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**Title: The Effects of Health, Social, and Consumption Capital on Running-related Expenditures in China**

**Abstract**

**Research question:** This study investigates the effects of health, social, and consumption capital on running-related expenditures. It adds to previous research by empirically testing investment in the stock of health on participation-related expenditures.

**Research methods:** Chinese amateur runners (n=6693) were surveyed on health capital (i.e. health change since taking up running), social capital (i.e. running group participation), consumption capital (i.e. sport profiles), demographics, and running-related expenditures over a one-year period. Two instrumental variables reflecting life domain satisfaction were included to address the endogeneity of health change.

**Results and findings:** Results show that variables capturing health, social, and consumption capital significantly affect total running-related expenditures, whereas the effects on expenditure categories vary. After taking endogeneity into account, the results showed that health change since taking up running positively affects total running-related expenditures and sport apparel expenses.

**Implications:** The findings provide empirical support for Downward, Dawson, and Dejonghe's (2009) general economic model of sports consumption by revealing that health, social, and consumption capital are significant drivers of participation-related expenditures. While mass participation, health, and economic objectives may be achieved concurrently, policy makers should carefully balance these objectives. Sport managers and marketers can use mass participant sport events to stimulate continued participation, and this in turn generates health, social, and consumption capital that drives expenditures. Fostering running group participation increases expenditures. Early career runners should be targeted for sport apparel. Cross-promotion among related sports may increase overall sport consumption.

**Keywords:** Instrumental variables, Sport consumption, Running industry, Mass participant sport event, Heckman analysis

### Introduction

A “running fever” has been catching on in China. The number of running events registered with the Chinese Athletic Association (CAA) rose from 22 in 2011 to 328 in 2016, and the number of event entrants increased from 400,000 in 2011 to 2.8 million in 2016 (Guodong Technology Corporation [GTC], 2018). In contrast to the pursuit of sport excellence, Chinese amateur runners typically treat running as a lifestyle choice and a vehicle for pursuing self-development (Ronkainen, Shuman, Ding, You, & Xu, 2018; Xue, Ge, & Zheng, 2016). The recent Chinese sports policy discourse focuses on stimulating mass sport participation for both health and economic purposes (Zheng & Houlihan, 2018). Running as a popular form of mass sport participation is considered to serve both purposes in China (The General Administration of Sport in China [GASC], 2018).

The exponential increase in running participation and events in China has contributed to the growing, multifaceted running industry, including training, apparel, events, and tourism (GTC, 2018). At the local level, municipalities came to realize that staging a city marathon was a worthwhile investment in that it helped to showcase the destination, develop sport participation, grow the local economy, and promote health. The number of Chinese cities hosting a marathon rose from 79 in 2015 to 234 in 2017 (GTC, 2018). At the national level, sport became an increasingly important sector of the economic strategy to grow “the happiness industries.”<sup>1</sup> Thus, stimulating the “marathon industry” (i.e. the running industry) aligns with this objective. The National Development and Reform Commission (NDRC) and the GASC, together with a list of ministries, issued a number of policy decrees to foster the growth of

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<sup>1</sup> In 2016, the Office of the State Council in China officially referred to *tourism, culture, sport, health, elderly care, and education* as the happy industries. See: [http://www.gov.cn/zhengce/content/2016-11/28/content\\_5138843.htm](http://www.gov.cn/zhengce/content/2016-11/28/content_5138843.htm)

China's running industry. The running industry is expected to reach cn¥120 billion/€15.4 billion in size by 2020 (GASC, 2018).<sup>2</sup> Runners' participation and expenditures are responsible for the economic outcomes from running and hence for a sustainable running industry. A close examination of drivers of running-related expenditures will enhance understanding in this regard.

Various forms of capital have been conceptualized as drivers of participation-related expenditures (Downward, Dawson, & Dejonghe, 2009). Previous studies explained sport participation expenditures or certain components (e.g. apparel expenditures) on the basis of *consumption capital*, *social capital*, and socio-demographics (e.g., Sato, Jordan, Kaplanidou, & Funk, 2014; Thibaut, Vos, Lagae, Van Puyenbroeck, & Scheerder, 2016; Wicker, Hallmann, & Zhang, 2012; Wicker, Prinz, & Weimar, 2013). Nonetheless, few studies have empirically tested the effect of investment in *health capital* on participation-related expenditures.

Health is a key motivation for marathon running (Masters, Ogles, & Jolton, 1993; Shipway & Holloway, 2016; Xing, X., 2016). In the context of this study, running as a manifestation of China's new individualist culture has been embraced by China's growing middle class as a means of achieving health, happiness, and success (Greenhalgh & Winckler, 2005; Ronkainen et al., 2018; Tsang, 2014), notwithstanding increasing concerns about its negative impact on health (Xing, Z., Liu, & Ouyang, 2017). Therefore, it is particularly relevant to include health change in the sport expenditure model. In addition to consumption capital (i.e. sport profiles), social capital and socio-demographics, this study examines the effect of health change, as an indicator of health capital, on running-related expenditures in China.

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<sup>2</sup> Conversions were all based on the exchange rates on December 25, 2017 (the day we closed the survey): €100 to CN¥778.21; US\$100 to CN¥655.42.

## **Theoretical Framework and Literature Review**

Sport consumption is considered to be a process involving two related components: sport participation and sport expenditures (e.g. Downward et al., 2009). For a person to continually engage in sport participation, he or she has to spend money to acquire relevant products and services and allocate time for that participation (Becker, 1965; Taks, Renson & Vanreusel, 1994; Thibaut, Eakins, Vos, & Scheerder, 2016). While the demand for sport goods and services may be derived from sport participation, ultimately, both are derivatives of investments in forms of capital, which determines the efficiency of production (Becker, 1965; Downward et al., 2009). In the context of this study, runners' investment in health, social, and consumption capital is of particular relevance to the economics of sport participation (Downward et al., 2009).

### **Health Capital and Sport Expenditures**

Investment in health is closely related to human capital (Becker, 1965; Grossman, 1972) and is of great importance to sport consumption (Downward et al., 2009). Building on Becker (1965), Grossman (1972) introduced the term "health capital." Originally referred to as "the stock of health," the concept has been used extensively in the field of health economics. Following Grossman's (1972) demand for health model, research has consistently shown that exercise and sporting activities positively affect health capital (e.g. Gerdtham, Johannesson, Lundberg & Isacson, 1999; Humphreys, McLeod & Ruseski, 2014; Nocera & Zweifel, 1998). Health capital consequently affects participation-related expenditures, which may result in a recursive process (Downward et al., 2009).<sup>3</sup> In this study, health capital is defined as the accumulation of health benefits (i.e. health change) from running.

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<sup>3</sup> The use of instrumental variables to address this recursive relationship is described in Data Analysis.

Empirical work revealed that improving one's health was the leading reason why people trained for and ran marathons (e.g. Masters et al., 1993). Similarly, Shipway and Holloway (2013) identified "the desire for health and fitness" (p. 78) as the cornerstone of distance running culture. Health orientation was also the primary motive of marathon runners in China (Xing, X., 2016). From the perspective of investment in health capital, it was assumed that demand for running and the resulting consumption would produce a marginal effect on the stock of health. Indeed, it was posited that sport participation and its related expenditures stemmed from "investment in the stock of personal, social, or health capital of individuals" (Downward et al., 2009, p. 84). Thus, this study examines how perceived change in health due to running, as an investment in health capital, impacts running-related expenditures.

### **Social Capital and Sport Expenditures**

Social capital reflects relationships and networks of influence (Bourdieu, 1986) or value associated with being a member of a social network (Putnam, 2000). Sport group membership, as a proxy for social capital, impacts participation choice and increases participation frequency (Downward, Lera-López, & Rasciute, 2012), which in turn affects sport-related expenditures (Downward et al., 2009; Wicker et al., 2013). While facilitating the formation of social capital (Bourdieu, 1986; Putnam, 2000) and enhancing opportunities for social interaction (Xing, X., Chalip, & Green, 2014), sport groups serve as important settings for socialization in running (e.g. Masters et al., 1993; Xing, X., 2016). In a nationwide survey of Chinese runners, the majority of running group members capitalized on services offered by their groups, among other things, including group training, race registration, and social get-togethers (Xing, X., 2018). Social capital gained from these running group activities may affect running-related

expenditures, either through improved efficiency (i.e. decreasing expenditures) or strengthened preference (i.e. increasing expenditures; Wicker et al., 2013).

In other settings, event participants' motivation to socialize significantly increased the portion of social spending (Xing, X. et al., 2014). Nonetheless, although sport club members were big spenders (Wicker et al., 2010), studies on participation-related expenditures had not yet empirically identified the effect of club or sport community membership, as accrument of social capital, on expenditures (e.g., Thibaut, Vos, et al., 2016; Wicker et al., 2013). In short, this study investigates that effect.

### **Consumption Capital and Sport Expenditures**

The concept of consumption capital was constructed to modify and expand Becker's (1965) household production model (Stigler & Becker, 1977). Exposure to repetitive consumption of similar goods produces consumption capital, involving the abilities and skills necessary for a given consumption activity/domain. Consumption capital affects utility acquisition, as improved consumption skills may foster maximum enjoyment (Scitovsky, 1976). Sport practice and competition as forms of repetitive consumption generate consumption capital that optimizes utility acquisition through improved efficiency and/or strengthened preference (Downward & Riordan, 2007). This in turn impacts financial investment in goods and services associated with that participation (Wicker, Breuer, & Pawlowski, 2010; Wicker et al., 2013).

Participants' sport profiles serve as a proxy for consumption capital (Wicker et al., 2010, 2013). Empirical findings regarding seniority or years of participation and sport expenditures are inconsistent. Research by Taks, Renson, and Vanreusel (1999) showed a positive effect on total sport expenditure (the sum of direct and indirect sport expenses). In Wicker et al.'s (2013)

study, an inversed u-relationship was found in the total expenditure model and the sport equipment expenditure model but not in the competition expenditure model. Accordingly, it is likely that sport seniority, as a component of consumption capital, affects both the efficiency of consumption (i.e. ability to spend less to maintain the same utility) and the demand for participation (i.e. increased demand leading to increased expenditures) in different ways, therefore acting differently upon categories of participation-related expenditures.

Running load depicts a runner's training routine. It captures both time and frequency of running, which are critical for the maintenance and accumulation of consumption capital. Empirically, the amount of time spent (Taks et al., 1999; Wicker et al., 2010, 2013) as well as the frequency of participation (Thibaut, Vos et al., 2016) positively affect participation-related expenditures. In addition to running, runners often include other sports in their exercise regime. Participation in other sports may have a spillover effect on the accumulation of consumption capital in running through a higher skill level (Downward, 2007; Downward & Riordan, 2007; Downward et al., 2012). This may also result in higher demand for running and consequently higher running expenditures. Nonetheless, sport consumption is time-consuming (Taks et al., 1994), particularly marathon running. Participation in other sports may compete with running for leisure time, thus exerting a negative effect on running-related expenditures.

Competitive running events can accumulate consumption capital. As a major source of enjoyment for many runners (Ronkainen et al., 2018), competition strengthens preference and increases demand for running. Essentially, competition builds up expenditures because it may require registration fees, pre-event training, and travel-related expenses (e.g. Sato et al., 2014; Wicker et al., 2012). Moreover, previous research shows that both performance and race

distance, as a reflection of skill levels (i.e. the accumulation of consumption capital), positively affected sport expenditures (e.g. Davies, 2002; Wicker et al., 2013). This study examines the above sport profile variables as proxies for consumption capital on running-related expenditures.

In summary, the purpose of this study is to investigate the effects of health, social, and consumption capital on running-related expenditures, while controlling for socio-demographics and addressing the endogeneity of health change through instrumental variables.

### **Method**

#### **Data Collection**

Data on expenditures of Chinese runners were collected from November 25 to December 25, 2017, using a Chinese survey platform ([www.wjx.cn](http://www.wjx.cn)). The survey link was sent via text messages to 200,000 runners in the 2017 CAA database of full- and half-marathon finishers (GTC, 2018). In return for their participation, runners had the chance to win one of 20 prizes. A total of 38,000 runners visited the survey link, and 29% of them (11,052) completed the survey.<sup>4</sup> The low visit rate can be attributed to the attrition in text message delivery as well as the low likelihood of opening a text message due to the clutter of unsolicited “trash” text messages in China. To ensure data quality, the 11,052 observations were screened based on (a) the amount of time used to complete the survey (as recorded by the survey platform), (b) repeated submission (i.e. those who submitted the survey multiple times to increase the chance of prize winning), and (c) the logic of answers embedded in the survey. Although 10,414 observations passed the screening, 6,693 were used for data analysis due to missing values in running group membership, income, or employment. The dropped sample and the analyzed

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<sup>4</sup> The questionnaire is available as online supplementary material.

sample did not differ significantly across the examined variables.

### **Study Participants**

The participants, who finished minimum one half- or full-marathon in 2017, were non-elite Chinese runners. The sample included both leisure participants (i.e. joggers) and serious participants (i.e. runners, Smith, 1998). They represented different levels (or intensities) of behavioral commitment to running (Derom & Taks, 2011). The sample mainly came from Jiangsu (12.0%), Beijing (11.7%), and Guangdong (9.1%) in China. The majority of the participants were men (75.2%) between 18 and 69 years of age ( $M = 33.55$ ,  $SD = 8.85$ ). While there is no information about the profiles of China's running population at large, geographic distribution, gender, and age compositions of the sample were comparable to the 2017 CAA full- and half-marathon finisher database. Participants had on average 16.14 years of education ( $SD = 1.85$ ). A large percentage of the sample had an annual family income of ¥50,000/€6425 to ¥120,000/€15420 (30.0%) or ¥120,000/€15,420 to ¥300,000/€38,550 (39.7%). Ninety-two percent had jobs with a fixed work schedule (see also Table 1). The sample represented a higher- or medium level of education and income compared to the general Chinese population (Xue et al., 2016).

### **Measurements**

**Independent variables.** An overview of the measurement of all health-, social-, consumption-related, and socio-demographic variables is provided in Table 1. *Health capital* is difficult to measure because it is unobservable (Gerdtham & Johannesson, 1999; Gerdtham et al., 1999). Whereas sophisticated measures such as quality-adjusted life-years were developed to determine a person's health status, some researchers opted for a one-item

## RUNNING-RELATED EXPENDITURES IN CHINA

categorical measure of overall health status due to its high reliability and ease of use (e.g. Gerdtham & Johannesson, 1999; Gerdtham et al., 1999; Nocera & Zweifel, 1998). When inserting different measures of health capital into a model, Gerdtham et al. (1999) showed that the one-item categorical measure yielded similar and even better results, consistent with predictions of the health demand model (Grossman, 1972), than other sophisticated measures. Consequently, this study adopted a one-item health capital measure by asking the study participants the degree to which their health status had changed since taking up running (health change in 5 categories).

<insert Table 1 about here>

Running group membership was used (group membership: dummy variable) to gauge *social capital* (e.g. Thibaut, Vos et al., 2016; Wicker et al., 2013). Moreover, the frequency of attending group activities was measured (group activities in 3 categories). Similarly to research by Thibaut, Vos et al. (2016) and Wicker et al. (2013), *consumption capital* was measured in terms of the runners' sport profiles (in the past year) including running years (in 4 categories), monthly running kilometres (running load in 5 categories), number of other sports practised (other sports), completion of a full-or half-marathon (event distance: dummy variable), number of running events attended (total events), and number of travel events attended (travel events).

Finally, socio-demographics not only affect lifestyle and preferences (Bourdieu, 1984) but also frame sport consumption. Consequently, age, gender (dummy variable), number of years of education (education), family income (in 5 categories), and employment with a flexible or fixed work schedule (work schedule: dummy variable) were used as control variables.

**Instrumental variables.** The “satisfaction with life” domain measures (Cummins,

Eckersley, Pallant, Van Vugt, & Misajon, 2003) were chosen as the instrumental variables for generalized method of moments (GMM) analysis. The two domain variables were living standard and personal achievement, which were measured on a 10-point scale (from 1 = extremely unsatisfied to 10 = extremely satisfied). Furthermore, health status (from 1 = very poor to 5 = excellent) was included in the first stage of the Heckman analysis to meet the modelling requirements.

**Running-related expenditures.** There is no agreement on the definition and categories of sport expenditures (Thibaut, Eakins, Vos, & Scheerder, 2017). To capture the nature of running-related consumption and to align it with goods and services offered by the running industry, the following considerations were taken. First, sport expenditures can be broadly divided into two groups: direct expenditures — related to sport participation — and indirect expenditures that belong to other economic sectors but are incurred for sport purposes (Késenne & Butzen, 1987; Thibaut et al., 2017). Second, competition is an integral part of distance running. Travel to attend running events entails a distinctive set of expenses and is a salient sport tourism outcome (Sato et al., 2014; Wicker et al., 2012). In this context, registration fees are a direct sport expenditure and travel-related expenses are indirect sport expenditures. Finally, a distinction was made between the purchase of durable goods (e.g. sport apparel) and the purchase of non-durable goods (e.g. services in regular training). Consequently, 11 running-related expenditure items were measured. While collectively making up *total running-related expenditures per year* (TOT), the items were grouped into four expenditure categories.

*Training-related expenses per year* (TRN: non-durable, direct sport expenditures) capture expenditures on services and goods for daily training in the past year. The five items

## RUNNING-RELATED EXPENDITURES IN CHINA

are: (1) paid training lessons, (2) rehabilitation and medical services, (3) sport nutrition and supplements, (4) athletic training supplies and medicine, and (5) supplementary training equipment. *Sport apparel expenses per year* (APP: durable, direct sport expenditures) include the following purchases in the past year: (1) running shoes, (2) running apparel and accessories, (3) auxiliary items such as a water bag and athletic glasses, and (4) wearable devices. *Event registration fees per year* (REG: a direct sport expenditure related to competition) refers to the total amount spent on event registration in the past year. For *event travel-related expenses per year* (TOUR: indirect expenditures related to competition), the study participants were asked to estimate the total amount they spent on meals, accommodation, transportation, sightseeing, shopping, and entertainment when travelling to attend running events that required an overnight stay in the past year.

Previous studies noted that, when participants were asked to recall purchase prices over an extended period of time (such as a year), they were often unable to remember the exact amounts due to memory decay (Sudman & Bradburn, 1973; Thibaut, Vos, et al., 2016). We also encountered this issue in the pretest ( $n = 12$ ) when asking participants to report the exact amount spent in the past year. Due to the formidable task of memory retrieval, they experienced frustration and almost quit the survey. Consequently, the expenditure questions were revised, and single-choice questions were developed by coding the range of each expenditure item to appropriate intervals to ease the recall task. Our practice of using intervals to gauge sport expenditures was similar to that used in Scheerder, Vos, and Taks's (2011) study. The 11 expenditure items were consequently converted to numbers by taking the middle point of the expense range for statistical analysis.

## Data Analysis

**Regression analysis using GMM.** Five multiple linear regression models were constructed to examine the effect of three forms of capital on running-related expenditures. The independent variables across all five models include health, social, and consumption capital (respectively health change, running group participation, and sport profiles), and socio-demographics as the control variables (see Table 1). The dependent variables were TOT and four expenditure categories (see Table 2). Given that the expenditure variables were positively skewed (1.352 ~ 2.462, SD = 0.024), the logarithmic form was used to make their distributions closer to the normal distribution. The coefficients ( $\beta_i$ ) were multiplied by 100 to obtain the approximate percentage change in dependent variable ( $\% \Delta \hat{y} \approx 100 \cdot \Delta \log(y)$ ), given one-unit change of factor  $i$ , ceteris paribus. To allow for the interpretation of coefficients associated with dummy variables and ordinal variables, the exact percentage change was calculated by using the formula  $\% \Delta \hat{y} = 100 \cdot [\exp(\hat{\beta}_i) - 1]$  (Wooldridge, 2009).

The models were checked for multicollinearity by calculating variance inflation factors (VIFs). VIF values higher than 10 indicate severe collinearity (Gujarati, 2004). The maximum VIFs in the models ranged from 2.92 to 3.14. Thus no significant multicollinearity problems were detected.

The relationship between health change and running-related expenditures could be recursive (Downward et al., 2009), as runners who spent more might experience more health change and vice versa. The issue of endogeneity was acknowledged and addressed by applying the instrumental variable approach (Wooldridge, 2010). The instruments ( $\mathbf{z}_I$ ) must be relevant to the endogenous explanatory variable  $h$  (i.e. the relevance condition:  $\text{Cov}(\mathbf{z}_I, h) \neq 0$ ) and

uncorrelated with the error term ( $u$ ) in the estimation equation (i.e. the exogeneity condition:  $\text{Cov}(\mathbf{z}_I, u) = 0$ ). In other words, their effects on expenditure variables are only determined through the health change variable.

Two life domain satisfaction variables (i.e. satisfaction with living standards and satisfaction with personal achievement) were chosen as the instruments. Life domain satisfaction reflected a level of positive well-being. Positive well-being was often associated with healthy lifestyles and prudent health behaviors (Grant, Wardle, & Steptoe, 2009). This may lead to desirable health outcomes such as resistance to illness and reduced risk of mortality (e.g. Cohen, Alper, Doyle, Treanor, & Turner, 2006; Koivumaa-Honkanen et al., 2000). It is likely that runners' degree of life domain satisfaction leads them to healthy behavior choices such as refraining from smoking and limiting fat intake (Grant et al., 2009), and this in turn affected the extent to which they improved their health through running. On the other hand, it is unlikely that life domain satisfaction would directly affect expenditures.

GMM was used to estimate the models. The sample of this study was large in size and cross-sectional. The five models were found to be heteroscedastic (White tests:  $491.05 \leq \chi^2 \leq 605.14$ ,  $p < .001$ ). These features led to the choice of GMM as it was efficient for large-scale cross-sectional data, particularly in the presence of heteroscedasticity (Wooldridge, 2010).

The relevance and validity of the instruments were empirically tested. The null hypotheses that the instruments had no impact on health change were rejected (Kleiberg-Paap rk LM tests: from  $43.225 \leq \chi^2 \leq 189.643$ ,  $p < 0.001$ ; Kleiberg-Paap rk Wald tests:  $79.784 \leq F \leq 106.765$ ,  $F > 10$ ). The Hansen J tests at 5% level of significance maintained the null hypotheses that the instruments were exogenous ( $0.199 \leq p \leq 0.626$ ), indicating that the instruments were not

significantly related to the error term of the expenditure equations. Exclusion restriction was satisfied (Woodridge, 2010). Therefore, the instruments were considered relevant and valid for controlling the endogeneity of health change.

**Heckman analysis.** Given that zero observations cannot be converted to natural log, they were excluded from estimation. Zero observations accounted for 0% (TOT), 4.37% (TRN), 0.63% (APP), 0.98% (REG), and 22.05% (TOUR) respectively. The model on TOUR had a significant pileup at the value of zero, meaning that a considerable number of runners who spent zero (missing subject?) on TOUR in the previous year were excluded from the estimation equation. To address this issue, an additional model estimation taking the pileup of zero into account was performed to supplement the GMM estimation on TOUR.

In studies taking an economic approach to examine sport consumption, the Heckman model (e.g. Downward & Riordan, 2007; Pawlowski & Breuer, 2011; Thibaut, Vos, & Scheerder, 2014) or the hurdle model (e.g. Eakins, 2018; Thibaut et al., 2017) is typically employed when the data contains a significant number of zeros. The choice between the two depends on “whether observations of  $y_i = 0$  represent an actual choice of zeros” (Jones, 2000, p.285). The Heckman model assumes that “there is a latent or hidden positive expected sports consumption and non-participation can be said to represent a potential level of consumption” (Eakins, 2018, p.165). The hurdle model (also the Tobit model) takes the zeros as “genuine” due to “the individual’s deliberate choice to abstain from consuming the good” (Thibaut et al., 2017, p. 7).

In this study, we first asked the runners whether they attended travel running events (defined as requiring the runners to leave their regular living space and stay for at least one

night) in the past year. Nonetheless, runners might travel to events but for whatever reason decide not to stay overnight. These runners, albeit treated as non-spenders on TOUR, had “a potential level of consumption” (Eakins, 2018, p.165). Given the way non-spenders on TOUR were defined, the Heckman model was considered appropriate (Humphreys, Lee, & Soebbing, 2011; Jones, 2000).

This choice was further supported for two reasons. First, the Heckman model assumes the error terms of the two stages are correlated (Wooldridge, 2010). In this study, the possibility that certain variables affect both error terms in the TOUR decision and amount equations cannot be eliminated. Second, the Heckman model requires the existence of a sample selection bias (Heckman, 1976). In this study, a sample selection bias was empirically detected (see below). The Heckman model uses an explicit selection equation to correct selection bias in the population model (Leung & Yu, 1996). The first stage selection equation was expressed as follows:

$$s = \begin{cases} 1 & \text{if } z\gamma + v \geq 0 \\ 0 & \text{otherwise} \end{cases}$$

$s = 1$  when log (TOUR) was observed, and  $s = 0$  when log (TOUR) was absent. The vector  $z$  included factors that determined whether a runner attended travel events in the past year. All 6,693 observations were entered to estimate a probit model of  $s$  on  $z$ . The Inverse Mills ratios  $\lambda(z\gamma)$  for each runner  $i$  were computed after the coefficients  $\hat{\gamma}$  were obtained. In the second stage, the selected sample (i.e. all observations for which TOUR was positive) were used to run an OLS regression in which log (TOUR) was the dependent variable and  $\mathbf{x}$  and  $\lambda(z\gamma)$  were the explanatory variables. The second stage equation is expressed as follows:

$$\log(\text{TOUR}) = \mathbf{x}\beta + \rho\lambda(z\gamma) + \mu$$

Since the vector  $\mathbf{x}$  is required to be a strict subset of vector  $\mathbf{z}$ , health status (a variable not affecting running-related expenditure directly), was added to the first stage selection equation to avoid curvilinearity (Heckman, 1979). The coefficient on  $\lambda$  was significant ( $t = -2.36, p < 0.05$ ). The assumption ( $H_0: \rho = 0$ ) was rejected, indicating a selection bias. The sign and size of the coefficients in the Heckman estimation were generally comparable to those in the GMM estimation on TOUR (see Model 5 and Model 6 in Table 3). This reinforced the robustness of the estimators on TOUR.

## Results

### Descriptive Statistics

As shown in Table 1, the runners reported, on average, definite health improvements since running. Mirroring the nascent surge of running in China, more than 90% of the runners started running in the past six years. The majority ran less than 200 km per month (85.1%). They attended, on average, 8.54 running events and 2.5 travel events in 2017; 62.6% of those runners were members of a running group, and 28.2% attended group activities once a week or more.

As shown in Table 2, the runners spent, on average, ¥13295/€1708 ( $SD = ¥12431/€1597$ ) on running in 2017. TRN accounted for ¥2054/€264 ( $SD = ¥2525/€324$ ), APP was ¥5441/€699 ( $SD = ¥4471/€575$ ), REG was ¥1066/€137 ( $SD = ¥1325/€170$ ), and TOUR was ¥4734/€608 ( $SD = ¥7181/€923$ ), representing respectively 15.4%, 40.9%, 8.0%, and 35.6% of TOT. The high standard deviations and the difference between the minimum and the maximum indicated great variations within the sample in their annual running-related expenditures.

<insert Table 2 about here>

### Model Results

Results of the models are reported in Table 3. All five GMM models significantly predicted running-related expenditures. All variables were significant in Model 1 (TOT), while their effects on the four expenditure categories varied.

<insert Table 3 about here>

Health change, as a proxy for health capital, positively affected APP, but was insignificant on TRN, REG, and TOUR. Regarding social capital, running group members spent significantly more on APP and REG than non-group members, but the two did not differ on TRN and TOUR. Frequency of attending group activities positively affected TRN, APP, and REG but not TOUR. Regarding consumption capital, running years positively affected REG and TOUR, but not TRN. The effect of running years on APP was first positive and then dropped to a negative level for runners with six or more years of experience. Running load positively affected all expenditure categories. The number of other sports practised also had positive effects on all expenditure categories with the largest effect size being on TRN. Full-marathon runners spent less on TRN but more on REG and TOUR than half-marathon runners. The two groups did not differ on APP. Numbers of total events as well as travel events attended in the past year positively affected all expenditure categories.

For the control variables, age assumed a curvilinear relationship across all expenditure categories. Male runners spent less than female runners across all expenditure categories. Education positively affected TRN, APP, and TOUR but not REG. Income positively affected all expenditure categories. Runners with a flexible work schedule spent more than runners with a fixed work schedule on TRN, APP, and TOUR, but the two groups did not differ on REG.

## **Discussion**

This study investigated the effects of health, social, and consumption capital on total running-related expenditures per year (TOT) as well as four expenditure categories — training-related expenses (TRN), sport apparel expenses (APP), event registration fees (REG), and event travel-related expenses (TOUR) — while controlling for socio-demographics and the endogeneity of health change. All variables had significant impacts on TOT whereas the effects on expenditure categories varied. This confirmed that expenses associated with participation in a given sport, as a multifaceted product, may differ significantly across categories of goods and services (Eakins, 2016; Pawlowski & Breuer, 2011). The findings supported the call to distinguish between sport-appropriate expenditure categories (Thibaut et al., 2017; Wicker et al., 2013) in order to generate effective management and marketing implications (Eakins, 2016; Pawlowski & Breuer, 2011).

### **Health Capital and Sport Expenditures**

Sport participation and exercise positively contributed to the stock of health (Gerdtham et al., 1999; Grossman, 1972; Humphrey et al., 2014; Nocera & Zweifel, 1998). This study further demonstrated that perceived health benefits of sport participation as health investment drove participation-related expenditures (Downward et al., 2009). Nonetheless, the effect of health change was confined to TOT and APP and not apparent for event-related expenses (i.e., REG and TOUR) and TRN. Further subgroup analyses suggested that runners first formed an expectation about the effect of running on health improvement before they “bought health” through spending on running<sup>5</sup>. In other words, it is likely that the relationship between health

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<sup>5</sup> In the sub-group analysis, similar analyses were carried out but the sample was divided into three groups based on running years (less than one year, one to three years, three years or more). The findings showed that although health change did not

## RUNNING-RELATED EXPENDITURES IN CHINA

improvement and participation-related expenditures is recursive in nature (Downward et al., 2009). Therefore, it can be inferred that runners may have established an association between sport apparel purchases (as expenditures necessary for daily running) and health benefits before they invested in health through APP. On the other hand, an association between health improvement and expenditures on running events, and potentially between health improvement and training services and products geared toward preparation for these events, may not have been established through previous experience. Consequently, no significant effect was observed.

At the policy level, our findings provide support for China's integrated approach of embedding both health and economic objectives in its mass sport policy (The State Council, 2014), as investment in health leads to increased total running expenditures, thereby boosting the running industry. Nonetheless, this comes with caveats. The marathon culture in China downplays safe training and features high injury rates. More than 50% of the Chinese full- and half-marathon runners sustained running injuries in 2017 that adversely affected their health (Xing, X., 2018; Xing, Z., et al., 2017). This might explain why expenditures on running events were not associated with health improvement.

While the Chinese local governments enthusiastically embrace mass participant sport events (MPSEs) to achieve mass sport, health, and economic objectives (GTC, 2018), they should be aware that a marathon event by itself does not improve and in fact may even jeopardize health (Xing, X., 2018; Xing, Z., et al., 2017). Chinese runners mainly run for health<sup>6</sup>

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affect any expenditure in the less-than-one-year group, it significantly affected TOT and APP in other groups. This suggests that those who ran less than one year may not have formed an expectation about running for health improvement at the beginning of the year during which running-related expenditures were measured. Consequently, health change was less relevant to their running-related expenditures. Results are available upon request.

<sup>6</sup> Further data analyses revealed that around 70% of the runners across all running year groups were motivated to run for health; those who ran six or more years were least likely to run for performance; and the longer the years of running, the higher runners rated health change since running. The results are available upon request.

and do not directly associate MPSEs with health benefits. Marathon events should therefore be strategically positioned to build participation momentum (Funk, Jordan, Ridinger, & Kaplanidou, 2011) to help runners to accumulate the health, social, and consumption capital that drives expenditures. In the same vein, marketing communication should focus on the events' experiential aspects such as subculture celebration, enjoyment, socialization (Ronkainen et al., 2018; Shipway & Jones, 2008) while furnishing with tips on safe training and competition.

### **Social Capital and Sport Expenditures**

Social capital generated by sport club membership increased the frequency of sports participation (Downward et al., 2012), which in turn led to increased expenditures. Building on Thibaut, Vos, et al. (2016) and Wicker et al. (2013), this study showed empirically that running group membership or frequency of attending group activities significantly increased TOT, TRN, APP, and REG, thereby highlighting social capital as a driver of running-related expenditures.

Nonetheless, running group membership and activities were insignificant on TOUR. One potential explanation is that being part of a group produces the multiplier effect (Bourdieu, 1986) on the event-related financial investment because of group rate benefits (e.g. sharing travel and accommodation, ability to register at group rates). On the other hand, running group members were frequent event attendees (total running events and travel events attended annually were respectively 10.2 and 3.0 by members and 5.4 and 1.6 by non-members). Further analyses revealed that total events served as a full mediator between group membership and TOUR. This suggests that group membership led to more event attendance and consequently more expenditures on TOUR<sup>7</sup>. Therefore, group participation is economically relevant for

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<sup>7</sup> Further analyses also indicated that total events attended partially mediated the relationship between group membership and TOT/APP/REG. The results are available upon request.

consumption from a scale perspective. Overall, promoting group participation is effective in fostering running-related expenditures.

### **Consumption Capital and Sport Expenditures**

Confirming the statement by Downward et al. (2009) that participation-related expenditures were derivatives of that participation, this study demonstrated that consumption capital was a potent driver of participation-related expenditures (e.g. Taks et al., 1999; Thibaut, Vos, et al., 2016; Wicker et al., 2010, 2013). All consumption capital variables produced positive influences on TOT. Further, corroborating the notion that impacts of consumption capital on participation-related expenditures can vary (Wicker et al., 2013), it was found that the effect of running years was insignificant on TRN and first positive and then negative on APP, while the effect of event distance was negative on TRN and insignificant on APP.

Participation in other sports can either transfer skills that accumulate consumption capital, thus increasing participation and its associated expenditures (Downward, 2007; Downward et al., 2009, 2012; Downward & Riordan, 2007), or compete for limited leisure time, thus reducing expenditures (Taks et al., 1994). Findings of this study supported the former effect. Specifically, while the number of other sports practised had the largest effect size on TRN, it also positively affected other expenditure categories. In addition, our findings demonstrated the critical role of running events in generating consumption capital and attracting expenditures (Sato et al., 2014; Wicker et al., 2012). Through strengthened preference (Wicker et al., 2010, 2013), consumption capital accumulated via event attendance (both total events and travel events) positively affected all expenditure categories — direct and indirect expenditures as well as expenditures on durable and non-durable products. Further, all sport profile variables positively affected

event-related expenditures (i.e. TOUR and REG). Notably, although runners with six or more running years significantly reduced expenditures on APP, their event-related expenditures remained high.

These findings on consumption capital have multiple implications. First, marketing efforts for sport apparel benefit from targeting early career runners but not those with many years of running experience, who spend even less than the novices. Second, joint promotion and cross-recruitment among related sports such as running, cycling, swimming, and triathlon may enhance overall sport consumption provided that the chosen sports do not erode each other's participation time through improved efficiency and strengthened preference. Finally, increasing the supply of running events may economically stimulate the running industry (Sato et al., 2014; Wicker et al., 2012) when properly managed (i.e. steadily developing a healthy participation base and gradually increasing event distances as runners' ability improves). Meanwhile, running events can be used as platforms to promote training-related products and sport apparel through pre-event exhibitions/fairs and targeted communication via the event's media channels.

### **Socio-demographic Characteristics and Sport Expenditures**

The findings confirmed that socio-economic characteristics shaped sport consumption outcomes (Bourdieu, 1984). Consistent with other studies, an inverted U function between age and running-related expenditures was observed (Sato et al., 2014; Wicker et al., 2013). The sample reached the highest TRN at the age of 36.4 years, APP at 39.3 years, REG at 37.7 years, and TOUR at 42 years, suggesting that expenses on training and event registration peaked at younger ages while expenses on sport apparel and travel events peaked at slightly older ages.

Other characteristics being equal, female Chinese runners spent significantly more than male runners. While contrary to findings in other studies (e.g. Lera-Lopez & Rapun-Garate, 2005, 2007; Scheerder et al., 2011), this finding was consistent with those of Wicker et al. (2010).

In line with the literature (e.g. Lera-López & Rapún-Gárate, 2005, 2007; Taks et al., 1999; Wicker et al., 2010, 2013), income exerted a positive effect on expenditure. Its effect size varied across expenditure categories: TOUR was most constrained by income levels while REG was least constrained. These variations were consistent with findings in Eakins' (2016) study on Irish household sport expenditures, which showed that sport participants were more immune to economic constraints on direct expenses such as paying registration fees than indirect expenses such as sports holidays and transportation (Késenne & Butzen, 1987; Thibaut et al., 2017). Consistent with work examining the effect of time on sport consumption (Ohl & Taks, 2007; Taks et al, 1994; Wicker et al., 2010), this study found that a flexible work schedule led to greater expenditures except for REG. It is plausible that REG may not be affected by a flexible work schedule because running events usually take place on weekends and holidays.

These socio-demographic findings have segmentation and policy implications. First, middle-aged Chinese runners should be the primary target for businesses in the running industry. Second, the Chinese female runner segment presents significant market opportunities, particularly for training and apparel. Third, running events aiming to attract tourism spending should target high-income runners, whereas local running events may benefit from targeting all income levels. Finally, policies encouraging a flexible work schedule may facilitate sport consumption.

### **Limitations and Future Research**

This study has a number of limitations that suggest avenues for future research. First, there is the sample selection issue. Longitudinally, runners who stopped running after experiencing deteriorating health were not captured. Cross-sectionally, the sample was limited to Chinese runners who finished at least a half- or full-marathon in the past year. In order to produce a more complete picture, future studies should endeavor to use a longitudinal design and to expand the sample to runners who have run shorter distance events or have never attended a running event.

Second, the choice of instrumental variable “is difficult, if not impossible” (Humphreys et al., 2014, p. 45). While living standard and personal achievement as instruments on health change passed both the under-identification and Hansen J tests in all five models, weak instrument robust tests showed that they were weak instruments in the TRN, REG, and TOUR models, making findings for these models prone to type II error (Wooldridge, 2010). In particular, a potential relationship between health change and TRN may be present but not detected due to the limitations of the instruments. It is recommended that future studies explore alternative instruments such as participation motives (e.g. Dolan, Kavetsos, & Vlaev, 2014; Wicker, 2018) to control endogeneity when examining the effect of health change on participation-related expenditures. Moving forward, a longitudinal study design is called for to address the issue of causality while examining the impacts of health, social and consumption capital on participation-related expenditures (Testoni, Mansfield, & Dolan, 2018).

Third, one Likert scale item was used to measure health change since starting to run. Although it is a reliable measure of health capital (e.g. Gerdtham & Johannesson, 1999;

Gerdtham et al., 1999; Nocera & Zweifel, 1998), future studies are encouraged to apply more sophisticated measures such as quality-adjusted life-years (c.f. Gerdtham & Johannesson, 1999) to gauge change in health capital resulting from sport participation.

Fourth, this study found that the effect of running group participation was insignificant on event travel-related expenses, while another study found group socialization increased event expenditure (Xing, X. et al., 2014). Given that effect can be context-dependent (Taks et al., 1999), the relationship between sport group participation and event-related expenditures requires further investigation.

Finally, the effect of running events on health was not directly tested in this study. There is growing interest in the relationship between MPSEs, health (Murphy & Bauman, 2007; Murphy, Lane, & Bauman, 2015), and subjective well-being (Sato, Jordan, & Funk, 2016; Taks, Littlejohn, Snelgrove, & Wood, 2016; Wicker, 2018). The mediating roles of health and subjective well-being in the relationship between MPSEs and participation-related expenditures warrant future examination.

### **Conclusion**

This study brought out the vibrant sport consumption power in up-and-coming countries like China. Echoing the tenet of the general economic model of sports consumption (Downward et al., 2009), it demonstrated that sport participation fostering health, social, and consumption capital significantly affected participation-related expenditures.

Our study contributed to the literature mainly in four areas. First, it tested health, social, and consumption capital concurrently. Notably, it is one of the first studies to empirically examine the impact of health capital on participation-related expenditures. Second, in

## RUNNING-RELATED EXPENDITURES IN CHINA

responding to calls in previous studies (e.g. Eakins, 2016; Pawlowski & Breuer, 2011; Thibaut et al., 2017; Wicker et al., 2013), it distinguished between training-related expenses, sport apparel expenses, event registration fees, and event travel-related expenses, thus generating specific managerial and marketing implications. Third, it creatively identified life domain satisfaction as the instrument with which to ascertain the effects of health capital on participation-related expenditures. This not only improves the validity of the findings but also adds new variables to the limited pool of instruments used in sport consumption studies (e.g. Humphreys et al., 2014; Wicker, 2018). Finally, by using an eastern culture (China) as the study setting, it extended the generalizability of the economic model of sports consumption (Downward et al., 2009). Overall, this study provided insights that could help policy makers, local governments, and sport organizations to develop strategies for achieving and balancing health, social and economic objectives through mass sport participation (Edwards & Rowe, 2019).

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RUNNING-RELATED EXPENDITURES IN CHINA

Table 1

*Description of independent variables and summary statistics*

Variable	Description	<i>M (%)</i>	<i>SD</i>
Health Change	Health change since starting to run (1 = obvious deterioration; 5 = obvious improvement)	4.396	0.634
Group Membership	Whether belonged to a running group (0 = no; 1 = yes)	0.626	--
Group Activity	Frequency of attending group activities (%)		
	a = less than once a month or none	52.3	--
	b = 1- 3 times per month	19.5	--
	c = $\geq$ once a week	28.2	--
Running Years	Number of years running regularly (%)		
	a = < 1 yr	14.5	--
	b = 1 to < 3yrs	47.5	--
	c = 3 to < 6yrs	29.5	--
	d = 6 yrs or more	8.5	--
Running Load	Average monthly running distance (%)		
	a = < 50km	31.2	--
	b = 50 to < 100km	24.1	--
	c = 100 to < 200km	29.8	--
	d = 200 to < 300km	11.7	--
	e = $\geq$ 300km	3.2	--
Other Sports	Number of other sports practiced	2.468	1.546
Event Distance	Whether completed a full- or half-marathon (0 = half; 1 = full)	0.515	--
Total Events	Number of total running events attended	8.544	8.695
Travel Events	Number of travel running events attended	2.505	2.710
Age	Runner's age (in years)	33.547	8.849
Age Squared	Squared term of age (= age * age)	1203.7	645.1
Gender	Runner's gender (0 = female; 1 = male)	0.752	--
Education	Number of years in education	16.140	1.851
Income	Annual family income (in cn¥ / €; %)		
	a = <¥50000/€6425	12.3	--
	b = ¥50000/€6425 to < ¥120000/€15420	30.0	--
	c = ¥120000/€15420 to < ¥300000/€38550	39.7	--
	d = ¥300000/€38550 to < ¥500000/€64250	11.0	--
	e = $\geq$ ¥500000/€64250	7.0	--
Work Schedule	Flexible or fixed work schedule based on employment (0 = flexible; 1 = fixed)	0.922	--

RUNNING-RELATED EXPENDITURES IN CHINA

Table 2

*Summary statistics of running-related expenditures per year*

Variable	<i>M</i> (in cn¥ / €)	<i>SD</i> (in cn¥ / €)	Min (in cn¥ / €)	Max (in cn¥ / €)
Total (TOT)	13295/1708	12431/1597	100/13	80250/10312
lnTOT	9.07	0.99	4.61	11.29
Training (TRN)	2054/264	2525/324	0/0	17750/2281
lnTRN	7.01	1.23	4.61	9.78
Apparel (APP)	5441/699	4471/575	0/0	22000/2827
lnAPP	8.24	0.95	4.61	10.00
Event Registration (REG)	1066/137	1325/170	0/0	5500/707
lnREG	6.37	1.12	4.61	8.61
Event Travel (TOUR)	4734/608	7181/923	0/0	35000/4498
lnTOUR	8.06	1.22	4.61	10.46

RUNNING-RELATED EXPENDITURES IN CHINA

Table 3

Results of regression analyses

	(1)	(2)	(3)	(4)	(5)	(6)
	TOT	TRN	APP	REG	TOUR	TOUR
	(GMM)	(GMM)	(GMM)	(GMM)	(GMM)	(H-OLS)
Health Change	0.221** (2.92)	0.144 (1.21)	0.322*** (3.77)	0.042 (0.48)	0.058 (0.53)	-0.012 (-0.52)
Group Membership	0.119*** (4.30)	0.027 (0.61)	0.100** (3.16)	0.152*** (4.67)	0.078 (1.93)	-0.01 (-0.15)
Group Activities (Ref = a)						
b	0.037 (1.29)	0.112* (2.45)	0.086** (2.65)	0.056 (1.62)	-0.049 (-1.20)	-0.05 (-1.07)
c	0.073** (2.64)	0.207*** (4.75)	0.123*** (3.89)	0.115*** (3.34)	-0.047 (-1.14)	-0.08 (-1.84)
Running Years (Ref = a)						
b	0.159*** (5.19)	0.071 (1.51)	0.124*** (3.66)	0.191*** (5.76)	0.130** (2.98)	0.12* (2.06)
c	0.148*** (4.35)	0.0730 (1.40)	0.038 (1.00)	0.214*** (5.79)	0.230*** (4.76)	0.22*** (3.69)
d	0.056 (1.32)	-0.125 (-1.85)	-0.135** (-2.71)	0.142** (2.94)	0.160** (2.68)	0.15* (2.00)
Running Load (Ref = a)						
b	0.197*** (7.30)	0.110* (2.52)	0.191*** (6.22)	0.130*** (4.14)	0.150*** (3.75)	0.13** (2.80)
c	0.271*** (8.38)	0.224*** (4.40)	0.300*** (8.27)	0.193*** (5.10)	0.234*** (5.07)	0.29*** (5.27)
d	0.290*** (6.68)	0.241*** (3.52)	0.326*** (6.57)	0.169** (3.18)	0.251*** (4.17)	0.43*** (6.84)
e	0.375*** (6.18)	0.472*** (4.99)	0.427*** (6.33)	0.223** (3.13)	0.201* (2.19)	0.41*** (4.60)
Other Sports	0.062*** (10.56)	0.183*** (19.71)	0.048*** (7.35)	0.021** (2.86)	0.021* (2.38)	0.02 (1.85)
Event Distance	0.100*** (4.77)	-0.091** (-2.70)	0.017 (0.73)	0.260*** (10.43)	0.206*** (6.76)	0.26*** (3.49)
Total Events	0.007*** (6.06)	0.008*** (4.26)	0.009*** (6.43)	0.019*** (12.64)	0.006*** (3.51)	0.024*** (10.77)
Travel Events	0.139*** (36.33)	0.051*** (8.03)	0.051*** (11.53)	0.169*** (35.26)	0.204*** (36.04)	
Age	0.074*** (10.98)	0.079*** (7.35)	0.091*** (11.59)	0.042*** (5.25)	0.081*** (8.08)	0.08*** (7.00)
Age Squared	-0.0009*** (-10.39)	-0.0011*** (-7.47)	-0.0012*** (-11.03)	-0.0006*** (-5.21)	-0.0010*** (-7.23)	-0.001*** (-5.75)

RUNNING-RELATED EXPENDITURES IN CHINA

Gender	-0.201 ***	-0.308 ***	-0.213 ***	-0.0821 ***	-0.117 ***	-0.11**
	(-9.44)	(-8.82)	(-9.15)	(-3.38)	(-3.56)	(-3.10)
Education	0.013**	0.018*	0.012*	0.0089	0.014*	0.02**
	(2.73)	(2.33)	(2.18)	(1.54)	(2.02)	(2.99)
Income (Ref = a)						
b	0.278***	0.223***	0.281***	0.0723*	0.278***	0.30***
	(8.52)	(4.62)	(7.42)	(2.10)	(6.07)	(5.93)
c	0.501***	0.355***	0.505***	0.178***	0.555***	0.58***
	(15.14)	(7.19)	(13.21)	(4.94)	(11.95)	(11.17)
d	0.751***	0.686***	0.736***	0.358***	0.822***	0.89***
	(18.98)	(11.16)	(15.96)	(7.75)	(14.32)	(13.42)
e	0.919***	0.871***	0.888***	0.411***	1.061***	1.19***
	(19.83)	(12.21)	(17.65)	(7.71)	(16.20)	(15.96)
Work Schedule	-0.127***	-0.168***	-0.146***	0.0104	-0.131**	-0.17**
	(-3.92)	(-3.35)	(-3.85)	(0.26)	(-2.78)	(-3.18)
Constant	5.583***	4.022***	4.468***	4.048***	4.568***	5.24***
	(21.19)	(9.66)	(15.04)	(13.14)	(11.51)	(15.91)
<i>F</i>	284.59 ***	72.96 ***	132.02 ***	287.31 ***	229.13 ***	
<i>R</i> <sup>2</sup> <sub>adj</sub>	0.508	0.195	0.311	0.476	0.478	
<i>N</i>	6693	6418	6651	6637	5132	6693

Note. Non-standardized coefficients presented; t-values in parentheses; \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ ; reported F-values refer to the GMM models; due to exclusion of zero expenditure observations, sample sizes of models (2) to (5) are smaller than 6693.