

How do household disposable income and weekly hours of work influence the development of different kinds of night time economy in UK?

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1. Introduction

As the London's night economy report says, the night-time activities in London are not only bars, pubs and clubs currently, but have evolved further in the activity and participant diversity and job creation (The London Assembly, 2018). Which factors have contributed to this transformation? How about the development of night time economy in the whole UK? This research tries to answer this questions from the perspectives of household disposable income and weekly hours of work, to analyse their relationship with the different kinds of night time economy in UK. As a result, whether the number of service and goods provided by night time economy will grow following the increasing of customers' disposable income and the decreasing of working time can be predicted and the suggestions for the future development of night time economy can be given.

2. Literature Review

Being a precondition for recreation, available time free from working and housework significantly influence the entertainment expenditures (Chen, 2012). Many detailed researches have been done to investigate the relationship from the aspect of the time variance caused by demographic structure. Vogel (2014) points out the demands for leisure service and goods are notably impacted by the changing of different age cohort, while Gladwell and Bedini (2004) indicates the influence factors for leisure time are different in gender. As the time available for night-time activities is difficult to measure for they vary in age, gender, education and so on, to simplify the analysis, this research choose the changing of weekly hours of work by years to represent the trend of time available for night life, assuming the more time is spent in working, the less time is taken to night activities. By analysing the entertainment and leisure expenditures in USA from 1900 to 1961, Owen (1971) found it was closely related to the disposable income. Again, this research use the changing of household disposable income by years to represent the trend of money available for night-time activities to do the analysis. Putting multiple variables such as time variance, disposable income and different kinds of entertainment into single regression is commonly utilized in investigation of analysing the influence factors for entertainment expenditures, however, it disobeys the assumption that the independent variables are independent. Chen (2012) used hierarchical linear regression to analyses the contextual direct effect between different kinds of entertainment and the total entertainment expenditure, and the contextual moderate effect relating various kinds of entertainment to the relationship of time variance and disposable income with entertainment expenditure, but focused too much on the sophisticated methodology, the explanation for how these factors affect entertainment expenditures in real world are omitted. Also, this analysis method cannot investigate the direct relationships between the time variance and disposable income with different kinds of entertainment. Therefore, this research tries to build multiple linear regression models based on working hours and household disposable income for different kinds of night time economy separately to make the analysis procedure and result more concise and straightforward, to interpret the result to the real world more easily and detailed, and to predict the influence of

changing of disposable income and working hours to the development of different categories of night time economy more accurately.

3. Methodology

3.1 Data Source

The data for the number of workplaces in the Night Time Economy (NTE) in UK from 2001 to 2016 are provided by the office of National Statistics (2018) to stand for the development of NTE which are divided into four parts (figure 1): cultural and leisure activities (CLA), activities which support night time cultural and leisure activities (ASNTCLA), 24 hour health and personal social services (HPSS), Activities that support wider social and economic activities (ASWSEA). The data for the median equivalised household disposable income (£ per year based on 2016/17 prices) per household (HDI) and the actual weekly hours of work per person (WHW) in UK from 2001 to 2016 are also provided by ONS (2018). A dataset has been organized derived from these three resources and the descriptive statistics are shown in below (figure 2).

Figure 1 - List of the Standard Industrial Classification (SIC 2007) Codes in the Night Time Economy

Secti on	SIC07 group	SIC07 title	Night Time Economy category
I	55.1	Hotels and similar accommodation	Cultural and leisure activities
I	56.1	Restaurants and mobile food service activities	Cultural and leisure activities
I	56.2	Event catering and other food service activities	Cultural and leisure activities
I	56.3	Beverage serving activities	Cultural and leisure activities
N	80.1	Private security activities	Cultural and leisure activities
R	90.0	Creative; arts and entertainment activities	Cultural and leisure activities
R	91.0	Libraries; archives; museums and other cultural activities	Cultural and leisure activities
R	92.0	Gambling and betting activities	Cultural and leisure activities
R	93.1	Sports activities	Cultural and leisure activities
R	93.2	Amusement and recreation activities	Cultural and leisure activities
G	47.1	Retail sale in non-specialised stores	Activities which support night time cultural and leisure activities
G	47.8	Retail sale via stalls and markets	Activities which support night time cultural and leisure activities
H	49.1	Passenger rail transport; interurban	Activities which support night time cultural and leisure activities
H	49.3	Other passenger land transport	Activities which support night time cultural and leisure activities
I	55.2	Holiday and other short-stay accommodation	Activities which support night time cultural and leisure activities
I	55.3	Camping grounds; recreational vehicle parks and trailer parks	Activities which support night time cultural and leisure activities
I	55.9	Other accommodation	Activities which support night time cultural and leisure activities
O	84.2	Provision of services to the community as a whole	24 hour health and personal social services
Q	86.1	Hospital activities	24 hour health and personal social services
Q	86.9	Other human health activities	24 hour health and personal social services
Q	87.1	Residential nursing care activities	24 hour health and personal social services
Q	87.2	Residential care activities for learning disabilities, mental health and substance abuse	24 hour health and personal social services
Q	87.3	Residential care activities for the elderly and disabled	24 hour health and personal social services
Q	88.1	Social work activities without accommodation for the elderly and disabled	24 hour health and personal social services
A	01.4	Animal production	Activities that support wider social and economic activities
A	01.5	Mixed farming	Activities that support wider social and economic activities
C	10.8	Manufacture of other food products	Activities that support wider social and economic activities
C	22.2	Manufacture of plastics products	Activities that support wider social and economic activities
C	28.9	Manufacture of other special-purpose machinery	Activities that support wider social and economic activities
C	29.1	Manufacture of motor vehicles	Activities that support wider social and economic activities
G	46.3	Wholesale of food; beverages and tobacco	Activities that support wider social and economic activities
H	49.4	Freight transport by road and removal services	Activities that support wider social and economic activities
H	51.1	Passenger air transport	Activities that support wider social and economic activities
H	52.1	Warehousing and storage	Activities that support wider social and economic activities
H	52.2	Support activities for transportation	Activities that support wider social and economic activities
H	53.2	Other postal and courier activities	Activities that support wider social and economic activities
J	58.1	Publishing of books; periodicals and other publishing activities	Activities that support wider social and economic activities
J	59.1	Motion picture; video and television programme activities	Activities that support wider social and economic activities
J	59.2	Sound recording and music publishing activities	Activities that support wider social and economic activities
M	75.0	Veterinary activities	Activities that support wider social and economic activities
N	82.2	Activities of call centres	Activities that support wider social and economic activities
P	85.5	Other education	Activities that support wider social and economic activities
S	94.9	Activities of other membership organisations	Activities that support wider social and economic activities

Figure 2 – Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
CLA	16	238895	268995	249127.19	8805.760
ASNTCLA	16	76110	87590	80145.63	3342.907
HPSS	16	47050	76470	60235.31	8598.886
ASWSEA	16	255450	310180	269639.38	14407.199
HDI	16	23004	27310	25200.63	1041.441
WHW	16	31.51399651	32.72603028	32.02702177	.2987993674
Valid N (listwise)	16				

3.2 Data Analysis

To analyse the relationship of CLA, ASNTCLA, HPSS and ASWSEA with HDI and WHW, we build multiple regression model for each part of NTE separately. Setting the hypothesis as “Both HDI and WHW have relationships with the number of workplaces of CLA, ASNTCLA, HPSS and ASWSEA in UK”, the equations for CLA, ASNTCLA, HPSS and ASWSEA are built like below.

$$CLA = \beta_0 + \beta_{01} * HDI + \beta_{02} * WHW + \varepsilon_0$$

$$ASNTCLA = \beta_1 + \beta_{11} * HDI + \beta_{12} * WHW + \varepsilon_1$$

$$HPSS = \beta_2 + \beta_{21} * HDI + \beta_{22} * WHW + \varepsilon_2$$

$$ASWSEA = \beta_3 + \beta_{31} * HDI + \beta_{32} * WHW + \varepsilon_3$$

To verify whether these equations are feasible, F-test and T-test are utilized.

3.2.1 F-test

H₀: All coefficients = 0

H₁: At least one $\beta_j \neq 0$, $\alpha = 0.05$

If p-value > 0.05, not enough evidence to reject H₀. If p-value ≤ 0.05 , reject H₀, accept H₁.

3.2.2 T-test

H₀: Gradient = 0

H₁: Gradient $\neq 0$, $\alpha = 0.05$

If p-value > 0.05, not enough evidence to reject H₀. If p-value ≤ 0.05 , reject H₀, accept H₁.

4. Result

The results of p-value for F-test for four models are all less than 0.05, so we accept that at least one $\beta_j \neq 0$ is true in 0.05 significant level. As the p-value for T-test for HDI are also all less than 0.05, we accept that the gradient for HDI is not equal to zero, while this for WHW are more than 0.05 in CLA, ASNTCLA and HPSS models, which means we don't have enough evidence to reject the hypothesis that the gradient of WHW is equal to zero. However, the p-value for T-test for WHW in ASWSEA model is still less than 0.05, indicating we can reject H_0 , and believe WHW has linear relationship with ASWSEA in 0.05 significant level.

Figure 3 – p-value for Four Models

Model	CLA	ASNTCLA	HPSS	ASWSEA
p-value for F-test	0.000	0.000	0.000	0.000
p-value for T-test for HDI	0.000	0.000	0.000	0.000
p-value for T-test for WHW	0.219	0.408	0.736	0.020

To build more suitable models for CLA, ASNTCLA and HPSS, we delete the variable of WHW which gradient is equal to zero in high possibility. The new p-value for F-test and T-test are all less than 0.05, meaning the four established regression models are possible. The adjusted R square in figure 4 implies HDI can explain 65.7% variance of CLA, 66.1% variance of ASNTCLA, 67.2% variance of HPSS, and both HDI and WHW can explain 71% variance of ASWSEA, meaning four parts of NTE can fit the final regression line well.

Figure 4 – Adjusted R Square and p-value for F-test for Four New Models

New Model	CLA	ASNTCLA	HPSS	ASWSEA
Adjusted R Square	0.657	0.661	0.672	0.710
p-value for F-test	0.000	0.000	0.000	0.000

The coefficients of four new models are shown like below (figure 5-8):

Figure 5 - Coefficients for CLA Model

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1 (Constant)	73413.757	32239.391		2.277	0.039					
HDI	6.973	1.278	0.825	5.455	0.000	0.825	0.825	0.825	1.000	1.000

Figure 6 - Coefficients for ASNTCLA Model

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
2 (Constant)	13277.480	12175.336		1.091	0.294					
HDI	2.653	0.483	0.827	5.496	0.000	0.827	0.827	0.827	1.000	1.000

Figure 7 - Coefficients for HPSS Model										
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
3 (Constant)	-113103.418	30787.152		-3.674	0.003					
HDI	6.878	1.221	0.833	5.635	0.000	0.833	0.833	0.833	1.000	1.000

Figure 8 - Coefficients for ASWSEA Model										
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
4 (Constant)	-683754.751	261203.705		-2.618	0.021					
HDI	13.108	2.106	0.948	6.226	0.000	0.783	0.865	0.865	0.834	1.199
WHW	19454.242	7338.574	0.403	2.651	0.020	0.017	0.592	0.368	0.834	1.199

The equations for four new models are like below:

$$CLA = 73413.757 + 6.973*HDI + \varepsilon_0$$

$$ASNTCLA = 13277.480 + 2.653*HDI + \varepsilon_1$$

$$HPSS = -113103.418 + 6.878*HDI + \varepsilon_2$$

$$ASWSEA = -683754.751 + 13.108*HDI + 19454.242*WHW + \varepsilon_3$$

5. Conclusion and Discussion

This research finds that the different part of night time economy has different relationship with household disposable income and weekly hours of working. Though the increasing of household disposable income will positively relate to the growing of the number of all kinds of night time economy, the weekly hours of working has no significant relationship with the cultural and leisure activities, activities which support night time cultural and leisure activities, and 24 hour health and personal social services, and surprisingly, following the addition of working hours, the number of workplaces of activities that support wider social and economic activities will also rise. One possible explanation for this is the flourishing of night time economy in UK promotes more job opportunities and extending the lasting time of working which result in the addition of weekly hours of working, and this weakens the influence of people may take part in more night-time activities when free time is increasing. The coefficient of household disposable income in cultural and leisure activities and 24 hour health and personal social services are higher than it in activities which support night time cultural and leisure activities, while it in activities that support wider social and economic activities is the highest, which means as the increasing of household disposable income, more workplaces of activities that support wider social and economic activities are needed than other three parts. As the growing of household disposable income in the future is a trend, investors in UK can

put more money in the production of food, plastics, books, sound recordings and so on which are the materials for night-time activities, but devote less money to retail and accommodation which has almost reach the saturation point and are required less by customers.

There are many limitations in this research. The sample of this research is small which only contains the data from the year of 2001 to 2016 because the previous data is difficult to find which may cause the deviation and the result is a little unreliable. The classification of night time economy provided by ONS is also crude and the data for smaller categories of night time economy is unavailable. More detailed analysis in smaller categories based on longer years can be done in the future so that more accurate and reliable suggestions can be given for night time economy. The method for investigating the relationship can be supplemented as well, as hierarchical linear regression can be used to analyse how household disposable income, weekly hours of working, and the number of workplaces of different parts of night time economy influence the development of night time economy in UK in a whole.

Word Count: 1659 words

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