DOI: 10.1111/asej.12291

ORIGINAL ARTICLE

Distributional Effects of Freedom and Income on Life Satisfaction: Evidence from East Asian Chinese Societies

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Funding information
Academia Sinica, Grant/Award Number: AS-CDA-106-H01

Abstract

We estimate the distributional effects of freedom and income on life satisfaction (LS) for East Asian Chinese societies through an ordinal parametric quantile regression approach. The results show that freedom and income exhibit positive and mostly significant effects across societies and LS levels. The freedom effects generally become larger for those at higher LS quantiles. However, the income effects decline as the LS quantile level increases. Thus, one may have a trade-off between freedom and income without compromising individual LS. The trade-off of freedom (income) for income (freedom) is more pronounced for people at a lower (higher) LS level.

KEYWORDS
Chinese societies, distributional effect, freedom, income, life satisfaction, societal values

JEL CLASSIFICATION
A12, A13

1 | INTRODUCTION

Literally, freedom refers to one's ability to choose, act, speak, and think without undue or unjust constraints (Cambridge Dictionary, 2021; Chanley & Chanley, 2015).

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Received: 5 August 2021; Accepted: 11 March 2023

Freedom in a society, as measured by Inglehart et al. (2008), is based on the locus of control from a socio-psychological perspective (i.e., the extent of people feeling that they have the freedom of choice and control over the events that influence their life). This locus of control type of freedom is closely related to economic and business freedom. For instance, as illustrated by Pitlik et al. (2015), the increasing economic and business freedom mitigates economic scarcity. Consequently, it increases the society members' locus of control. The present study employs this definition of freedom.

The level of freedom that a society can provide its members influences their life satisfaction (LS). According to Nobel Laureate Sen (1999), freedom is the end goal of a country's development; income-related factors such as GDP growth and industrialization are mere means to freedom. The role of freedom to LS might vary across different levels of LS as more freedom is needed to achieve a high degree of LS. This tallies with Inglehart and Welzel's (2005) idea of "rising freedom," along with the modernization transition of a society from an agricultural to a knowledge economy. In this context, Chinese societies in East Asia would be good examples for examining the relationship between freedom and LS because,[1] over the past few decades, these Chinese societies have been experiencing several transformations in terms of their cultural variations and development of their economies and freedom.

Regarding cultural variations, in Singapore, the English-educated Chinese dominate the society and Western cultural assimilation prevails (Heidhues, 1992). In China, Hong Kong, and Taiwan, the Chinese share a similar language and cultural heritage. Nevertheless, due to political, economic, and social changes, there have arisen variations in their subcultural values (see Liao et al., 2005; Yao & Wu, 2009).[2]

As for the development of the economies and freedom before the 1970s, bare (life or death) survival was the overriding concern of East Asian Chinese in the face of extreme poverty (Ohno, 2008). While the economic conditions have greatly improved in these societies, their levels of freedom may not have risen correspondingly. Based on each country's freedom assessment (Freedom House, 2021),[3] the scores among these Chinese societies vary substantially from "not free" (China) to "partly free" (Singapore and Hong Kong), culminating in "free" (Taiwan).

Authoritarian developmentalism has brought economic prosperity to the Chinese societies (Prandecki, 2014). Thus, the basic human needs for survival

[1]In the present study, Chinese refers to the ethnic group. For example, Chinese in Singapore refers to the ethnic group of Chinese in Singapore.

[2]In Hong Kong, as a former British colony, the influence of Western culture is pronounced. The culture in Taiwan is traditional Chinese and also influenced by the culture of Japanese and aboriginal peoples. As for China, it has been transformed by communist ideology since 1949 and the Cultural Revolution of 1966–1976.

[3]Freedom House defines freedom from a broader perspective: from individual freedom of expression and of belief, to the political, associational and organizational rights.

have been met, and movement to a higher quality of life is emerging. Maslow's theory of motivation suggests that non-income-related factors (i.e., self-actualization that requires high levels of freedom), should be more important than income to a person's LS at high levels of human requirement. Modernization theory also predicts that the demand for freedom will arise because freedom is one of the important societal values for the transition to a knowledge-based society (Inglehart & Welzel, 2005). This implies that the Chinese societies may no longer be so willing to trade off freedom for income as they were struggling for mere survival. The previous developmental strategies of these Chinese societies (that trade off freedom for economic growth) might thus need a rebalancing.

In this context, it would be imperative to know empirically the trade-off between freedom and income in these Chinese societies for a better LS policy formulation. Moreover, this trade-off could be more comprehensively analyzed if we estimate the effects of freedom and income on LS from a distributional perspective rather than focus merely on the mean the LS distribution. This provides further insights into the income–freedom–LS relationship. For instance, the effect of an increase in income on the low LS people could be of interest to the government compared to the average LS people. Thus, the distributional perspective of the income–freedom–LS relationship across the various Chinese societies could have important policy implications.

Nevertheless, to our knowledge, this has been largely ignored in the literature. In examining the relationship among income, societal values (including freedom), and LS, previous studies focused on entire societies from an averaging perspective. For example, Lim et al. (2020) focus on the entire societies (Chinese and non-Chinese) of East-Asian countries using the mean comparison approach to examine the income–societal values–LS relationship. In this paper, we focus on the Chinese societies and use empirical data to shed light on the relationship of income, freedom, and LS across different Chinese societies from a distributional perspective.

Given the richness of cultural variation, economic development, and increased emphasis on freedom in East Asian Chinese societies, we use the socioeconomic data of these societies in the present study and perform a distributional regression analysis to evaluate the complex roles of freedom and income in achieving higher levels of LS. Specifically, we estimated the distributional effects of freedom and income on LS. We found that freedom and income exhibit positive and mostly significant effects across societies and LS levels. The freedom effects generally become larger for those at higher LS quantiles. However, the income effects decline as the LS quantile level increases. Thus, one may have a trade-off between freedom and income without compromising individual LS. The trade-off of freedom (income) for income (freedom) is more pronounced for people at a lower (higher) LS level.

2 | LITERATURE REVIEW

2.1 | Life satisfaction

From a psychological point of view, LS is a different construct from happiness. Happiness is an instantaneous enjoyable experience that is momentary and affective, whereas LS refers to a long-term, cognitive, and stable feeling of a person about their overall quality of life. Empirically, the use of the word "happiness" or "LS" is mostly dictated by the data availability.

It is important to note that the two constructs, although different in terms of definition, empirically are proven in the literature to be valid and reliable measurements of one's subjective wellbeing (Binder and Coad, 2011). In the literature of happiness, the "happiness" and "LS" are used interchangeably (Boo & Yen, 2016; Veenhoven, 2012a, 2012b). In our empirical study, LS refers to the overall life satisfaction of the World Values Survey.

There have been international studies focusing on the complex links between income (economic development), which usually leads to a higher average income among citizens, and subjective wellbeing (Helliwell, 2006; Huang et al., 2020; Zagorski, 2011). Inglehart et al. (2008) found that social tolerance and political freedom play important roles in the complex links.

2.2 | Freedom

Previous studies have shown that freedom can explain substantial variations in LS in high-income countries (e.g., Brule & Veenhoven, 2014). Verme (2009) hypothesized that an individual could derive LS from freedom, which, psychologically, is a sense of locus of control (i.e., a control over one's choice). In a sample of 267 870 respondents from 84 countries, freedom of choice is indeed found to predict LS, and its predictive power is higher than that of other identified LS drivers, such as income. This finding is also supported by previous studies using cross-sectional or panel data. See, for instance, Inglehart et al. (2008), Nakazato et al. (2017), and Huang et al. (2020).

It has been shown that the strength of the relationship between freedom and LS is stronger in individualistic societies than in collectivistic societies (Minkov et al., 2020; Nakazato et al., 2017). However, it remains unknown whether this relationship varies among different collectivistic societies, such as the East Asian Chinese societies.

2.3 | Income and societal values

Besides freedom, there are other factors that play significant roles in LS, with income being one of the factors. Using panel data for 55 countries from 2007 to

2017, Huang et al. (2020) found that among middle-income countries, national income measured with per capita values has an inverted U-shaped relationship with happiness. This is consistent with the findings of Zagorski (2011) and Helliwell (2006) that a high-income society has a lower income effect on LS than a low-income society.

The Easterlin paradox highlights that income is significantly and positively correlated with LS and happiness at the cross-section level (Easterlin, 1995; Easterlin et al., 2010). The East Asian happiness gap reveals that the Chinese-dominated societies in East Asia (China, Hong Kong, Singapore, and Taiwan), which have had remarkable economic growth, are found to have lower LS and happiness than other countries (Ng, 2002). Using cross-sectional evidence, culture has been found to be the potential explanation for the East Asian gap found at the macro level (Lim et al., 2020; Ye et al., 2015). Lim et al. (2020) found that within the same cultural heritage, countries that value beliefs to various degrees may exhibit different levels of LS. Thus, both income and societal values in Chinese societies are also explanatory variables of interest.

In addition, previous studies have found the effects of income on LS could be asymmetric. For example, Boes and Winkelmann (2010) found that the effect of income is substantially lower on high levels of LS than on low levels (dissatisfaction). A decreasing importance of income and other LS drivers is observed empirically (Binder & Coad, 2011). This suggests the usefulness of a distributional approach to the study of LS determinants.

2.4 | Ordinal parametric quantile regression approach

For empirical analysis of LS data, the notion of mean LS comparison has recently been scrutinized and considered unreliable (Bond & Lang, 2019; Schroeder & Yitzhaki, 2017). This is because the mean ranking is generally not invariant with respect to an arbitrary monotone transformation of the individual LS, yet such invariance is desirable as LS scales are ordinal in nature.

Chen et al. (2022) propose performing ordinal median regression analysis on LS data, thereby resulting in the notion of median LS comparison, which is unaffected by monotone transformations. To estimate the conditional median of LS, these authors employ both parametric and semiparametric ordered discrete response models where the observed discrete LS scales are driven by a latent continuous happiness index in a threshold-crossing fashion.

The distributional effect aspects of the determinants of LS have been of growing interest in the recent happiness economics literature (Boes & Winkelmann, 2010; Ngoo et al., 2021). For example, Ngoo et al. (2021) found that the effects of LS determinants could vary substantially across LS quantile levels. However, their estimation approach is based on the standard quantile regression of Koenker and Bassett (1978), where the outcome of interest is

assumed to be continuously distributed and, hence, does not respect the discreteness of the LS outcome. Our estimating model is free from these shortcomings. It accounts for both the ordinality and discreteness of the observed LS scales and can be used as a simple and coherent approach to the distributional regression analysis of LS.

3 | DATA AND METHODOLOGY

3.1 | Data

We used the World Values Survey (WVS) wave 6 (2010–2014) data[4] and extracted the samples of Chinese respondents in China, Hong Kong, Singapore, and Taiwan.[5] We preprocessed the data by retaining only the observations that do not have any missing values in either their LS outcomes or explanatory variables. This resulted in a dataset consisting of a total of 4755 Chinese respondents, with the largest number in Singapore (1394; 29.32%), followed by China (1387; 29.17%), Taiwan (1060; 22.29%), and Hong Kong (914; 19.22%).

In the WVS, LS was measured by asking respondents to indicate how satisfied they were with their life as a whole, using a scale that ranged from 1 (completely dissatisfied) to 10 (completely satisfied).[6] The reliability, comparability, and usage, including its interchangeability with happiness, of this one-item overall LS evaluation in relation to subjective wellbeing have been discussed and established in the literature (see Di Tella & MacCulloch, 2008; Diener, 1984; Easterlin, 2001; Easterlin et al., 2010; Veenhoven, 2012a, 2012b).

Our main variables of interest are income and freedom. Income was measured as a self-rated income level compared to others on a 10-point scale (from 1, being the lowest, to 10, being the highest). This is a relative income measurement that facilitates the comparison across countries. Freedom was measured using a 10-point scale (with 1 being "no choice at all" and 10 being "a great deal of choice") that was solicited by a question referring to how much freedom of choice and control an individual feels to have over the way their life turns out. This is a locus of control type's measurement of freedom.

[4]At the time of analysis of the present paper (April 6, 2020), the latest available WVS at the individual level is wave 6 (2010–2014). The latest data set, WVS 7, is available for the public after completion of the present paper. In the WVS 7, the influence of COVID19 occurs in Singapore (2020) but not in other societies (2018, 2019). To ensure analysis of data that are free of influence of COVID19, we do not adopt the latest WVS7.

[5]The Chinese in Malaysia are excluded due to the small sample size (319 respondents) which causes convergence problems in the 25th and 75th percentile estimation.

[6]In WVS data, there is a measurement of happiness, by asking for a response from a question, "Taking all things together, would you say you are", using 4-point rating scale (4 very happy, 3 rather happy, 2 not very happy and 1 not at all happy). We choose the Life satisfaction question because the scale used (10-point) is substantially larger than this (4-point) and able to provide more variations.

Other variables, such as socio-demographic characteristics and other societal values, were also included as control variables due to their determinant roles in LS (e.g., Blanchflower, 2020; Easterlin et al., 2012). The definitions and measurements of these variables are presented in Appendix 1(a)–(c). See also Appendix 2 for further descriptions and summary statistics of all explanatory variables in our empirical study.

3.2 | Method

Our empirical strategy builds upon the parametric setting of Chen et al. (2022), by which we specify a parametric distribution for the latent LS, which embeds a parametric form of heteroskedasticity conditional upon the explanatory variables. We estimate the model parameters using the maximum likelihood estimation method and then construct the conditional quantiles of LS based on the postulated distributional specification and the estimated parameters. Through this ordinal parametric quantile regression approach, we are thus able to empirically assess the effects of freedom, income and other societal values on the distribution of the LS outcome.

We employ the following parametric framework for the quantile regression analysis of LS data. Let Y denote the outcome of individual reported LS, which is labeled over a J point scale. That is, Y takes a value over the set of integers $\{1,2,3,\ldots,J\}$. We assume that the reported LS (Y) is determined by a latent LS index (H) in a threshold-crossing fashion as specified below:

$$Y = \sum_{j=1}^{J} j \times 1\{\gamma_{j-1} < H \le \gamma_j\}, \tag{1}$$

$$H = \beta' X + \sigma(X'\delta)\varepsilon, \tag{2}$$

where $1\{\cdot\}$ is an indicator function taking a value of 1 if the input statement holds true and 0 otherwise; $\gamma = (\gamma_1,\ldots,\gamma_{J-1})$ is a vector of cut-off points where $\gamma_0 = -\infty < \gamma_1 < \ldots < \gamma_{J-1} < \gamma_J = \infty$; $\sigma(\cdot)$ is a known nonnegative function, and ε is an unobserved disturbance independent of a vector of explanatory variables X. We assume that the distribution of ε is known so that we can estimate the parameter vectors β, δ, and γ using the maximum likelihood estimation method.

The model above generalizes the standard ordinal logit and probit models as special cases, where $\sigma(\cdot)$ is a constant function equal to 1, and the distribution of ε is specified respectively as the standard logistic and normal distributions. Through the non-constant scale term $\sigma(X'\delta)$, we can allow the LS determinants X to affect not only the conditional mean of H but also the conditional variance as well as various parts of the conditional distribution of H.

We are interested in the distribution of H (latent LS), which is not affected by the labeling of Y. We investigate the distribution aspect of H through its conditional quantile function:

$$Q_\tau(H|X) = \beta' X + \sigma(X'\delta)c_\tau, \tag{3}$$

where $Q_\tau(H|X)$ and c_τ denote the τ quantile of the distribution of H given X and that of the distribution of ε, respectively. By equivariance of quantiles, we note that, for every strictly increasing function $g(\cdot)$,

$$Q_\tau(g(H)|X = x^*) \geq Q_\tau(g(H)|X = x^{**}) \Leftrightarrow Q_\tau(H|X = x^*) \geq Q_\tau(H|X = x^{**}). \tag{4}$$

The equivalence above implies that the ranking of the τ quantile of LS over groups of individuals with group identities being defined through the values of their observed characteristics is stable concerning any monotone transformation of the individual LS level (H). Such stability is important for ranking ordinal outcomes such as individual subjective wellbeing and LS, yet as shown in Bond and Lang (2019), it does not generally hold when the ranking is based on the mean of the ordinal variable.

Chen et al. (2022) consider the notion of median ranking, and their parametric implementation is based on empirical models (1) and (2) where the $\sigma(\cdot)$ function is exponential (i.e., $\sigma(t) = e^t$) and the LS disturbance ε follows either the standard logistic or normal distribution. Their empirical results are relatively insensitive to the specification of the distribution of ε. In our empirical analysis, we also adopt this parametric setting where the distribution ε is standard logistic and, by using Equation (3), estimate the 25th (first quartile, Q1), 50th (median, Q2), and 75th (third quartile, Q3) percentile of the conditional LS distribution.

From Equation (3), the marginal effect of X on the τ conditional quantile of LS is:

$$\nabla_x Q_\tau(H|X = x) = \beta + [\sigma'(x'\delta)c_\tau]\delta, \tag{5}$$

where $\sigma'(\cdot)$ denotes the first-order derivative of $\sigma(\cdot)$. If ε is symmetrically distributed, the value of c_τ is equal to zero for $\tau = 0.5$, and thus the marginal effect in Equation (5) reduces to β for the median case. For other quantile cases, $Q_\tau(H|X)$ is nonlinear in the covariates so that the marginal effect depends upon the value of X. To facilitate the presentation of marginal effects at other quantiles, we report the marginal effects from a least squares linearization of $Q_\tau(H|X)$, which proceeds as shown below.

Given a random sample $(Y_i, X_i)_{i=1}^n$ of n observations, let $\widehat{\beta}$ and $\widehat{\delta}$, respectively, denote the maximum likelihood estimates of β and δ. Using these estimates, we can construct:

$$\widehat{H}_{\tau,i} = \widehat{\beta}' X_i + \sigma\left(X_i'\widehat{\delta}\right) c_\tau, \tag{6}$$

which is the τ level quantile predicted latent LS of the ith individual. Let $\widehat{\theta_\tau}$ denote the solution to the minimization over θ of the following least squares objective function:

$$\sum_{i=1}^{n} \left(\widehat{H}_{\tau,i} - X_i'\theta\right)^2. \tag{7}$$

Then $x_i'\widehat{\theta_\tau}$ is the best linear approximation in the least squares sense of the estimated τ level quantile LS of individual i. Let θ_τ denote the linearized marginal effect of X at the τ level quantile of LS (H), which is the solution to the minimization of the population objective function:

$$E(Q_\tau(H|X) - X'\theta)^2. \tag{8}$$

We report in our empirical study the estimates $\widehat{\theta_\tau}$ of the linearized marginal effect θ_τ. For inference, note that $\sqrt{n}\left(\widehat{\theta_\tau} - \theta_\tau\right)$ is asymptotically normal with mean zero and some variance Ω. Given our distributional assumption for the disturbance ε, it is straightforward to see that $\widehat{\theta_\tau} = \widehat{\beta}$ and $\theta_\tau = \beta$ for $\tau = 0.5$ so that an estimator of Ω for the median case is immediately available as the estimated asymptotic variance matrix for the $\widehat{\beta}$ vector in the maximum likelihood estimation procedure. For inference in other quantile cases, we estimate their corresponding asymptotic variances through bootstrapping.

4 | RESULTS AND ANALYSIS

4.1 | Descriptive statistical analysis

Table 1 presents the mean, median, and empirical distribution of the reported LS scale. On average, Chinese are happy with their lives. The mean LS is 6.935 (on the 10-point rating scale). The Chinese in China have the highest LS (7.076). This is followed by those in Taiwan (6.895), Singapore (6.892), and Hong Kong (6.833). These mean differences are found to be significant, with a p-value of 0.0071 (based on a one-way ANOVA test). The median is 7 for all Chinese societies.

Figure 1 depicts the empirical distribution of reported LS of Chinese in various societies. The Chinese in China, Hong Kong, and Taiwan have very similar

TABLE 1 Life satisfaction distribution, mean and median

	Overall	China	Hong Kong	Singapore	Taiwan
Sample size	4755	1387	914	1394	1060
1 (completely dissatisfied)	1.09	0.65	1.42	0.36	2.36
2	1.39	1.95	1.09	1.29	1.04
3	2.67	2.96	1.86	2.01	3.87
4	3.93	4.69	4.49	3.66	2.83
5	11.34	10.24	14.33	9.04	13.21
6	14.66	12.69	14.44	16.43	15.09
7	22.31	17.3	23.41	30.13	17.64
8	25.95	27.69	23.52	27.04	24.34
9	9.13	12.98	8.53	5.88	8.87
10 (completely satisfied)	7.53	8.87	6.89	4.16	10.75
Mean[a]	6.935	7.076	6.833	6.892	6.895
Median	7	7	7	7	7

Note: A one-way ANOVA test on the mean differences is found to be insignificant with a *p*-value of 0.0071.

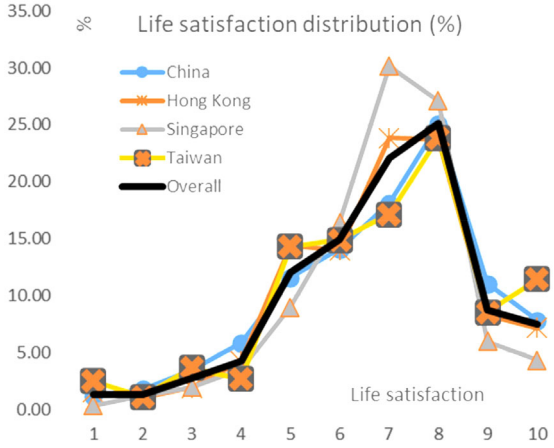


FIGURE 1 Empirical distribution of life satisfaction (a) marginal effect of freedom and level of life satisfaction [Color figure can be viewed at wileyonlinelibrary.com]

LS distributions. However, their distributions are substantially different from that of the Chinese in Singapore. The percentages of "high" (a score of 8–10) and "low" (1–3) LS for the Chinese in China, Hong Kong, and Taiwan are

higher than those for the Chinese in Singapore. In contrast, the Chinese in Singapore have a higher percentage of moderate LS (a score of 5–7) than those in China, Hong Kong, and Taiwan. This highlights heterogeneity across different parts of the LS distributions of the four Chinese societies and illustrates the usefulness of performing a distributional regression analysis. In other words, comparisons merely based on either the mean or median would not reveal this heterogeneity.

The descriptive statistics of the socioeconomic and societal values of the respondents are presented in Appendix 2. In terms of relative income, the Chinese in China, Hong Kong, and Taiwan perceive their income as in the middle of their countries (around 5 on a 10-point rating scale), whereas those in Singapore perceive their level of income as higher than the middle (around 6; see Appendix 2). Finally, it is evident in the data that heterogeneity exists in the societal values across these Chinese societies.

4.2 | Regression analysis

We perform our ordinal parametric quantile regression of Section 3.2 at the 25th, 50th, and 75th percentile levels over the sample of Chinese in China, Hong Kong, Singapore, and Taiwan. In what follows, we summarize the main findings. Detailed results for the estimated models are collated in Appendix 3. The results of goodness of fit tests are presented in Appendix 4. Table 2 summarizes the (linearly approximated) marginal effects of freedom and income on LS

TABLE 2 The estimated effects of freedom and income

	Life satisfaction percentile		
	25th	**50th**	**75th**
Freedom			
China	0.2676* (0.152)	0.2791*** (0.096)	0.2907* (0.170)
Hong Kong	0.1290** (0.062)	0.1446*** (0.055)	0.1603** (0.081)
Singapore	0.6223** (0.262)	0.6151*** (0.205)	0.6080** (0.264)
Taiwan	0.1748* (0.091)	0.2493*** (0.093)	0.3239* (0.179)
Income			
China	0.1734* (0.098)	0.1097*** (0.040)	0.0459 (0.030)
Hong Kong	0.0677** (0.035)	0.0460** (0.020)	0.0243 (0.020)
Singapore	0.2120** (0.107)	0.1938** (0.079)	0.1757* (0.102)
Taiwan	0.2264* (0.132)	0.2176** (0.088)	0.2088* (0.126)

Note: Standard errors are reported in parentheses.
***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

among the Chinese. For ease of interpretation, these effects are also depicted in Figure 2.

From Table 2, we find that freedom exhibits positive and significant effects across all societies and LS levels. Most of the results are significant at the 5% level. In the 50th LS percentile, the freedom effect is found to be significant at the 1% level. The finding of the 50th LS percentile (median) is consistent with the previous studies that typically found a positive and significant effect of freedom by mean comparison analysis (see Inglehart & Welzel, 2005; Nakazato et al., 2017). Thus, either Chinese societies or not, at mean or at median, freedom is found to be significantly related to LS.

Figure 2a clearly shows that the estimated marginal effects of freedom are the highest in Singapore and the lowest in Hong Kong. The estimated

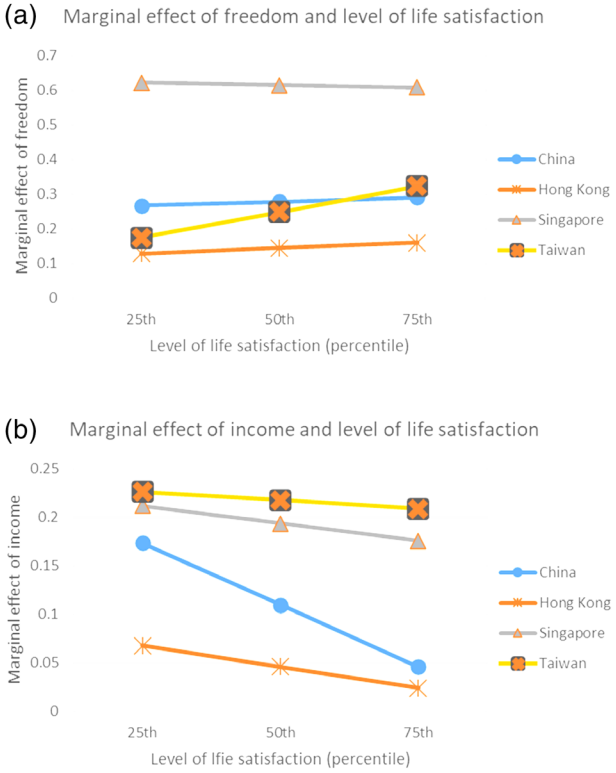


FIGURE 2 Marginal effects of freedom and income across quantile levels of life satisfaction: (a) marginal effect of freedom and level of life satisfaction and (b) marginal effect of income and level of life satisfaction [Color figure can be viewed at wileyonlinelibrary.com]

marginal effects of freedom are generally not a decreasing function of the LS quantile. Overall, we observe a positive relationship between the freedom effects and LS quantiles. This relationship is somewhat weak for the Chinese in China, Hong Kong, and Singapore. However, for the Chinese in Taiwan, it is evidently substantial. In Taiwan, for those who are in the bottom 25th percentile, a one-unit increase in freedom will increase LS by 0.17 units, and for those in the top 25th percentile, the increase in LS almost doubles (0.32 units).

While income also has positive effects regardless of the societies and LS levels, the effects decline as the quantile level increases. At the 50th percentile, the income effects are significant at a nominal level no larger than 5% for all four societies. For the 25th and 75th percentiles, the significance is mostly at the 10% level and varies across societies.

From Figure 2b, overall, the income effect is the highest in Taiwan and the lowest in Hong Kong. This is reconciled with the previous finding on the income–happiness effects among the Asian societies, where income is found to have higher impacts in Taiwan than others Asian societies (Lim et al., 2020). In this context, the generalization of Zagorski (2011) and Helliwell (2006) (i.e., the empirical evidence that high-income countries are associated with a low effect of income on happiness) is not supported by the current finding.

From the LS distributional perspective, unlike the freedom effect (see Figure 2a), across different quantiles of LS, the income effect is the highest (lowest) for those who are in the 25th (75th) percentile. This reveals a negative relationship between the marginal effect of income and the level of LS. As shown by the slopes in Figure 2b, it is the strongest (steepest) in China and the weakest in Taiwan (the least steep). This reveals that the effect of income not only has a diminishing marginal utility, as found by previous

TABLE 3 Test of differences and increasing and decreasing effects across the quantiles

	China	Hong Kong	Singapore	Taiwan
p-values of test of effect homogeneity				
Freedom	0.000	0.000	0.000	0.000
Income	0.000	0.289	0.000	0.958
p-values of test of weakly increasing effects				
Freedom	0.805	0.903	0.486	0.959
p-values of test of weakly decreasing effects				
Income	0.973	0.966	0.758	0.688

TABLE 4 The sign of estimated effects of other societal values.

	25th percentile				50th percentile				75th percentile			
	CHN	**HKG**	**SGP**	**TWN**	**CHN**	**HKG**	**SGP**	**TWN**	**CHN**	**HKG**	**SGP**	**TWN**
Defiance (−)	(−)	(+)	(−)	(−)	(−)	(+)	(−)	(−)*	(−)	(−)	(−)	(−)
Disbelief (−)	(+)	(−)	(+)	(+)	(+)	(+)	(−)	(+)	(+)	(+)	(−)	(−)
Relativism (−)	(−)	(−)	(−)	(−)	(−)*	(−)	(−)	(−)*	(−)	(−)	(+)	(−)
Skepticism (−)	(−)	(−)	(−)	(−)*	(−)**	(−)	(−)	(−)**	(−)	(−)	(−)	(−)
Autonomy (+)	(+)	(−)	(−)	(−)	(+)**	(−)	(−)	(+)	(+)	(+)	(−)	(+)
Equality (+)	(+)	(−)	(+)	(+)	(+)	(+)	(+)**	(+)	(+)	(+)	(+)	(−)
Choice (+)	(−)	(+)	(+)	(+)	(−)	(+)	(+)**	(−)	(−)	(−)	(+)*	(−)
Voice (+)	(−)	(+)	(−)	(−)	(+)	(+)	(−)*	(−)	(+)	(+)	(−)	(+)
Trust (+)	(+)	(+)*	(+)	(+)	(+)*	(+)	(+)	(+)	(+)	(+)	(+)	(+)
Fairness (+)	(+)	(−)	(+)	(−)	(+)**	(+)	(+)	(+)	(+)	(+)	(+)	(+)

Note: CHN, HKG, SGP, and TWN are, respectively, abbreviations of China, Hong Kong, Singapore, and Taiwan.
The symbols (−) and (+) represent the negative and positive effects of the societal values on life satisfaction, respectively.
***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.
The signs (−) and (+) in parentheses in the first column represent the expected signs of the marginal effects.

studies (Zagorski, 2011), but is also diminishing over the increasing quantile of LS.

In Table 3, for each society and for freedom and income, respectively, we provide formal statistical test results on the relationship between the corresponding quantile-specific effects across quantiles. In particular, we consider testing the following hypotheses. First, separately for freedom and income, we test whether the effects at the 25th, 50th, and 75th percentiles are homogenous through a Wald test of the null hypothesis that the marginal effect parameters are of the same value across the three quartiles. Second, we test whether the freedom effects are weakly increasing across the three quartiles, whereas, for income, we test whether the effects are weakly decreasing across quartiles. We use the Chen–Szroeter test (Chen & Szroeter, 2014) of parameter inequalities for implementing the latter two tests on the monotone relationship. From Table 3, the results show that the freedom effects are significantly different across the three quartiles, and this heterogeneity holds across all four Chinese societies of our study. Moreover, for all of these societies, we cannot reject the null hypothesis that the freedom effects are weakly increasing across quartiles. By contrast, the income effects are significantly different across quartiles only for the samples of China and Singapore. Yet, this does not contradict the result that, for all societies, the null hypothesis of weakly decreasing income effects across quartiles is not rejected in our data. [Correction added on 20 April 2023, after first online publication: Reference '(Chem & Szroeter, 2014)' has been corrected to '(Chen & Szroeter, 2014)' for correctness.]

We have included the variables of other societal values as control variables. For readers interested to know the results, please refer to Table 4, which summarizes the marginal effects of other societal values on LS among the Chinese societies. Overall, at the 50th percentile, the societal values are found to be significantly related to LS. This is consistent with the previous studies using the mean comparison approach (e.g., see Lim et al., 2020; Ye et al., 2015).

There is a potential endogeneity issue between income and happiness. We address the endogeneity using the instrument-free inferences of Kripfganz and Kiviet (2021) and Kiviet (2020). The results suggest that the bias of endogeneity should not be prevalent, and at least, it would not change the signs of estimated coefficients of income and freedom (see Appendix 5).

5 | CONCLUSION AND DISCUSSION

In this paper, we have estimated the effects of freedom and income on the distribution of LS over samples from Chinese societies in China, Hong Kong, Singapore, and Taiwan. We find that freedom has significant and positive effects among the Chinese regardless of the society and LS quantile. The positive effect of freedom is intuitively appealing and consistent with the findings of

previous studies (Inglehart et al., 2008; Rahman & Veenhoven, 2018), which focus mainly on the effect on the mean. However, we note that the magnitude of the estimated freedom effect generally becomes larger with the increase in the LS quantile. Thus, it suggests a "strengthening" effect of freedom in the sense that freedom could matter even more to those with a higher level of LS. This strengthening effect of freedom is the highest in Taiwan.

By contrast, we observe that income matters more for those with a lower level of LS. Previous studies have found that the LS effect of income is subject to the law of diminishing marginal utility; that is, the effect of income on LS is diminishing as the income increases (e.g., see Veenhoven, 1991; Frey & Stutzer, 2002; Zagorski, 2011). In this regard, from a distributional perspective, the present study finds that the magnitude of the income effect on LS is decreasing over the level of LS. The decreasing effect of income is the highest in China.

The policy implications of the above findings are clear. Income matters for LS of the Chinese in various societies. Freedom also plays important roles. Freedom influences LS regardless of the level of LS and the location of Chinese society. There are "strengthening" freedom effects and "weakening" income effects over the LS quantiles. Together with the law of diminishing marginal utility of income, this indicates that at the high level of income, there is a limited substitution of freedom for income in terms of LS, and the trade-off of freedom for income is more effective for people in low LS quantiles than for those in high LS quantiles.

Some Chinese societies have been trading off freedom for income (i.e., reducing liberal democracy for high economic growth). For example, in Singapore, high economic growth is achieved by restricting the society's fundamental freedoms (Austin, 2009). In China, economic success has been linked to the ability to exert political control over society (So, 2014). However, China has the largest weakening income effects and lowest strengthening freedom effects, and rebalancing of income and freedom could be vital to improve people's LS.

Given the substantially high effects of freedom over the LS distribution, the Singapore Government could rebalance its economic development strategies between income and freedom. In Taiwan, with its strengthening effects of freedom and high income effects, the policy that trades off freedom for income could be focused on people with low LS. For Hong Kong, the income and freedom effects being relatively the lowest might indicate the considerable room still available for income–freedom tradeoff policies.

Keeping individual LS (utility) constant, we can trade off freedom for income at a lower level of LS. However, upon achieving a high level of LS, our empirical results suggest this trade-off would become less effective, and the demands of people for freedom may no longer be compromised. With respect to the previous studies, this finding induces a new policy implication for Chinese societies. In terms of LS, the limited substitution of freedom for income suggests that the authoritarian developmentalism approach is less relevant and there is a

need to rebalance between income and freedom in a society's developmental policies. Furthermore, we believe this is an important policy issue for all societies and could be one of the potential research areas in happiness economics in the future.

The above findings are subject to a few caveats. First, the data used in our study exclude the sample that could be affected by COVID-19 (i.e., wave 6 of WVS). Second, due to data limitations, the endogeneity issue is not explored in the empirical model of the present paper. Extending the analysis of Kiviet (2020) and Kripfganz and Kiviet (2021) to the ordinal regression setup is outside the scope of the present paper. It is suggested that future studies take these issues into account.

ACKNOWLEDGMENTS

This research was supported in part through the Taiwan Fellowship program of the Ministry of Foreign Affairs, Taiwan, and by Academia Sinica (AS-CDA-106-H01). We would like to thank Shuo-Chun Chang for his excellent assistance in processing the data.

CONFLICTS OF INTEREST STATEMENT

There are no competing interests, either financial or non-financially, that the authors may have in relation to the work presented in the submitted manuscript.

DATA AVAILABILITY STATEMENT

We downloaded the data from the website World Values Survey (VWS). The data and documentations (questionnaires and coding information) are deposited and available for download from the WVS website: http://www.worldvaluessurvey.org/wvs.jsp

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How to cite this article: Lim, H.-E., Shaw, D., Chen, L.-Y., & Liao, P.-S. (2023). Distributional Effects of Freedom and Income on Life Satisfaction: Evidence from East Asian Chinese Societies. *Asian Economic Journal*, *37*(1), 113–143. https://doi.org/10.1111/asej.12291

APPENDIX 1

Variable	Definition	Measurement
(a) Definition and measurement of socio-demographic variables		
Health	State of health	1 = poor, 2 = fair, 3 = good, 4 = very good
Dmale	Gender	1 = male, 0 = female
Age	Age	years
Marital status	Marital status	1 = married, 0 = living together, divorced, separated, widowed, and single
Employment	Employment status	1 = full time, 2 = part time, 3 = self-employed, 4 = retired, 5 = others (housewife, student, unemployed, other)
EducationALL	The highest level of education	1 = no formal schooling, 2 = incomplete primary school, 3 = complete primary school, 4 = incomplete secondary school, 5 = secondary school, 6 = incomplete pre-university, 7 = complete pre-university, 8 = incomplete university, 9 = complete university.
(b) Definition of dummy variables for marital and employment status used in the regressions		
Dmarried	Dummy for marital status (comparison group: single)	1 = married 0 = otherwise
Dfulltime	Dummy for employment status (comparison group: housewife, student, unemployed, and others)	1 = full time employment 0 = otherwise
Dparttime	Dummy for employment status (comparison group: housewife, student, unemployed, and others)	1 = part time employment 0 = otherwise

(Continues)

Variable	Definition	Measurement
Dselfemp	Dummy for employment status (comparison group: housewife, student, unemployed, and others)	1 = self employed 0 = otherwise
Dretired	Dummy for employment status (comparison group: housewife, student, unemployed, and others)	1 = retired 0 = otherwise
(c) Definition and measurement of societal values		
Defiance	Respondents' lack of devoutness to their parents, respect for authority, and national pride (a high value represents high defiance).	Index (0–1)
Disbelief	Responses to questions about the unimportance of religion, religious practices, and the respondents' self-perception as religious or not (a high value represents high disbelief).	Index (0–1)
Relativism	Respondents' perception of the following actions as just: avoiding a fare on public transport, cheating on taxes if you have a chance, someone accepting a bribe in the course of his or her duties (a high value represents high relativism).	Index (0–1)
Skepticism	Lack of confidence in the armed forces, police and courts (a high value represents high skepticism).	Index (0–1)
Autonomy	Importance of qualities that children can be encouraged to learn at home: independence, imagination, obedience (a high value represents high autonomy)	Index (0–1)

(Continues)

Variable	Definition	Measurement
Equality	Agree or not on the statements: A university education is more important for a boy than for a girl; on the whole, men make better political leaders than women do (a high value represents a high level of support for gender equality)	Index (0–1)
Choice	Justified or not on the actions: homosexual acts, abortion and divorce (a high value represents a high level of choice)	Index (0–1)
Voice	Importance of the following aims for this country in the next 10 years such as giving people more voice in important government decisions, protecting freedom of speech, seeing that people have more voice about how things are done at their jobs and in their communities (a high value represents a high level of voice)	Index (0–1)
Trust	Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?	Dummy variable (0 being "need to be very careful" and I being "most people can be trusted")
Freedom	How much freedom of choice and control do you feel you have over the way your life turns out?	10-point rating scale (1 being "no choice at all" and 10 being "a great deal of choice")
Fairness	Agree or not based on the rating scale: 1 being "in the long run, hard work usually brings a better life"; 10 being "hard work does not generally bring success" (a high value represents a high level of fairness)	10-point rating scale

Note: World Values Survey 2010–2012, Questionnaire.

APPENDIX 2: Socioeconomic, societal, and cultural characteristics.

	China		Hong Kong		Singapore		Taiwan	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Health								
Poor	76	5.48	51	5.58	19	1.36	24	2.26
Fair	310	22.35	334	36.54	236	16.93	95	8.96
Good	651	46.94	396	43.33	746	53.52	645	60.85
Very good	350	25.23	133	14.55	393	28.19	296	27.92
Gender								
Female	687	49.53	503	55.03	769	55.16	536	50.57
Male	700	50.47	411	44.97	625	44.84	524	49.43
Marital								
Married	1149	82.84	565	61.82	858	61.55	629	59.34
Others[a]	238	17.16	349	38.18	536	38.45	431	40.66
Employment								
Full time	717	51.69	365	39.93	621	44.55	545	51.42
Part time	259	18.67	102	11.16	120	8.61	55	5.19
Self	36	2.6	34	3.72	73	5.24	77	7.26
Retired	134	9.66	152	16.63	194	13.92	111	10.47
Others[b]	298	21.49	363	39.72	513	36.8	355	33.49
Education[c]								
No formal	83	5.98	21	2.3	67	4.81	21	1.98
Primary 1	0	0	40	4.38	91	6.53	14	1.32
Primary 2	295	21.27	85	9.3	85	6.1	98	9.25
Secondary 1	0	0	130	14.22	82	5.88	6	0.57
Secondary 2	456	32.88	202	22.1	296	21.23	139	13.11
Pre-Univ 1	0	0	32	3.5	115	8.25	38	3.58
Pre-Univ 2	307	22.13	140	15.32	263	18.87	238	22.45
University 1	0	0	63	6.89	70	5.02	78	7.36
University 2	246	17.74	201	21.99	325	23.31	428	40.38
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Socioeconomic characteristics								
Income	4.485	1.878	4.721	1.905	5.726	1.526	4.814	1.647

(Continues)

	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age	42.885	14.789	44.286	16.290	43.338	16.880	43.402	16.495
Education	5.487	2.302	5.876	2.302	5.974	2.395	7.011	2.197
Health	2.919	0.830	2.668	0.791	3.085	0.706	3.144	0.663
Societal values								
Defiance	0.350	0.176	0.386	0.186	0.283	0.156	0.432	0.186
Disbelief	0.880	0.194	0.723	0.275	0.463	0.304	0.573	0.278
Relativism	0.471	0.423	0.429	0.408	0.546	0.433	0.377	0.367
Skepticism	0.309	0.302	0.184	0.346	0.194	0.333	0.198	0.474
Autonomy	0.596	0.609	0.228	0.582	0.254	0.515	0.264	0.606
Equality	0.538	0.231	0.581	0.231	0.565	0.231	0.607	0.228
Choice	0.216	0.221	0.336	0.233	0.329	0.223	0.389	0.230
Voice	0.179	0.232	0.417	0.307	0.341	0.256	0.241	0.252
Trust	0.661	0.473	0.484	0.500	0.380	0.486	0.312	0.464
Freedom	7.275	1.919	6.859	1.958	6.752	1.640	7.518	2.018
Fairness	7.250	2.377	6.998	2.554	6.349	2.296	7.076	2.518

[a]Others consist of the marital status of living together, divorced, separated, widowed, and single.
[b]Others consist of the employment status of the housewife, student, unemployed, and others.
[c]Primary 1 = incomplete primary school; Primary 2 = complete primary school; Secondary 1 = incomplete secondary school; Secondary 2 = complete secondary school; Pre-Univ 1 = incomplete pre-university; Pre-Univ 2 = complete pre-university; University 1 = incomplete university/without degree; University 2 = complete university with degree.

APPENDIX 3: Results of estimated ordinal parametric quantile regression

	Q1 (Bottom 25%)		Q2 (Median, 50%)		Q3 (Top 25%)	
	Coeff	Std Err.	Coeff	Std Err.	Coeff	Std Err.
(a) Estimated linearized marginal effect: China						
Socio-demographic variables						
Income	0.1734	0.0975	0.1097	0.0396	0.0459	0.0302
Health	0.1764	0.1011	0.2556	0.0926	0.3349	0.1876
Dmale	−0.0591	0.0873	−0.0613	0.0597	−0.0635	0.0832
Age	−0.0695	0.0389	−0.0354	0.0182	−0.0014	0.0194
Agesq	0.0008	0.0004	0.0005	0.0002	0.0002	0.0002
Dmarried	0.1845	0.1629	0.1115	0.0951	0.0385	0.1433
Dfulltime	−0.1638	0.1591	−0.1647	0.1019	−0.1657	0.1497
Dparttime	−0.0590	0.1614	−0.0738	0.1030	−0.0886	0.1392
Dselfemp	−0.4094	0.3332	−0.3526	0.2195	−0.2957	0.3028
Dretired	−0.2865	0.2391	−0.2211	0.1512	−0.1557	0.2374
Education ALL	0.0228	0.0244	0.0335	0.0180	0.0442	0.0333
Societal and cultural values						
Defiance	−0.0683	0.2516	−0.2921	0.1855	−0.5159	0.3613
Disbelief	0.3025	0.2965	0.2964	0.1832	0.2902	0.3081
Relativism	−0.0370	0.1054	−0.1436	0.0837	−0.2503	0.1689
Skepticism	−0.4183	0.3051	−0.4657	0.2196	−0.5131	0.3869
Autonomy	0.3760	0.2750	0.3778	0.1791	0.3796	0.2680
Equality	0.0326	0.1812	0.0357	0.1260	0.0389	0.2124
Choice	−0.0538	0.1981	−0.1044	0.1349	−0.1551	0.2509
Voice	−0.2005	0.2688	0.0110	0.1292	0.2225	0.1972
Trust	0.2413	0.1643	0.1400	0.0752	0.0386	0.0966
Freedom	0.267	0.1518	0.2791	0.0957	0.2907	0.1695
Fairness	0.0327	0.0293	0.0347	0.0173	0.0366	0.0290
(b) Estimated linearized marginal effect: Taiwan						
Socio-demographic variables						
Income	0.2264	0.1315	0.2176	0.0876	0.2088	0.1261

(Continues)

	Q1 (Bottom 25%)		Q2 (Median, 50%)		Q3 (Top 25%)	
	Coeff	Std Err.	Coeff	Std Err.	Coeff	Std Err.
Health	0.4314	0.2223	0.4716	0.1855	0.5119	0.2858
Dmale	−0.2202	0.1674	−0.2147	0.1196	−0.2092	0.1783
Age	−0.0580	0.0309	−0.0229	0.0193	0.0121	0.0278
Agesq	0.0005	0.0003	0.0002	0.0002	−0.0002	0.0003
Dmarried	0.3925	0.2441	0.4596	0.1971	0.5267	0.2864
Dfulltime	0.1310	0.1803	−0.2139	0.1527	−0.5590	0.3892
Dparttime	−0.0161	0.2873	−0.2845	0.2285	−0.5530	0.4395
Dselfemp	0.0064	0.2886	−0.2739	0.2283	−0.5542	0.4560
Dretired	−0.0011	0.3543	0.0537	0.2453	0.1085	0.3876
EducationALL	0.0774	0.0629	0.0483	0.0341	0.0191	0.0510
Societal and cultural values						
Defiance	−0.5375	0.4946	−0.5598	0.3305	−0.5821	0.4358
Disbelief	0.2305	0.3181	0.0365	0.1707	−0.1575	0.2956
Relativism	−0.1735	0.2054	−0.2480	0.1482	−0.3225	0.2502
Skepticism	−0.9871	0.5936	−0.7684	0.3595	−0.5497	0.5272
Autonomy	−0.1675	0.2860	0.0047	0.1871	0.1768	0.3056
Equality	0.2244	0.3324	0.0201	0.2157	−0.1841	0.4198
Choice	0.1378	0.3737	−0.1894	0.2330	−0.5167	0.4616
Voice	−0.3524	0.3522	−0.0373	0.1757	0.2778	0.2977
Trust	0.2089	0.1946	0.1889	0.1197	0.1690	0.1542
Freedom	0.1748	0.0908	0.2493	0.0929	0.3239	0.1785
Fairness	−0.0065	0.0357	0.0008	0.0186	0.0081	0.0257
(c) Estimated linearized marginal effect: Hong Kong						
Socio-demographic variables						
Income	0.0677	0.0345	0.0460	0.0199	0.0243	0.0196
Health	0.1633	0.0870	0.1748	0.0709	0.1863	0.0980
Dmale	−0.0615	0.0620	−0.0315	0.0366	−0.0015	0.0564
Age	−0.0270	0.0168	−0.0199	0.0110	−0.0128	0.0120
Agesq	0.0003	0.0002	0.0003	0.0001	0.0003	0.0002
Dmarried	0.1450	0.0854	0.0948	0.0546	0.0445	0.0678
Dfulltime	0.0052	0.0647	0.0116	0.0404	0.0179	0.0588

(Continues)

	Q1 (Bottom 25%)		Q2 (Median, 50%)		Q3 (Top 25%)	
	Coeff	Std Err.	Coeff	Std Err.	Coeff	Std Err.
Dparttime	−0.0778	0.0877	−0.0299	0.0560	0.0180	0.0791
Dselfemp	−0.0867	0.1020	−0.0776	0.0881	−0.0685	0.1833
Dretired	−0.1625	0.1340	−0.1209	0.0847	−0.0794	0.1180
EducationALL	−0.0058	0.0128	−0.0114	0.0098	−0.0169	0.0166
Societal and cultural values						
Defiance	0.0287	0.1551	0.0120	0.0910	−0.0048	0.1497
Disbelief	−0.0138	0.0846	0.0069	0.0582	0.0276	0.1021
Relativism	−0.0299	0.0647	−0.0341	0.0433	−0.0383	0.0654
Skepticism	−0.2670	0.1766	−0.1867	0.1144	−0.1064	0.1531
Autonomy	−0.0472	0.0932	−0.0133	0.0619	0.0206	0.1068
Equality	−0.0476	0.1189	0.0117	0.0771	0.0711	0.1342
Choice	0.1888	0.1340	0.0430	0.0723	−0.1028	0.1174
Voice	0.0244	0.0812	0.0556	0.0550	0.0868	0.0906
Trust	0.1239	0.0752	0.0662	0.0404	0.0085	0.0544
Freedom	0.1290	0.0615	0.1446	0.0550	0.1603	0.0807
Fairness	−0.0004	0.0111	0.0050	0.0070	0.0103	0.0123
(d) Estimated linearized marginal effect: Singapore						
Socio-demographic variables						
Income	0.2120	0.1067	0.1938	0.0791	0.1757	0.1015
Health	0.5591	0.3001	0.7157	0.2599	0.8724	0.4325
Dmale	−0.2504	0.2314	−0.2793	0.1733	−0.3082	0.2576
Age	−0.0425	0.0394	0.0040	0.0284	0.0505	0.0449
Agesq	0.0005	0.0004	0.0000	0.0003	−0.0004	0.0005
Dmarried	0.3201	0.3119	0.1175	0.1971	−0.0852	0.2893
Dfulltime	0.2645	0.2729	0.2417	0.1998	0.2190	0.2824
Dparttime	−0.3509	0.3830	−0.5177	0.3192	−0.6846	0.4228
Dselfemp	0.0961	0.4442	0.1101	0.3513	0.1242	0.5025
Dretired	0.4530	0.4814	0.6088	0.3715	0.7648	0.5813
EducationALL	−0.0030	0.0525	0.0040	0.0387	0.0110	0.0551
Societal and cultural values						
Defiance	−1.1206	0.7536	−1.1657	0.6074	−1.2110	0.8258
Disbelief	0.1107	0.3736	−0.0206	0.2447	−0.1518	0.3233

(Continues)

	Q1 (Bottom 25%)		Q2 (Median, 50%)		Q3 (Top 25%)	
	Coeff	Std Err.	Coeff	Std Err.	Coeff	Std Err.
Relativism	−0.2841	0.2626	−0.0740	0.1747	0.1360	0.2542
Skepticism	−0.4323	0.5423	−0.6443	0.4343	−0.8564	0.6663
Autonomy	−0.4840	0.4552	−0.3250	0.2922	−0.1661	0.3796
Equality	0.9529	0.6204	1.1597	0.5137	1.3668	0.8652
Choice	0.6821	0.5677	0.9223	0.4632	1.1627	0.6831
Voice	−0.5855	0.4918	−0.5661	0.3343	−0.5468	0.5366
Trust	0.3207	0.2374	0.1877	0.1593	0.0548	0.2182
Freedom	0.6223	0.2618	0.6151	0.2050	0.6080	0.2644
Fairness	0.0333	0.0488	0.0476	0.0354	0.0619	0.0564

APPENDIX 4: Results of goodness of fit tests for the estimated model

The values of variance inflation factor (VIF) range from the lowest of 1.03 to the highest of 2.76, which indicates a low multicollinearity among the independent variables except the age and age squared. The relationship between age and age squared is nonlinear (quadratic), and thus, it does not fit into the multicollinearity that refers to a linear relationship. Thus, we exclude age squared in the calculation of VIF.

The value of pseudo-R^2 suggests a good fit between the estimated model and the sample. As compared to the estimated models, the model with intercept only is rejected with a p-value of nearly zero.

		China	Hong Kong	Singapore	Taiwan
Multicollinearity	VIF	1.03–2.19	1.03–2.64	1.03–2.76	1.04–2.49
Pseudo R^2		0.1239	0.1491	0.0835	0.1136
LR-test (p-value)		0.0000	0.0000	0.0000	0.0000

[a]The VIF excludes the age squared.

[b]Pseudo R^2 and LR test for the fitness of the empirical model (1)–(2) where $\sigma(t) = e^t$ and ε follows the standard logistic distribution.

APPENDIX 5

We faced difficulties in identifying the appropriate instrumental variables: variables that influence freedom (income) and, at the same time, have no influence on life satisfaction. The cross-sectional data employed in the present study limits the identification of appropriate instrumental variables. These have posed barriers for us to address the endogeneity issues.

According to Wooldridge (2010), one of the three common sources of endogeneity is omitted variable bias. When a model is estimated with a few control variables (due to data availability, for instance), the omitted variables will be part of error terms and generate a spurious correlation between error terms and explanatory variables. In the present paper, the effects of income and freedom are estimated with a relatively large number of control variables (various sociodemographic and societal value variables), thereby substantially mitigating the problem of endogeneity due to omitted variable bias.

To obtain a quick feel on the potential bias of endogeneity. We performed the instrument-free inferences for endogeneity as suggested by Kiviet (2020) and Kripfganz and Kiviet (2021). Intuitively, the endogeneity between income and happiness could lead to a positive correlation of error terms and income (happy people are more productive; similarly, freedom is likely to lead to higher productivity). Likewise, happy people are likely to have more freedom. Hence, our prior belief is that the endogeneity, if it exists, will also be likely to lead to a positive correlation between error terms and freedom.

For a given postulated correlation between endogenous variables and regression errors, Kiviet (2020) derived in the linear regression framework the bias-corrected estimators of coefficients of endogenous variables along with their corresponding confidence intervals that enable us to test whether the coefficients are significant or not. We can therefore assess how the bias-corrected estimated coefficients vary across a range of considered levels of endogeneity correlation. Kripfganz and Kiviet (2021) suggested and implemented in Stata a procedure that could allow for inference irrespective of the availability of any exogenous instrument. We applied their approach and plotted in Figure A5.1 the bias-corrected estimated coefficients of income and freedom against a wide range of endogeneity correlations. If there is no endogeneity (postulated correlation between regression error and endogenous variable equal to zero), the estimated coefficients (income and freedom) in Figure A5.1 are found to be positive and significantly different from zero (95% confidence interval). In contrast, if there is endogeneity with positive correlation (the likely case for the present paper if endogeneity exists), the estimated coefficients as shown in Figure A5.1 will be significant and negative. Consequently, if the estimated model suffers from endogeneity due to positive correlation between error terms and endogenous variables, the estimated coefficients of endogenous variables (income and freedom) are likely to be negative. Nevertheless, in our empirical analysis, which

assumes exogeneity of income and freedom conditional on the given large set of additional control variables, the estimated coefficients of income and freedom are found to be positive (see Table 2). Thus, if we are mainly concerned about the positive endogeneity correlation case, our empirical results are compatible with the findings in Figure A5.1, where the estimated coefficients over the range of nonnegative correlations are positive only when the value of endogeneity correlation is nearly zero. In other words, the bias of endogeneity due to positive correlation between regression errors and endogenous variables might not be prevalent. That being said, our arguments here are based on the presumption that the linear regression framework of Kiviet (2020) and Kripfganz and Kiviet (2021) is a good approximation to the ordinal regression context of the present paper. Therefore, the evidence discussed here is meant to be supportive but not confirmative. Extending the analysis of Kiviet (2020) and Kripfganz and Kiviet (2021) to the ordinal regression setup is outside the scope of the present paper. We leave this interesting topic for further research (Figure A5.1).

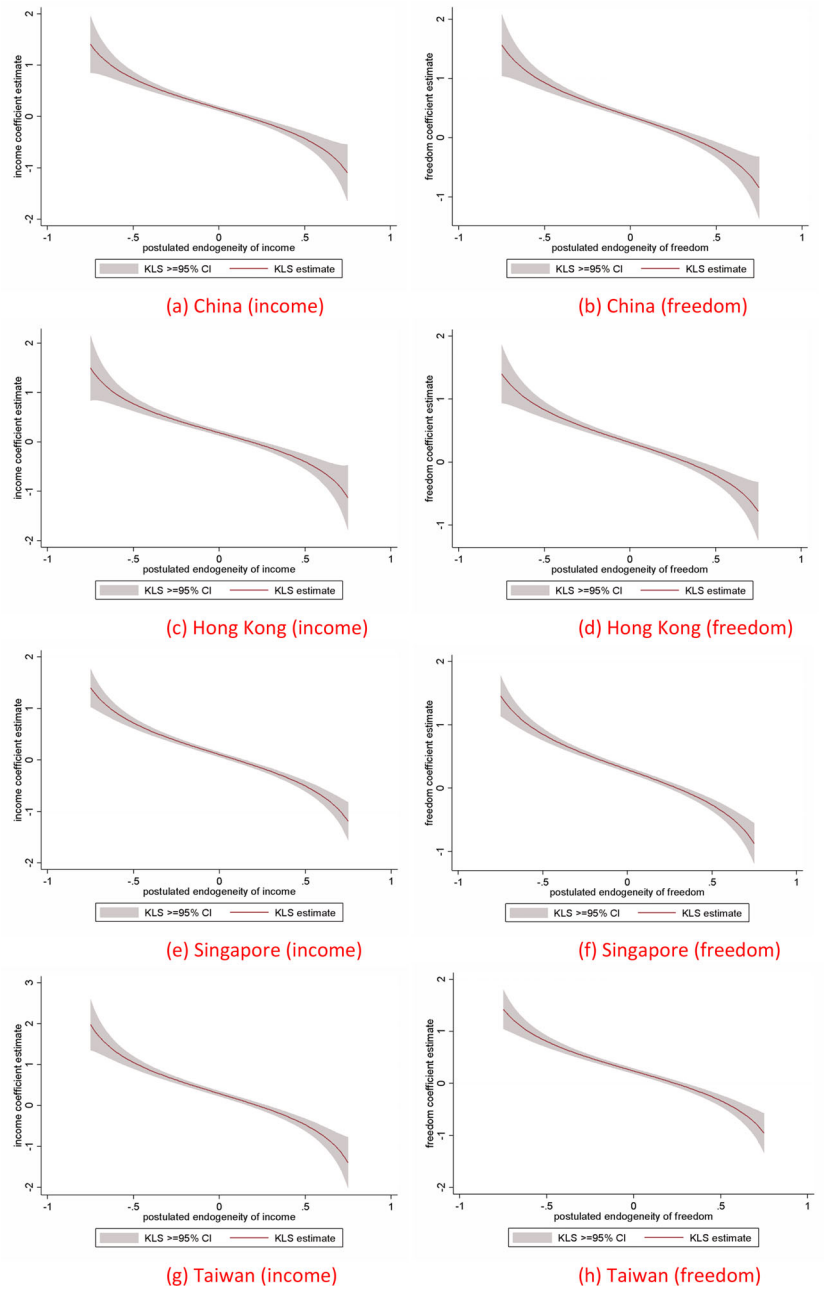


FIGURE A5.1 The estimated coefficients of income and freedom. [Color figure can be viewed at wileyonlinelibrary.com]