

Response to Reviewer Comments

Point 1: The title of the study highlighted that the study is from sociological perspective. I feel the emphasis in writing is not clear enough. I would suggest using sub-headings in literature. Probably one heading focus on Traditional (Economic) View on Leisure Time and Labor Productivity and a second heading focus on Sociological View on Leisure Time and Labor Productivity. The literature has some relevant content on both but are not in-depth and distinct enough.

Response 1: Thank you for your suggestions. I use the sub-heading in the literature to reflect the two kinds of views.

In the literature, we argue that 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. We have revised the literature to highlight the contradictory relationship between the two views.

Point 2: I would suggest put the subjective well-being literature under the “Sociological View on Leisure Time and Labor Productivity” Literature. In addition, a more in-depth and comprehensive review of literature is needed here. For example, the definition on subjective well-being is missing. The relationships between subjective well-being, productivity (or efficiency/efficacy) and leisure time are not clear enough at this stage. I would suggest authors dig further into the literature and clearly identify and summarize previous conclusions on relationships among key constructs (variables).

Response 2: This has been revised as follows:

Well-being refers to a series of joyful and pleasant emotions produced subjectively by human beings based on their own sense of satisfaction and security (Gao and Fei, 2019). We have revised the literature to highlight the relationships between subjective well-being, productivity (or efficiency/efficacy) and leisure time (see page 4), and we also have summarized previous conclusions on relationships among key constructs, for example, leisure activities and working efficiency, leisure participation and labor productivity, and so on.

Point 3: Based on that it is also important to identify the key differences between traditional economic view and the sociological view on the relationship between leisure time and productivity. Then justify why it is important and necessary to perform your proposed study. What unique contributions your study will make to existing literature.

Response 3: Although some economists suggest that leisure is effective in the

economic aspects (Farahani *et al.*, 2016), most neoclassical economists assume that leisure time has no influence on the quality of human capital.

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 (see page 2-3).**

Point 4: Then a stronger link between your proposed model and your sociological perspective literature is missing. You probably need to link the variables in your proposed theoretical model with previous literature, which may help build these links.

Response 4: I have linked the variables in my proposed theoretical model with previous literature, for example:

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 (see page 5).

Equation (2) shows that technical accumulation combines two processes: the process of “learning by doing” (K^α) and the process of “learning through leisure” ($l^{1-\alpha}$)¹, 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,**

¹ $1-\alpha$ 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, $1-\alpha < 0$.

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 ψ_1 denotes the magnitude of education time's (u) effect on the formation of human capital ($d \ln H / du = \psi_1$). Similarly, ψ_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 ε , as a parameter, denotes the proportion of leisure time involved in the formation of human capital, $0 < \varepsilon < 1$ (see page 6-7).

However, as in all studies, our study had some limitations. **Because of the non-availability of the data, this paper did not consider the impact of subjective feelings.** Future studies can consider extending the theoretical model to increase subjective variables to further explore the impact of leisure on productivity from the sociological point of view (see page 17).

Point 5: Minor punctuation issue. For example, "Li and Tsai (2013)explored" a space is needed between "(" and "explored". Please check though the whole document for similar mistakes.

Response 5: Thank you for your suggestions. We have already revised these mistakes.