Figure 2:** Comparison of GDPpp in six countries

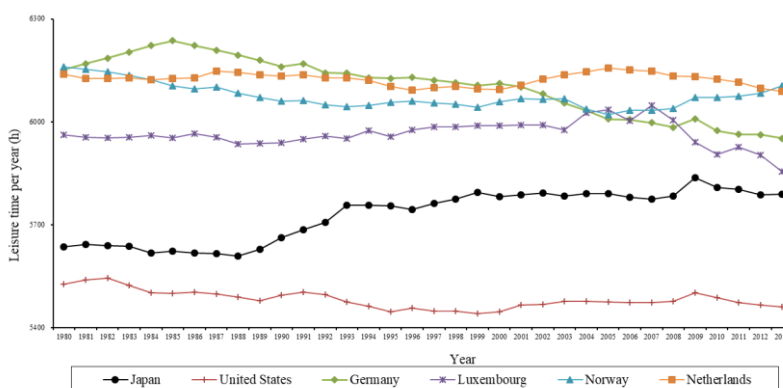


Note: United States, Japan and Germany are the top three countries in the GDP, while Luxembourg, Norway and Netherlands are the top three countries in the GDPpp.

**Figure 3: Comparison of education time in six countries**



**Figure 4: Comparison of leisure time in six countries**

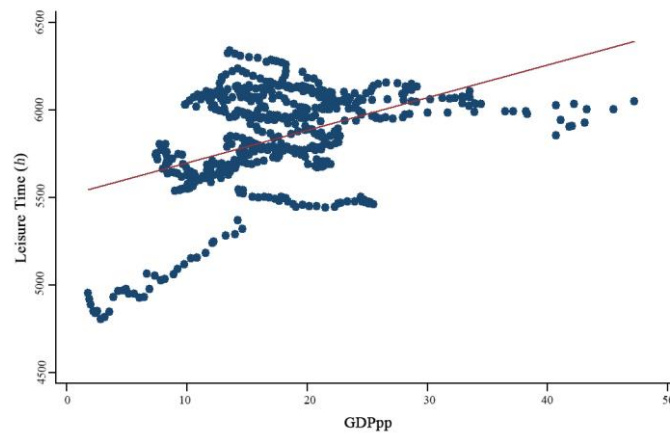


Although the progress of science and technology caused by education has improved labor productivity in the United States and Japan, workaholics(Kuroda, 2010) still obtain relatively less leisure time (Table 4). The ranking of leisure time is No. 20 in United States and No. 17 in Japan (See Table 4), and in 2013, the average annual leisure time of the United States and the Japanese were 5462 and 5790 hours respectively, far lower than most other OECD countries (Figure 4). According to Figure 5, leisure may have positive effects on labor productivity (per capita per hour GDP), and the less leisure time, the lower labor productivity, which is consistent with the result of empirical analysis (See Table 3). Thus, the positive effect of leisure on labor productivity in United States and Japan is very small. Furthermore, the inability to leisure due to overtime work may lead to an additional reduction in work efficiency(Rau and Triemer, 2004).

In contrast, in some European countries, labor productivity (GDPpp) is ranked

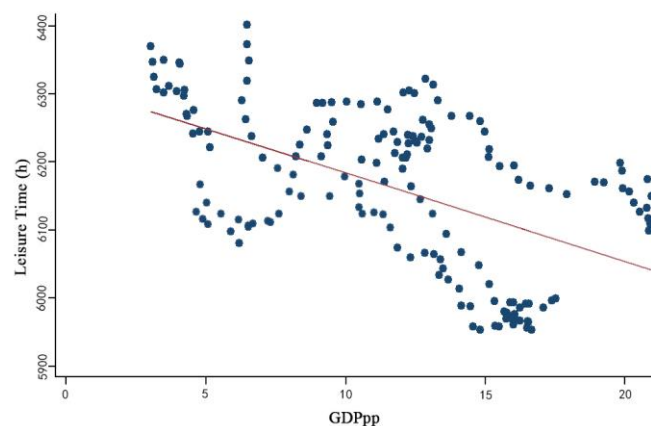
relatively higher than the GDP. For example, the top three countries in labor productivity are Luxembourg, Norway, and the Netherlands, even though their GDPs are not in the top 10 (Table 4). Moreover, Germany and Denmark also have the higher labor productivity, enjoy comparatively more leisure time. Why? It may be partly due to the accumulation of education time in northern European countries (See Figure 3), as higher human capital contributes to economic development (Kazmi *et al.*, 2017; Lucas, 1988; Romer, 1990). However, based on our regression results (Table 3) and the correlation between leisure and labor productivity in Figure 5, we argue that may be the time they spend on trips and entertainment refreshes and recharges them, and thus improve their productivity. In other words, “learning by playing” increases labor productivity in these countries (See Figure 5).

**Figure 5:** The correlation between leisure time and labor production in these 16 countries in 1980-2013



*Note:* the 16 countries are Luxembourg, Norway, Netherlands, United States, Denmark, Germany, Belgium, Sweden, Canada, Australia, United Kingdom, Finland, Japan, New Zealand, Greece, and Korea

**Figure 6:** The correlation between leisure time and labor production in these 5 countries in 1980-2013



*Note:* the 5 countries are France, Italy, Portugal, Spain, and Turkey

However, as reported in Table 4 and in Figure 6, there are notable outliers, such



as Portugal, Spain, Turkey, Italy and France suggesting that leisure time is not always positively related to labor productivity, and this is consistent with the results of the panel data regression (Table 3). The decline in productivity efficiency in these southern Europe countries may be due to two reasons. One is that the slower advancement of technology in these countries may reduce labor productivity at work. The other is that too much leisure time “crashes out” work time and leisure has a negative effect on labor productivity.

Additionally, according to Equation (11), the optimal value of  $l$  that maximizes GDPpp is about 5813 hours. These results have important political implications. Some of the OECD countries, such as Luxembourg (5964.70 hours) and Sweden (5947.36 hours), have leisure time that are around the optimal point, and these countries also have high labor productivity (GDPpp). In contrast, some other countries, such as Japan (5728.57 hours), United States (5482.89 hours) and Korea (5029.63 hours) with leisure time below the optimal value and hardly to obtain the beneficial effects of leisure time on labor productivity, they should increase people’s leisure time to a level that is closer to the 5813 hours level to optimize efficiency. However, it is obvious that too much leisure time may “crash out” work hours. For this reason, Portugal (6235.52 hours), Turkey (6218.27 hours), France (6203.14 hours), Spain (6125.24 hours), and Italy (6022.84 hours) should consider reducing leisure time to a level closer to the optimal point.

## 7 Conclusion

This study examines the impact of leisure time on labor productivity and the results confirmed the hypotheses in the theoretical part. The results of the panel data regression test indicate a curvilinear relationship between leisure time and labor productivity, implying that leisure time has a dual influence on labor productivity. When leisure time  $l$  reaches the optimal level (5813 hours), leisure has a compensatory effect on work and can positively influence labor productivity in terms of per capita per hour GDP. Specifically, it shows that leisure time is positively related to labor productivity in some OECD countries. This is not consistent with the view of leisure time in neoclassical economics, but are in according with sociological perspectives on leisure time, which suggest that if activities engaged in during leisure time are positive and constructive (e.g. reading or mountain climbing, for instance), they benefit individuals’ physical strength, willpower, and creativity (Barnett, 2006; Nimrod, 2007; Whiting and Hannam, 2015; Xie *et al.*, 2018).

But when leisure time  $l$  is far below the optimal level, the positive effect of leisure time on labor productivity are relatively small, or even almost zero. However, when leisure time  $l$  exceeds the optimal value, leisure time has a substitution effect on work hours and can negatively influence labor productivity. That is, as leisure time increases, work hours are “crashed out” and the

accumulation of human capital is reduced, which leads to a decline in labor productivity.

Additionally, education time is also found to have a significant positive impact on labor productivity in terms of per capita per hour GDP. These findings are consistent with those reported in Barro and Lee (2001), Rukumnuaykit and Pholphirul (2016) and Hermannsson and Lecca (2016). A higher average educational attainment indicates more skilled and productive workers, who in turn increase the output of goods and services in the economy.

The empirical results have important implications for policy makers. The positive effect of leisure time on work efficiency cannot be ignored, although work remains the central mechanism for distributing goods and benefits at the social and individual levels. It is worth noting this study's findings may not be applicable to non-OECD countries, especially considering the national differences in social and financial structures. Future studies can extend this model to other countries. It would be interesting to examine the impact of leisure time on labor productivity in different contexts.

## References

- Asteriou, D., and Hall, S. G. (2013). Applied Econometrics: A Modern Approach Using EViews and Microfit. Palgrave Macmillan, 409. DOI 10.1017/CBO9781107415324.004.
- Barnett, L. A. (2006). Accounting for leisure preferences from within: The relative contribution of gender, race or ethnicity, personality, affective style and motivational orientation. *Journal of Leisure Research*, 38(4): 445-474. DOI 10.1073/pnas.0703993104.
- Barro, R., and Lee, J. (2001). International Data on Educational Attainment: Updates and Implications. *Oxford Economic Papers*, 53(3): 541-563. DOI 10.1093/oep/53.3.541.
- Beatty, J., and Torbert, W. (2003). The False Duality of Work and Leisure. *Journal of Management Inquiry*, 12(3): 239-252. DOI 10.1177/1056492603256340.
- Beck, N. L., and Katz, J. N. (1995). What to do (and not to do) with time-series cross-section data. *American Political Science Review*, 89(3): 634-647. DOI 10.2307/2082979.
- Blekesaune, M. (2005). Working Conditions and Time Use. *Acta Sociologica*. 48(4):308-320. DOI 10.1177/0001699305059944.
- Böhnke, P. (2005). First European Quality of Life Survey: Life satisfaction, happiness and sense of belonging. Luxembourg: Office for Official Publications of the European Communities.
- Buchanan, J., and Yoon, Y. J. (1994a). The return to increasing returns. Ann Arbor: The University of Michigan Press.

- Chen, M. H. (2015). Cyclical effects of advertising on hotel sales, risk and return. *International Journal of Hospitality Management*, 46: 169–179. DOI 10.1016/j.ijhm.2015.01.004.
- Chen, Q. (2014). Advanced Econometrics and Stata Application. Beijing: Higher Education Press.
- Chen, Q. (2016). The influence of German dual vocational education on German economy. *Dissertation for Master degree, School of Advanced International and Area Studies, East China Normal University*.
- Cohen, G. M. (2010). Connecting with the larger purpose of our work. *J Pharm Sci*, 97(3): 1041-1046. DOI 10.1002/jps.21248.
- Coleman, D. J. (1993). Leisure Based Social Support, Leisure Dispositions and Health. *Journal of Leisure Research*, 25(4): 350-361. DOI 10.1080/00222216.1993.11969933.
- Csikszentmihalyi, M. (1975). Beyond Boredom and Anxiety. *Book Reviews, San Francisco: Jossey-Bass, Inc., 703-707*. DOI 10.2307/2065805.
- Dolton, P. (2003). Schooling and the Quality of Human Capital. *Economic Journal*, 113(491): F676-F678. DOI 10.1046/j.0013-0133.2003.172\_13.x.
- Eichenbaum, S. M., Hansen, L. P., and Richard, S. F. (1985). The dynamic equilibrium pricing of durable consumption goods. *Manuscript, Carnegie-Mellon University, PA*.
- Eschleman, K. J., Madsen, J., Alarcon, G., and Barelka, A. (2014). Benefiting from creative activity: The positive relationships between creative activity, recovery experiences, and performance - related outcomes. *Journal of Occupational & Organizational Psychology*, 87(3): 579-598. DOI 10.1111/joop.12064.
- Farahani, A., H. Safdel and M. Tayebbeh (2016). A Research on Leisure and Methods for Its Productivity. *Social Science Electronic Publishing*, 2(5): 37-41.
- Fernandez-Ballesteros, R., Zamarrón, D. M., and Ruíz, A. M. (2001). The contribution of socio-demographic and psychosocial factors to life satisfaction. *Ageing and Society*, 21(1): 25-43. DOI 10.1017/S0144686X01008078.
- Fogel, R. W. (2000). The Fourth Great Awaken and the Future of Egalitarianism. *University of Chicago Press, Chicago*.
- Gould, J., Moore, D., McGuire, F., and Stebbins, R. A. (2008). Development of the serious leisure inventory and measure. *Journal of Leisure Research*, 40(1): 47-68. DOI 10.1080/00222216.2008.11950132.
- Grossman, G., Helpman, E., Oberfield, E., and Sampson, T. (2017). Balanced growth despite uzawa. *American Economic Review*, 107(4): 1293-1312. DOI 10.1257/aer.20151739.
- Hanushek, E. A., and Kimbo, D. D. (2000). Schooling, labor-force quality, and the growth of nations. *American Economic Review*, 90(5): 1184–1208. DOI 10.1257/aer.90.5.1184.

- Hausman, A. (1978). Specification tests in econometrics. *Econometrica*, 46(6): 1251-1271. DOI 10.2307/1913827.
- Hendee, J. C. (1971). Sociology and applied leisure research. *The Pacific Sociological Review*, 14(3): 360-368. DOI 10.2307/1388648.
- Hermannsson, K. and Lecca, P. (2016). Human capital in economic development: from labour productivity to macroeconomic impact. *Economic Papers A journal of applied economics and policy*, 35(1): 24-36. DOI 10.1111/1759-3441.12126.
- Hills, P., and Argyle, M. (1998). Positive moods derived from leisure and their relationship to happiness and personality. *Personality and Individual Differences*, 25(3): 523-535. DOI 10.1016/S0191-8869(98)00082-8.
- Hu, J. (2001). Productivity and labor productivity. *Contemporary Economic Research*, 2: 63-64.
- Institute of Local Administration of the Empire. (1962). Growth and education in Japan. *Publication of the Imperial Academy of Local Administration*.
- Ioannides, Y. M., and Taub, B. (1992). On dynamics with time-to-build investment technology and non-time-separable leisure. *Journal of Economic Dynamics and Control*, 16: 225-241. DOI 10.1016/0165-1889(92)90032-A.
- Iwasaki, Y. (2007). Leisure and quality of life in an international and multicultural context: What are major pathways linking leisure to quality of life? *Social Indicators Research*, 82(2): 233–264. DOI 10.1007/s11205-006-9032-z.
- Ji, H. Y. (2017). An Aesthetic Interpretation and Literary Discourse of Classicism for Cultural Tourism in Goethe's Italian Journey. *Journal of Tourism & Leisure Research*, 29(11): 257-271.
- Kazmi, S. M., Ali, K., and Ali, G. (2017). Impact of Human capital on Economic Growth: Evidence from Pakistan, *Working Papers*. <http://hdl.handle.net/11540/7744>.
- Keane, M. P. (2011). Income Taxation in Life-Cycle Model with Human Capital. *Michael P Keane*, 1-40. [https://www.nuffield.ox.ac.uk/economics/papers/2012/Taxes\\_HC\\_42\\_Nuffield.pdf](https://www.nuffield.ox.ac.uk/economics/papers/2012/Taxes_HC_42_Nuffield.pdf).
- Kirchmeyer, C. (1992). Nonwork participation and work attitudes: A test of scarcity vs. expansion models of personal resources. *Human Relations*, 45(8): 775-795. DOI 10.1177/001872679204500802.
- Klinov, R. (2005). Schooling and the Quality of Human Capital, *Economica*, 72(287): 559-560. DOI 10.1111/j.0013-0427.2005.430\_8.x.
- Koch, M. J., and Mcgrath, R. G. (1996). Improving Labor Productivity: Human Resource Management Policies Do Matter. *Strategic Management Journal*, 17(5): 335-354. DOI 10.1002/(SICI)1097-0266(199605)17:5<335::AID-SMJ814>3.0.CO;2-R.
- Kubey, R., and Csikszentmihalyi, M. (1990). Television and the quality of life:

- how viewing shapes everyday experience. *Contemporary Sociology*, 20(2): 284. DOI 10.2307/2072983.
- Kuroda, S. (2010). Do Japanese Work Shorter Hours than before? Measuring trends in market work and leisure using 1976–2006 Japanese time-use survey. *Journal of the Japanese and International Economies*, 24(4): 481-502. DOI 10.1016/j.jjie.2010.05.001.
- Kydland, F. E. (1995). Business cycle and aggregate labor market fluctuation. *Frontier of business cycle research*. Princeton: Princeton University Press.
- Kydland, F. E., and Prescott, E. C. (1982). Time to build and aggregate fluctuations: Some New Evidence. *Econometrica*, 50(6): 1345-1370. DOI 10.2307/1913386.
- Ladro'n-de-Guevara, A., Ortigueira, S., and Santos, M. S. (1999). A two-sector model of endogenous growth with leisure. *Review of Economic Studies*, 66(3): 609-631. DOI 10.1111/1467-937X.00100.
- Laukka, P. (2007). Uses of music and psychological well-being among the elderly. *Journal of Happiness Studies*, 8(2): 215-241. DOI 10.1007/s10902-006-9024-3.
- Li, A., and Yang, M. (2004). Evolution an enlightenment of the policies of basic education reformation in Germany in the 20th century. *Studies in Foreign Education*, 31(11): 25-29.
- Li, C. Y. and Tsai, B. K. (2013). Impact of extraversion and sensation seeking on international tourism choices. *Transplantation Proceedings*, 41(2): 685-688. DOI 10.2224/sbp.2013.41.2.327.
- Liang, Z. Y. (1979). The relationship between Japanese education and economic development after World War II. *Studies in Foreign Education*, 4: 1-11.
- Liu, D., and Wang, H. (2005). The hidden force behind the miracle -- on the role of education in the postwar economic development in the Federal Republic of Germany. *Journal of Hengshui University*, 3: 58-60.
- Liu, H., Lin, Y. M., and Liu, R. G. (2016). The Impact of Work and Nonwork Boundary Asymmetrical Permeability on Employees' Well-Being. *Economic Management Journal*, 12: 89-99.
- Lu, L., and Argyle, M. (1993). TV watching, soap opera and happiness. *Gaoxiong yi xue ke xue za zhi = The Kaohsiung Journal of medical sciences*, 9(9): 501-507.
- Lucas, R. E. (1988). On the mechanism of economic development. *Journal of Monetary Economics*, 22: 3-42.
- Lv, X. Y. (2017). On the influence of educational reform on Japanese economy and its realistic significance to China. *Reform & Openning*, 17: 47-48.
- Mankiw, N. G., Romer, D., and Weil, D. N. (1992). A Contribution to the Empirics of Economic Growth. *The Quarterly Journal of Economics*, 107(2): 407-437. DOI 10.2307/2118477.
- Mankiw, N. G., Rotemberg, J. J., and Summers, L. H. (1985). Intertemporal

- substitution in macroeconomics. *The Quarterly Journal of Economics*, 100(1): 225-251. DOI 10.2307/1885743.
- Melamed, S., Meir, E. I., and Samson, A. (1995). The benefits of personality-leisure congruence: Evidence and implications. *Journal of Leisure Research*, 27(1): 25-40. DOI 10.1080/00222216.1995.11969975.
- Miller, L. E., and Weiss, R. M. (1982). The Work-Leisure Relationship: Evidence for the Compensatory Hypothesis. *Human Relations*, 35(9): 763-771. DOI 10.1177/001872678203500905.
- Monte., R. N. (2008). Leisure participation and satisfaction for healthy lifestyles. *Asia Life Science*, 2: 29-39.
- Nie, K. (2017). A study on the interaction between industrial clusters, industrial commons and human capital— A case study of Silicon Valley and Zhongguancun. *Dissertation for the Doctor degree in Regional Economy, Jilin University, Jilin*.
- Nimrod, G. (2007). Retirees' leisure: Activities, benefits, and their contribution to life satisfaction. *leisure Studies*, 26(1): 65-80. DOI 10.1080/02614360500333937.
- Pagano, I. S., Barkhoff, H., Heiby, E. M., and Schlicht, W. (2006). Dynamical Modeling of the Relations Between Leisure Activities and Health Indicators. *Journal of Leisure Research*, 38(1): 61-77. DOI 10.1080/00222216.2006.11950069.
- Pan, H. Y. (2013). Somaesthetics and leisure: the theory and practice of Shusterman's aesthetic thoughts. *Tourism Tribune*, 28(9): 114-120.
- Pintea, M. I. (2010). Leisure externalities: Implications for growth and Welfare. *Journal of Macroeconomics*, 32(4): 1025-1040. DOI 10.1016/j.jmacro.2010.08.001.
- Psarianos, I. N. (2007). A note on work-leisure choice, human capital accumulation and endogenous growth. *Research Economics*, 61(4): 208-217. DOI 10.1016/j.rie.2007.09.001.
- Rangazas, P. (2002). The Quantity and Quality of Schooling and U.S. Labor Productivity Growth (1870–2000). *Review of Economic Dynamics*, 5(4): 932-964. DOI 10.1006/redy.2002.0165.
- Rau, R., and Triemer, A. (2004). Overtime in relation to blood pressure and mood during work, leisure, and night time. *Soc Indic Res*, 67(1): 51-73. DOI 10.1023/B:SOCI.0000007334.20490.52.
- Reich, J. W., and Zautra, A. J. (2010). Experimental and measurement approaches to internal control in at risk older adults. *Journal of Social Issues*, 47(4): 143-158. DOI 10.1111/j.1540-4560.1991.tb01839.x.
- Robinson, J., and Godbey, G. (1997). Time for life: The surprising ways Americans use their time. *Contemporary Sociology*, 27(3): 251-252. DOI 10.2307/2655174.

- Romer, P. M. (1986). Increasing returns and long run growth. *Journal of Political Economy*, 94(5): 1002-1037. DOI 10.1086/261420.
- Romer, P. M. (1990). Endogenous Technological Change. *Journal of Political Economy*, 98(5): S71-S102. DOI 10.1086/261725.
- Rukumnuaykit, P., and Pholphirul, P. (2016). Human capital linkages to labour productivity: implications from Thai manufacturers. *Journal of Education & Work*, 29: 1-34. DOI 10.1080/13639080.2015.1104658.
- Schultz, T. W. (1961). Investment in human capital. *The American Economic Review*, 51(1): 1-17. DOI 10.2307/1818907.
- Smeets, P., Whillans, A. V., Bekkers, R., and Norton, M. I. (2018). Time Use and Happiness of Millionaires. *Hbs working paper series*. <https://www.hbs.edu/faculty/Pages/item.aspx?num=54674>
- Snir, R., and Harpaz, I. (2002). Work-leisure relations: leisure orientation and the meaning of work. *Journal of Leisure Research*, 34(2): 178-203. DOI 10.1080/00222216.2002.11949968.
- Spreitzer, E., and Snyder, E. E. (1974). Correlates of life satisfaction among the aged. *Journal of Gerontology*, 29(4): 454-458. DOI 10.1093/geronj/29.4.454.
- Stiglitz, J. E. (2001). Economics of the Public Sector. Beijing: China Renmin University Press (CRUP).
- Suarez, G. M. A. (2007). Utility and production externalities, equilibrium efficiency and leisure specification. *Journal of Macroeconomics*, 30(4): 1496-1519. DOI 10.1016/j.jmacro.2007.10.011.
- Vogel, R. M., Rodell, J. B., and Lynch, W. J. (2016). Engaged and productive misfits: how job crafting and leisure activity mitigate the negative effects of value incongruence. *Academy of Management Journal*, 59(5): 1561-1584. DOI 10.5465/amj.2014.0850.
- Waring, A. (2008). Health club use and 'lifestyle': exploring the boundaries between work and leisure. *leisure Studies*, 27(3): 295-309. DOI 10.1080/02614360802048845.
- Watkins, C. E., and Subich, L. M. (1995). Annual review, 1992-1994: Career development, reciprocal work/nonwork interaction, and women's workforce participation. *Journal of Vocational Behavior*, 47: 109-163.
- Wei, X., Huang, S. S., and Stodolska, M. (2015). Leisure time, leisure activities, and happiness in China: Evidence from a National Survey. *Journal of Leisure Research*, 47(5): 556-576. DOI 10.18666/JLR-2015-V47-I5-6120.
- Wei, X., Qu, H., and Ma, E. (2016). How Does Leisure Time Affect Production Efficiency? Evidence from China, Japan, and the US. *Social Indicators Research*, 127(1): 101-122. DOI 10.1007/s11205-015-0962-1.
- Whiting, J., and Hannam, K. (2015). Creativity, self-expression and leisure. *leisure Studies*, 34(3): 372-384. DOI 10.1080/02614367.2014.923494.

Wilensky, H. L. (1960). Work, careers and social integration. *International social science Journal*, 12(4): 543-560.

Xie, Y. P., Shen, S. B., and Chen, R. J. (2018). The More Leisure, the More Passion? A research on the Influence Mechanism of Leisure Participation on Knowledge Workers' Work Passion. *Economic Management Journal*, 7:128-145. DOI 10.19616 /j. cnki. bmj. 2018. 07. 008.

Zhao, J. H., and Fang, M. (2013). Relationships among the leisure participation leisure sport satisfaction and life quality of urban residents. *Journal of Sports and Science*, 34(4): 112-115.



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