

## **Кривая Энгеля для расходов домохозяйств на досуг и культурные ценности в г. Пермь**

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**Аннотация.** Растущая значимость культуры в социально-экономическом развитии выдвигает анализ «потребления культурных ценностей» на передний план. В статье рассматривается поведение домашних хозяйств, которые тратят деньги на отдых и культурные ценности, а также потенциальные факторы, влияющие на данный вид расходов.

**Ключевые слова:** кривая «доход-потребление», эластичность, потребительские предпочтения, нормальные товары, предметы роскоши, относительные цены.

### **An Engel Curve Analysis of Household Expenditures on Recreation and Culture in the City Perm**

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**Annotation.** The rising significance of culture in social and economic development puts forward the analysis of «cultural consumption». In this paper, we analyze the households that spend money on recreation and culture, the actual amount they spend and the potential factors that influence households' recreation and culture expenditures in Perm city.

**Keywords:** «income-consumption» curve, elasticity, consumer preferences, normal goods, luxury goods, relative prices.

As culture gained more importance in social and economic development issues, it is no longer a marginal or an add-on topic. Scientists are interested in understanding the interaction between culture and social and economic mechanisms. Therefore, there is a great need to collect empirical evidence showing the interplay between these spheres. The social impacts of culture has been studied extensively under many themes, such as social cohesion, personal development, civic participation, community empowerment and self-determination, health, well-being and building social trust, which all, in return, increase social capital. The economic impact of culture has also received significant attention. The OECD estimates show that in 2013 and 2014, the economic contribution of cultural industries to national GDP has been around 4,3% to 6,8% in Canada, UK and USA [9]. In our country this number is near 3,2%, which encourages scientists to investigate this area.

The analysis of cultural consumption from an economic point of view is crucial because it helps to understand who spends on what and to what extent households consume cultural goods and services. Such analysis helps to put together household profiles showing the basic demographic and socio-economic characteristics of households that spend on recreation and culture. Examining these profiles not only provides insight about the demand for recreation and culture, but also helps to better assess the potential social and economic impact of cultural consumption. Moreover, assessing expenditure patterns is important in the context of cultural policy. This helps policy makers to see the potential impact of a planned policy and to evaluate whether it will be effective or not.

The study aims to determine the extent of recreation and culture expenditures in Perm and the profile of households that spend and do not spend money on recreation and culture.

The terms leisure, culture and recreation have been mostly studied together and defined under the same discourse, which is related to quality of living. In line with

the increase in wealth, people started to have more leisure time and sought activities that would increase their quality of living. There exists a definition of cultural consumption (expenditures on culture), which we will use in this research. It is the value of financial transactions in purchasing, subscribing to, or renting cultural goods and services. Recreation, on the other hand, refers to activities, goods and services that help strengthening health and stimulate people's social well being.

We also use the Classification of Individual Consumption according to purpose by United Nations in order to derive the recreation and cultural spending's of households from the whole mass of expenditures. So, according to international classification they are: purchases of audio-visual, photographic and computer equipment; musical instruments; sports equipment; gardening tools and plants; tickets to football matches, concerts, museums, cinemas and theatres; service charges on lottery tickets and other forms of gambling; newspapers and books.

The literature on recreation and culture expenditures consists of various studies on different aspects of leisure, recreation and culture. A big number of studies focusing on patterns of household expenditures in recreation and culture have been undertaken either by national statistical offices or by intergovernmental establishments in the cultural field in order to gather reliable statistics and assemble new indicators through the support of foreign governments. Also a Canadian study [10] finds out that income, household size, household composition and geographic location are highly influential on cultural consumption in Canada.

There is also substantial literature exploring expenditure patterns of households with respect to variables such as income level, age and education. In these studies, Ernst Engel's paper on the relation between income and expenditure on food constitutes the main reference point [4]. Engel curves are used in order to depict the change of expenditure as income changes, in other words to derive income (expenditure) elastic ties, while keeping other variables constant. The reason why Engel curve analyses are intensively used in understanding household expenditure patterns is that they provide policy implications for taxation and pricing, and income distribution and other social matters.

All over the world many studies have implemented Engel-curve analysis to investigate trends and patterns of household expenditures, but we can't say the same about Russia. Most of European studies conducted Engel-curve analysis for all groups of expenditure, whereas only a few of these studies looked at specific expenditure items such as food, alcohol or recreation and culture. Therefore, they did not consider socioeconomic and demographic characteristics of households. Furthermore these studies were conducted in different countries within different social and economic dynamics and it is impossible to draw general conclusions on variables affecting outlays of cultural consumption. Among these studies, Dardis in 1994 provides much insight into the understanding of relations between household income level, education and age of household head, and leisure expenditures, in the United States [2]. In this cross-sectional analysis on households, author initially categorizes the leisure expenditures into three groups: active leisure, passive leisure and social entertainment. Moreover, a study by Deaton puts forward an important demographic detail in the analysis of the effect of age on household expenditures. In his research paper, he proposes a concept of demographic separability. The demographic vector, a set of demographic variables, used in an Engel-curve model may contain a wide range of information [3].

The tendency of males spending more than females (regarding the gender of household head) was noted by Becker [1] and Hill [6] in the end of XX century. A discrete choice model used by Favaro and Frateschi demonstrates that the effects of income, education, gender and age are significant in demand for music. It is also found that these effects differ across different genres of music [5].

All in all, cross-sectional analyses in many countries have tried to find out the determinants that influence household consumption expenditures on recreation and culture. Those studies confirm the consumption demand theory. In the light of these findings, the present study investigates the impacts of some various household characteristics on families' recreation and culture expenditures using data from the Household Budget Survey conducted in 2014 in Perm.

Let us consider the economic chain, which starts with the creation of cultural

goods and services, continues with the production and manufacturing, and ends with the distribution of them. The consumption of cultural goods and services (which goes after distribution) leads to social and economic outcomes. That is how the simplest example illustrates that consumption of these goods and services does not only play an incentive role for sustaining their production, but also generates important economic and social externalities for the whole society. That's why in order to evaluate the outcomes that culture can bring, we need to understand the consumption of it together with the knowledge about consumers' characteristics.

Let's try to answer the following questions: what affects demand for recreation and culture and what drives the consumption of recreational and cultural goods? The answers to these questions lie in the consumer demand theory. From economic studies we know that expenditure is resulted from consumers' behavior. The reason why we consume is to maximize our utility. We purchase goods and services that provide us satisfaction. Prices and income level, set by outside factors, and tastes and preferences, which determine the benefits or satisfaction a person receives are the main forces that defines consumption behavior. Utility is a representation of preferences, the existence of which depends on a set of assumptions formally called axioms of choice, they are: reflexivity, completeness, transitivity, continuity, non-satiation and convexity.

Given that a utility function exists (represents the preference ordering of the consumer) the consumer's problem reduces to constraint maximization: given the price and income level, the consumer seeks to choose a bundle of commodities that maximizes her/his utility. By assuming constant prices, capturing the relation between income and particular categories of expenditure, a model appears which is known as Engel curve. It shows the relationship between quantity and income. With the help of it we can classify goods as luxuries (elasticity  $> 1$ ), necessities ( $0 < \text{elasticity} < 1$ ) and inferior (elasticity  $< 1$ ).

Many functional forms of Engel curves have been explored in the literature. In many of those, certain criteria were sought. Originating from the principles of utility, forms consistent with the adding-up, non-negativity (that the component expenditures

predicted by the model should be non-negative) and saturation restriction (for a commodity there is a finite level that the consumer saturates) were generally preferred. Applied consumption expenditure studies have shown that linear and additive logarithmic forms do not satisfy the demand theory, whereas the best fitting models of Engel curves which satisfy adding-up, non-negativity of the component expenditures and also allow saturation are the Working-Leser models [7]. In particular, the Working-Leser model has proved a better fit to data in cross-sectional studies that is why we will use it in our research. The functional form of the Working-Leser is:

$$\mathbf{w}_i = \mathbf{a}_i + \mathbf{b}_i \log_i + \mathbf{u}_i$$

Where, the dependent variable is the budget share defined:  $\mathbf{w}_i = \frac{\mathbf{p}_i \mathbf{q}_i}{\mathbf{I}}$ ,  $\mathbf{I}$  – income,  $\mathbf{p}_i$ – price,  $\mathbf{q}_i$ – quantity.

So, based on theoretical foundations and previous empirical studies, the Working-Leser model is used in this paper to estimate the effects of expenditure/income and other household variables on recreational and cultural expenditure of households in city Perm.

The extended model we use throughout this study includes the following variables. We need to assume that all our dependent variables are exogenous and do not depend on the unobserved factors:

$$w_i = \beta_0 + \beta_1 \ln(\text{totexp}) + \beta_2(\text{size}) + \beta_3(\text{age}) + \beta_4(\text{gender}) + \beta_5(\text{educ}) + \beta_6(\text{marriage}) + u_i$$

Where: dependent variable – the share of household expenditures on recreation and culture in total household expenditures of Perm families. Totexp- this variable is defined as the logarithmic expression of total average monthly household expenditures in 2014. Based on the empirical findings, household expenditure is expected to have a positive impact on cultural spending, size- a positive relation is expected between household size and the share spent on recreation and culture, age - the theory suggests that age of household head influences household consumption decisions and this is supported by empirical evidence [2]. It is found that as household heads age rises they become less mobile and have less desire to do outdoor

activities, they tend to spend more on expenditures involving passive leisure activities such as watching TV, but less on active leisure and social entertainment activities, such as cycling, going to sports events. Gender - this dummy variable takes «1» for female heads, and «0» for male heads. Empirical findings indicate that male heads tend to spend more than female heads on recreation and culture due to having relatively more leisure time. Educ - we clustered it into two categories: «basic education» and «higher education», 0 and 1 correspondingly. This variable is hypothesized as one of the strongest variables that positively impact the recreation and culture expenditures. Marriage - there are two categories used for this dummy variable. «1» represents married, and «0» is not married (which includes single, never married, divorced, widowed, separated, and living together). We can't predict the impact of this variable concretely.

After explaining our model with its dependent and independent variables, the next step is to determine the best method in order to carry out regression analyses. The choice of the method is closely linked to the data source and the sample characteristics that it exhibits, which we explain next.

We conducted Household Budget Survey in Perm in 2014 among 1000 families, with the help of a questionnaires (both electronic and printed were used). As a result we obtained cross-sectional data containing needed characteristics of households for our modeling. The amazing fact appeared to happen with recreation and culture expenditure data. We assumed that households in Perm will spend less or no money on recreation and culture. In reality it was not: only 34 families of 1000 reported zero expenditure. That is why we have no need to implement, for example, the Tobit model in our analysis, because using standard econometric techniques such as the OLS regression analysis can lead to unbiased and consistent parameter estimates after just excluding this small amount of families from the sample [11]. We predict that in the data only 34 families put zero expenditures, because of, firstly, the status of our city – «The cultural capital of Urals», which means various cultural and recreational options for consumers and, secondly, because of peoples' understanding the necessity of these goods and services in their lives. Now we are able to conduct

preliminary data analyses in order to deeply investigate the profiles of analyzed households.

We start from identifying the outliers. According to the «common sense» expenditures on recreation and culture (as economic variable) should be more than zero. Only restricting the dependent variable we can achieve consistent and unbiased OLS estimates (also the size of a family and age of household head should also be  $> 0$ , according to logics). After identifying outliers let us comment on some main characteristics of our sample. On average, share of recreational and cultural expenditures in total household spending's is 0,17 (with deviation of  $\pm 0,12$ ). Also, we have an auxiliary variable culture (which means expenditures in rubles), but we do not comment on it, because it is used only for deriving the share of recreational and cultural expenditures. According to Working-Leser Engel curve analyses, we need to use share instead of quantitative variable. If to speak about size of a household, the minimum number of people in the family is one (it is a nuclear family). The distribution of size is leptokurtic and positively skewed. The average age of the reference person in the household is 44 years (with the deviation up to  $\pm 17$  years). It means that that there is not a big amount of young families. Moreover, the malegender of household head exceeds female by 649 people. Also there are more married couples 652, compared to not married 271. In our sample we have more people with higher education, compared to basic one. Some words about total spending's – the maximum sum in rubles is 100000, and the minimum is 20000, which means that there is high level of income differentiation [12]. It is an interesting trend that the distributions of variables (except dummies) are positively skewed and leptokurtic.

Before starting multiple regression analyses, let us look on correlation matrix in order to understand what kind of relationships is between variables. There is no sense to construct ordinary correlation matrix, because half of analyzed variables are dummies [11]. We will use Spearman's correlation coefficient in order to overcome this problem. The amazing fact is that the all relationships between variables in our data are statistically significant (except marital status and age of household head).



There is not only weak and medium dependence between variables, but also strong (correlation coefficient between size of family and total expenditures is equal to 0,6). However, there is nothing to worry about, because this coefficient will not lead to multicollinearity problem (if we delete size from the model, nothing will change; if we delete total expenditures there will be no sense of Engel curve analysis). The fact, that all the relationships between our dependent variable and independent ones are negative and statistically significant is quite exciting. Moreover, we can interpret it from the economical point of view. When the age of the household head increases he/she becomes less mobile and interested in cultural and recreational activities. In our city this people will spend more money on medicine, food and other categories, with the increasing of age. Female heads of families in Perm are more likely to spend money on culture than men. We can call it “ladies effect” – females have more time to buy books, go to the cinema and theatre, while men are busy working all day long. The overwhelming relationship is that people with more education (higher degrees) are less spending on cultural and recreational activities. We will try to interpret this relationship after regression analyses. Marital status of observed families influence negatively the cultural and recreational consumption in Perm, mainly because married couples have home duties, children and thus, spend less on “the issues of morality”. The same we can say about household size. The last variable to comment on is the total expenditures of households. When they increase the cultural consumption, according to correlation coefficient, will decrease. Preceding arguments are economically true, but not all of them satisfy the hypothesis of our research. However, let’s look on regression analysis, which is more precise, and obtain more concrete results.

Firstly, we will build multiple linear regression model. It will look like:

$$w_i = \beta_0 + \beta_1(\text{totexp}) + \beta_2(\text{size}) + \beta_3(\text{age}) + \beta_4(\text{gender}) + \beta_5(\text{educ}) + \beta_6(\text{marriage}) + u_i$$

We need to perform Wald test in order to know, do regression coefficients have joint effect on dependent variable or not. As a result we need to accept the alternative hypothesis (regressors are jointly significant at the 1% significance level). The next step in our modeling will be testing its specification. Ramsey test was

performed, and result appeared to be inordinate. Linear specification appeared to be not the ideal functional form of regression. That is why we included nonlinear regressor in the model – squared total household expenditures. The fact is that we tried to square all variables (age and size) except dummies. The results of Reset test did not changed compared with the linear model. However, the crucial assumption in our research is that, according to consumer demand theory and Engel curve analyses, we need use Working-Leser model for cross-sectional data: the dependent variable of which is share of cultural and recreational goods in the whole total expenditures and overall spending's are logarithmic (in order to overcome expenditure differentiation). We tried to use just cultural expenditures as the variable of interest, but our model appeared to be statistically insignificant. All in all, our second model specification will be:

$$w_i = \beta_0 + \beta_1 \ln(\text{totexp}) + \beta_2(\text{size}) + \beta_3(\text{age}) + \beta_4(\text{gender}) + \beta_5(\text{educ}) + \beta_6(\text{marriage}) + \beta_7(\ln(\text{totexp}))^2 + u_i$$

We conclude that after estimating equation by OLS we can interpret our coefficients in non-linear regression, but we cannot rely on their standard errors. However, calculating White heteroskedasticity-consistent standard errors can solve this problem, but the fact is that (in our case) they will change negligibly ( $\approx 0,02-0,04$ ), which does not significantly affect our results which we present next.

In this research Working-Leser model was estimated by OLS (see tab. 1). We do not obtain results of regression by Tobit model, because in our data there are only 34 families with zero expenditure on culture (we have just excluded them as outliers). From the tab.1 we can see that in this research two regression models were built: linear and non-linear (Working-Leser). Both of regressions are statistically significant, but nevertheless some of our hypothesis stated according to the economic model did not come true. Moreover we would not comment on interpretation of linear model because it is misspecified. Even adjusted R-squared of non-linear specification is higher, which is the sign that it is better than linear one (also the probability of F-test is 0,00). Now we will interpret the regression coefficients in the non-linear model built for 923 households in city Perm. It is statistically significant (both some

coefficients and model on the 1% level), so we can give economic interpretation (the whole results of analyses are presented in tab. 1):

$$1) \frac{\Delta \widehat{share}}{\Delta gender} = 0,14. \text{ It means that, if household head is female, share of}$$

cultural and recreational spending's in total expenditures will increase by 0,14 units, compared with male heads (other factors held constant).

$$2) \frac{\Delta \widehat{share}}{\Delta \ln(totexp)} = \beta_6 + 2 * \beta_7 * \ln(totexp) = -2,19 + 0,18 * \ln(totexp) .$$

We can simply equalize this derivative to zero, in order to find the peak of the parabola  $\Rightarrow \ln(totexp) = 11,687$ , thus total expenditures in rubles will be approximately equal to 119047. It means that when families' monthly total expenditures are increasing, households will spend less money on cultural and recreational activities (the share of them will be decreasing), until they reach the sum of approximately 119047. After overcoming the minimum level of cultural and recreational spending's, households are predicted to increase the described share. The minimum share of observed category of expenditures in the whole spending's will be equal to 0,01 (1%).

Table 1

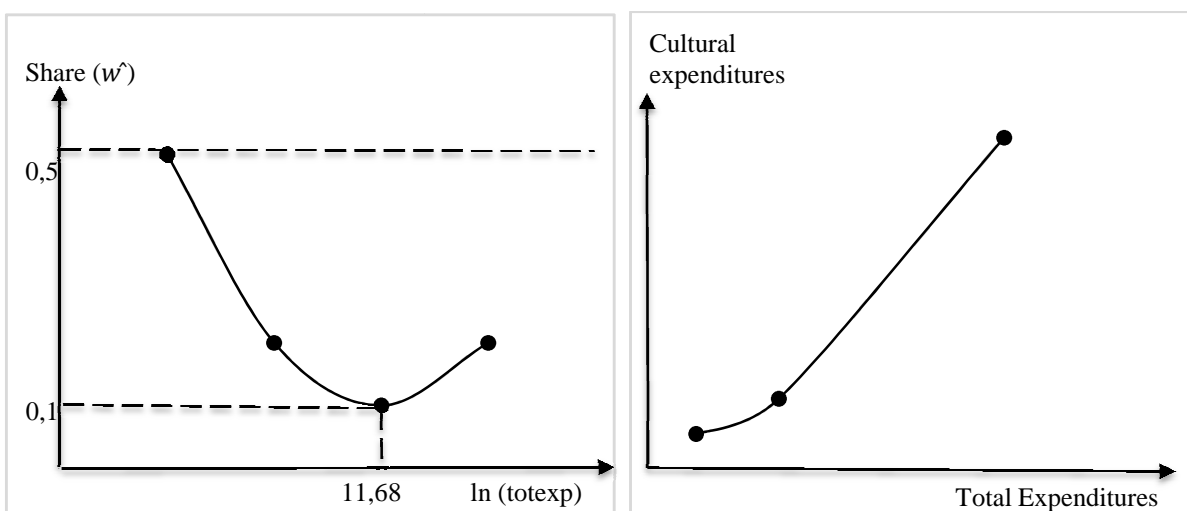
### Linear and non-linear regression models

	Linear multiple regression (1)	Nonlinear multiple regression (2)
<i>educ</i>	-0,0058 (0,009)	0,007 (0,009)
<i>gender</i>	0,029* (0,015)	0,14*** (0,02)
<i>marriage</i>	-0,0007 (0,008)	-0,0006 (0,007)
<i>size</i>	-0,011*** (0,002)	-0,003 (0,002)
<i>age</i>	-0,0003* (0,0001)	-0,00009 (0,0001)
<i>totexp</i>	-0,000002*** (0,0000001)	-
<i>ln totexp</i>	-	-2,19*** (0,57)
<i>ln totexp<sup>2</sup></i>	-	0,09*** (0,02)
<i>Intercept</i>	0,32*** (0,01)	12,7*** (3,14)
<i>R-squared adj (%)</i>	27,7	29,5

Note: statistical significance at 1% (\*\*\*), 5% (\*\*) and 10% (\*). The number of observations is constant (923 obs) during all specifications. Standard errors of coefficients are White heteroskedasticity-consistent.

All in all, the main thing, we have achieved, is the relationship between share of recreational and cultural spending's and overall household expenditures.

Moreover, gender of household person also influence described share. We need to mention that these results were obtained only because of Working-Leser model specification. If we regress just cultural expenditures (not share) on total expenditures and square of them, the both model and coefficients will be statistically insignificant. If we try to conduct the same procedure with linear model we will achieve the same result. After estimating multiple regression and proving of its quality (adjusted R-squared is 29,5 %), we can, finally present, the results graphically. As we mentioned above, there will be parabolic relationship between share of recreational and cultural spending's and total household expenditures (in Cartesian system vertical and horizontal axes correspondingly). The main problem is that we need to construct an Engel curve, which theoretically and traditionally is presented in the Cartesian system with other axes. Vertical axis should be cultural expenditures (in rubles), horizontal – total household expenditures. In the Engel curve analyses there is an assumption that expenditures are approximately equal to income of family. Moreover, according to empirical findings [7], in surveys people also do not want to answer about income and wages that is why expenditure pattern is used in this research. The needed axes were achieved by linearizing natural logarithm of overall household spending's, and multiplying share on them. Results are presented below:



**Graph 1 – Working-Leser relationship and Engel Curve for recreational and cultural goods**

According to the left graph we see that when total household expenditures (their logarithm) grow the share of recreational and cultural goods fall. It was explained by obtained regression coefficients (parabolic relationship). When we

changed our axes to standard ones (for Engel curve modeling), we received that when total household expenditures increase, cultural spending's are increasing too. The result may seem controversial but let's look on the concrete example. Imagine the family that spent in total 50000 rubles on average in a month during year 2014. Cultural expenditures of this family, for instance, will be 12000 rubles (share will be equal to 0,24). Than imagine one more family with overall monthly expenditures of 80000 and cultural spending's will be, for example, 16000 (share will be equal to 0,24). Thus, we can definitely see that when the total expenditures of family are increasing, cultural ones are increasing too, but the share of them will fall. That is why the Engel curve will be the function with positive slope. The economic theory suggests to call this increasing curve – Engel curve for luxury goods. Moreover, the elasticity of cultural and recreational goods by total expenditures will be more than one ( $e_{totexp}^{cult} > 1$ ). We can't calculate concretely this elasticity, because for every family it will be different and it will vary with different household profiles. Nevertheless, the theory suggests that cultural and recreational goods in our city Perm are supposed to be luxuries.

All in all, in this paper Engel curve analysis was conducted on the cross-sectional data with information about average monthly spending's of 1000 households in Perm on cultural and recreational goods. Two regression models were built during research and the highest R-squared had non-linear Working-Leser specification.

In this research we started from the economic modeling of consumer expenditures and included 6 variables, which somehow affect our expenditures on recreation and culture. We stated some hypothesis on the type of relationship between our variables. Some of them were accepted after estimating the relationship with the help of statistical tools. We can predict that in reality total expenditures of family may be interdependent with propensity to consume (see econometric model). Other independent variables may be also dependent on some unobserved factors, but taking the assumption of exogeneity we eliminated these relationships [12].

The most significant step, which predicted the results of research, was preliminary data analyses, especially identification of the outliers. The share of expenditures on recreational and cultural goods were mainly restricted by  $share > 0$ , because from the economic point of view, we should not take into consideration families with 0 expenditures. The sample was not seriously reduced up to 923 observations (after removing all outliers), so we could use simple OLS, instead of, for example, Tobit model.

According to analyses of descriptive statistics for each variable all of them were not normally distributed, which also made some specifics of our research. Moreover, all samples were (the variation coefficient was more than 33%). After preliminary data analyses the Spearman correlation coefficient was calculated, because of dummy variables (gender, marriage, education). The amazing fact was that the correlation between share of cultural and recreational expenditures and other variables were negative and statistically significant. Nevertheless, all coefficients can be interpreted from the economic point of view.

We suppose that results of this paper are not fully consistent with the idea that recreational and cultural goods and services are experience goods (one needs to form a taste through exposure and have a certain level of education in order to consume them). This is somehow the restriction of our research, which we will improve in future studies, by including this variable as a regressor. Moreover, different household expenditure levels observed on recreation and culture indicate different tastes and preferences of households. The difference in taste and preferences might not only be influenced by exogenous factors but also by the supply of recreational and cultural goods and services in different parts of the city Perm and other factors.

In future research other socio-economic profiles can be constructed in order to examine the household spending behavior on recreational and cultural goods and services. As modeling household participation and spending behaviors is becoming a growing interest, we will try to look at the households' cultural participation decisions, which were out of scope in this research due to the data limitation, we had. By utilizing time-use surveys, it would be interesting to look at those who did not

spend on recreation and culture but actually participated in recreation and cultural activities.

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