

The Impact of Industrial Structure on Household Expenditure—Based on a Personality Analysis Perspective

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Abstract

This study takes changes in provincial industrial structure as a background, and selects the data of individual and household economy of CFPS 2010 and 2018 as samples, and analyses the influence of the economic variable of industrial structure on household expenditure behaviour based on the perspective of Big Five personality analysis. Based on the empirical results, the following conclusions are drawn: first, the upgrading of industrial structure has a significant role in promoting household expenditure behaviour; second, the role of inter-provincial economic structure on household expenditure behaviour is affected by the personality characteristics of the head of the household; and third, the impact of inter-provincial economic structure on household economic behaviour is heterogeneous in terms of region, urban and rural areas, and income. The study further confirms the important influence of economic structure transformation and upgrading on household economic expenditure behaviour, and particularly illustrates the important role played by personality characteristics in the influencing mechanism, and to a certain extent provides a direction for the integration and development of the current research on industrial economics and personality economics.

Keywords

Industrial Structure, Household Expenditure, Big Five Personality Trait

1. Introduction

Industrial structure is an important criterion for measuring the quality of economic development. By adjusting the industrial structure, optimising the allocation of resources, and promoting technological innovation and industrial upgrading, it is possible to achieve a change in the mode of economic growth and to improve the quality and effectiveness of economic development. On the one

hand, the level of development of different industries has a direct impact on wage levels and income distribution, and the industries in which family members are engaged determine their sources of income and economic status, which in turn determines their choices and abilities in consumption. The adjustment of industrial structure has diversified impacts on different industries, which further affects the consumption and other expenditure activities of different households. On the other hand, commodity price is also a variable that is significantly affected by inter-provincial industrial structure. With the change of industrial structure, the price of certain commodities may rise or fall, and the price level directly affects the consumption level of the residents, thus this will further affect the consumption habits and purchasing power of the residents. Therefore, the adjustment of industrial structure has a multifaceted impact on household expenditure in China.

However, most of the existing literature on the impact of macroeconomic structure on household expenditure behaviour starts from the macroeconomic context, and seldom analyses its role in household expenditure behaviour from the perspective of the personality of the household's micro-subjects. Household expenditure is, after all, a family member-based activity, and the various personality traits of family members will affect the speed of cognitive acceptance and the degree of adaptation of family members to the objective economic environment, and produce different responses to the economic environmental context, thus having a potential and far-reaching impact on the behaviour of household expenditure. As a result, this paper selects household economic data and personal data from CFPS 2010 and 2018 to study the impact of industrial structure on household expenditure behaviour. After docking the household intertemporal data, considering the regional industry and related control variables, first the household expenditure behaviour is subjected to a baseline regression analysis, and then the Big Five personality variables of the head of the household are added to the study, and finally the above empirical results are tested for heterogeneity in terms of region, urban and rural areas, and income. The results show that the upgrading of industrial structure generally boosts household consumption, culture and education expenditures, and the mechanism of action is influenced by the personality traits of the household head such as extroversion, conformity, openness, etc., and the influence on household expenditures is more significant in the western region, urban areas, and high-income households. This paper tries to make an organic connection between regional economics and personality economics research, and also makes a preliminary exploration of the influence mechanism of industrial structure on household expenditure behaviour.

2. Theoretical Foundations and Research Hypotheses

2.1. The Impact of Inter-Provincial Industrial Structure on Residents' Expenditure Behaviour

There is a close link between provincial industrial structure and residents' con-

sumption expenditure, which has been widely discussed in the academic world. The discussion mainly focuses on three aspects: the impact of industrial structure on residents' consumption, the impact of residents' consumption on industrial structure, and the industrial structure and residents' consumption. [Cha and Ji \(2011\)](#) argue that upgrading the industrial structure and promoting economic growth will gradually reduce Engel's coefficient of urban and rural residents' consumption, thereby facilitating an upgrade in their consumption patterns. The study by [Zhao and Wang \(2020\)](#) found that China's industrial structure has a considerable impact on the consumption structure. This suggests that enhancing the inter-provincial economic structure can boost the income and consumption levels of the populace. Furthermore, scholars like [Yi and Zhou \(2018\)](#) and [Wu Jin \(2017\)](#) optimizing residents' consumption structures can effectively promote upgrades in industrial structures. Studies' consumption and industrial structure have also been conducted; [Zhao and Wang \(2020\)](#) found that industrial structure upgrading and residents' consumption can promote each other, but industrial structure upgrading promotes residents' consumption more than the latter promotes the former, and [Wang and Gao \(2023\)](#) pointed out that the industrial structure will help to promote the level of residents' consumption. On the one hand, the construction of industrial structure can promote the improvement of value-added and efficiency in the production of regional economy, so that the types and structure of the production products have undergone significant changes. With the renewal of industrial structure, the proportion of tertiary industry is rising, the types of service industry are diversified, and the development of consumer goods and enjoyment of consumer goods are increased, which significantly promotes the enhancement of the quality of supply, and helps to satisfy the residents' higher consumption demand. On the other hand, the upgrading of industrial structure can provide more high-level, high-quality and high-income jobs, which promotes the increase of household income and enhances the consumption capacity of residents. At the same time, under the premise of guaranteed income, labourers will have more leisure time, more opportunities to engage in recreational activities and cultivate their hobbies, and increase various types of expenditures such as culture and education. Accordingly, this paper puts forward the first research hypothesis.

Hypothesis 1: The upgrading of industrial structure has a facilitating effect on household expenditure behaviour.

2.2. The Effect of Personality Traits on Individual Expenditure Behaviour

In recent years, there has been a growing agreement amongst researchers regarding the description of personality traits, resulting in the proposal of the Big Five personality trait theory. The widespread application of feature classification in empirical research is mainly attributed to its highly generalised and universal nature. The Big Five personality traits constitute a commonly adopted scientific

personality classification in academia. [Costa and McCrae \(1992\)](#) developed this system, comprising five main dimensions and thirty sub-dimensions, specifically rigour, agreeableness, extraversion, openness and neuroticism. These include conscientiousness, agreeableness, extraversion, openness, and neuroticism. Rigour assesses an individual's aptitude in goal-directed behaviour, including action, persistence, and motivation. Extraversion may reflect the level of proficiency and quality of interpersonal interactions. Agreeableness can indicate attitudes of empathy, trust, and tolerance that an individual possesses towards others. Openness can describe one's cognitive style, while neuroticism may reveal the process of regulating one's emotions. Numerous studies have demonstrated that personality traits exhibit both stability and uniqueness and have the potential to impact individual responses and behaviours across varying situations. The incorporation of personality traits to elucidate individual economic conduct in the field of economics has established a strong basis which has consequently led to the amalgamation of economics and psychology, and brought forth the interdisciplinary field of personality economics. At present, there exists an extensive range of literature on personality economics which scrutinises the influence of personality traits on individual economic behaviour. [Brown and Taylor \(2011\)](#) included personality traits as a variable in household financial asset investment factors, making it the first such study. They found through empirical research that personality traits influence stock investments, but the study lacked an in-depth examination of the mechanism and had certain limitations. To address the limitations of prior research, [Li and Zhang \(2015\)](#), both domestic academics, conducted a study using data from the CFPS "Chinese Family Tracking Survey" project. The study eliminated potential endogenous influence of personality traits on family financial behaviour, and enhanced the understanding of the effect of personality traits on family stock investment. The impact of personality traits on household investment in stocks is further refined. Additionally, the impact of personality traits on portfolio choices and financial decisions within households is subtle. [Goldfayn-Frank \(2018\)](#) discovered that the personality traits of the spouse of the household head also significantly impact financial behaviour. There is a greater quantity of research exploring the influence of personality traits on personal financial behaviour, but these studies frequently prioritise investment aspects ahead of household expenditure behaviour. Most of them are confined to micro-subjective traits impacting household financial behaviour, with little investigation of the potential impact of both individual personality traits and macroeconomic and industrial factors. The present paper aims to cover this research omission.

Household spending behaviour is typically affected by numerous factors, one of which is the impact of personality traits. [Sarker et al. \(2013\)](#) showed that consumers' personality plays a direct and influential role in consumer behavior, because it affects the selection process, learning, and ultimately the purchasing behavior. [Landis and Gladstone \(2017\)](#) study suggests that extroverted individuals

in low-income groups tend to spend more on social status, which can affect their consumer behaviour. Otero-Lopez and Pol (2013) found that neurotic personality traits lead to a facilitating effect on self-compulsive purchases, while Thompson and Prendergast (2015) indicate that extraversion and neuroticism promote impulsive purchasing, while rigour inhibits it. Mehmetoglu (2012) investigated the impact of the “Big Five” personality traits on experiential consumption. Mehmetoglu (2012) examines the “five” personality for the influence of experiential consumption, found openness for cultural entertainment consumption, extreme sports consumption and natural consumption (such as hunting, mountaineering) has a significant effect on promoting, neuroticism for risk-free activities such as cultural entertainment consumption has certain effect, extroversion for leisure social consumption, same sex has positive effect for natural consumption, and rigor for extreme sports consumption has significant negative influence. The big five personality types comprehensively describe the internal tendency and psychological characteristics of human social tendency towards people and things, and these characteristics of the household head play an important role in the economic behavior of the family. Therefore, the second research hypothesis is proposed in this paper.

Hypothesis 2: The impact of changes in industrial structure on household spending behaviour is influenced by the personality traits of the household head.

2.3. Further Consideration of Regional, Urban-Rural Income and Other Factors

There could be various types of dissimilarity in how industrial structure affects household expenditure behaviour. The research conducted by Xiao (2020) reveals that the upgrading of inter-provincial industrial structure significantly enhances residents’ consumption upgrading. Further analysis revealed significant differences in the impact of industrial structural change on residents’ consumption upgrading across China’s three major regions: east, central and west. The promotion effect was found to be more pronounced in the eastern region, and weaker in the central region, while the western region demonstrated the weakest effect. Dong (2020) observes that heterogeneity exists in the impact of upgrading industrial structure on the service consumption of both urban and rural residents. The upgrading of industrial structure exhibits a more significant promotional effect on the service consumption of urban residents, but the promotional effect on the service consumption of rural residents is insignificant or even negative. However, the study conducted by Pan and Qiu (2023) discovered that the positive influence of optimising industrial structure on the consumption rate of rural residents is more pronounced. Wang (2020) highlighted that alterations in the industrial structure will result in changes to the employment structure, which ultimately impacts the labour force structure. In recent years, China’s tertiary sector has undergone rapid expansion, leading to an inevitable adjustment in the industrial structure and subsequent impact on employment. Income gen-

erated from employment serves as the primary source of residents' income, which consequently influences their consumption patterns. The rapid development of the tertiary industry has significantly increased the value of products, while also improving the quality and cost of consumer goods. Emerging service industries are expected to focus on developed cities, thereby creating more opportunities for the local population to participate in economic activities. However, higher-income groups may drive this process. In light of this, a third research hypothesis is proposed in this paper.

Hypothesis 3: The effect of the economic structure on household spending behaviour is heterogenous across regions, urban-rural areas and income levels.

3. Research Design

3.1. Data Sources and Variable Construction

This paper conducts empirical analysis using provincial economic and household data from 2010 and 2018. The province's high-speed railway mileage is sourced mainly from China Railway Corporation (CRCC) website and related news reports. Statistical yearbooks from each province in China serve as the data sources for assessing industrial structure, openness to the outside world, and government expenditure intensity. The Centre for Social Science Research of Peking University conducted the China Family Panel Studies (CFPS) in 2010 and 2018, which provide details on household economic behaviour and various control variables. The survey encompasses 25 provinces, municipalities and autonomous regions in mainland China, except Tibet, Qinghai, Ningxia and Inner Mongolia. The data on the personality traits of household heads in this article were obtained from the adult questionnaire section of the "China Household Tracking Survey", whereas information on household economic behaviour was extracted from the corresponding data in the household economic survey questionnaire of the "China Household Tracking Survey".

This study examines the influence of personality traits of household heads on their economic behaviour in the context of evolving industrial structure. Consequently, the 2010 and 2018 datasets are linked to the personal information of the household head and household economic information, respectively, using household codes. Any data with missing matches or zero income for either the household or head of the household is excluded. To consider panel data characteristics, the 10-year and 18-year data were re-matched using household sample codes, eliminating absent data and resulting in 9340 household observations.

This paper utilises the "Big Five" model as a means of measuring individual personality traits, a widely accepted method within the literature. Unfortunately, the CFPS research form lacked a section specifically designated for the analysis of participant personality traits. We developed a revised iteration of the NEO (Neuroticism, Extraversion, Openness to Experience) personality trait questionnaire originally formulated by [Costa and McCrae \(1992\)](#), incorporating insights gleaned from the British Household Panel Study (BHPS) and the German So-

cio-Economic Panel Study (GSOEP). Drawing on the CFPS questionnaire, we derived five key dimensions of personality traits, which in turn were subdivided into 14 sub-dimensions, as set out in comprehensive detail in **Table 1**. The personality traits of an individual can be classified into various dimensions. These dimensions include the rigour dimension comprising of being organised, enterprising, and cautious; the extroversion dimension incorporating enthusiasm, gregariousness, and positive mood indicators; the conformity dimension consisting of trust, altruism, and obedience indicators; the openness dimension comprised of action, and value indicators; and finally, the neuroticism category

Table 1. Questions in the CFPS questionnaire measuring the “Big Five” personality.

Big Five personality dimensions	Inspection aspects	Key feature	Correspondence issues in CFPS
rigour	methodical	Individual’s organisation of things and work	Degree of neatness of respondents’ clothing
	professional ambition	Individual goals and the drive to achieve them	Importance of having a sense of achievement
	prudence	Individual’s mental state prior to taking action	Respondents’ misgivings about the survey
extraversion	passionate	Individual attitudes towards others and relationships	Respondent’s Human Relationships
	gregarious	People’s willingness to be partners with others	Importance of not being alone
	positive emotions	The extent to which individuals tend to experience positive emotions	The importance of having fun in life
concentricity	trust	Individual’s level of trust in others	Level of trust in strangers
	altruism	Individual’s attention to the interests and needs of others	The importance of not being hated
	obedience	Individual’s tendency to be in conflict with others	Respondents’ level of co-operation with the survey
openness	act	Individual’s propensity to try different activities	Respondents’ interest in the survey
	fig. values (ethical, cultural, etc.)	The extent to which people are opposed to traditional values	Importance of Transmission Reception (reverse)
neuroticism	apprehensive	State of mind when dealing with difficult to grasp or frightening situations	Frequency of feeling nervous
	gloomy	Individual differences in the tendency to experience depressive emotions	Frequency of feeling emotionally frustrated and depressed
	vulnerability	Individual’s state in the face of stress	Degree of perceived ability to de-stress (reverse)

including anxiety, repression, and vulnerability indicators. Before calculating descriptive statistics, the scores for the personality variables were standardised using a range of 1 - 5. To limit the number of explanatory variables employed, the scores from 2 - 3 studied aspects of each personality were averaged. Finally, five explanatory variables were created, accurately representing the personality traits of the head of the household. These variables include Rigour (*con*), Extraversion (*ext*), Agreeableness (*agr*), Openness (*ote*), and Neuroticism (*neu*).

Based on the analysis of the existing documents, this paper selected the following control variables for the study: 1) hukou location (*urban*), with the code "1" for urban hukou and "0" for rural hukou; 2) gender aspect (*sex*), with "1" for male and "0" for female; 3) age group (*age*), 16 - 29, 30 - 39, 40 - 49, 50 - 59, 60 - 65, and 66 and above are set as six levels, with the variables age 16 - 29, age 30 - 39, age 40 - 49, age 50 - 59, age 60 - 65, and age 66; 4) ethnic background (*nation*), with Han Chinese set as "1" and non-Han Chinese set as "0"; 5) political identity (*pol_sta*), CCP member is set as "1", otherwise it is set as "0"; 6) level of education (*edy*), illiterate/semi-illiterate, not in school, primary school, junior high school, senior high school/vocational high school, college, bachelor's degree, and master's degree or above are marked as 0, 1, 2, 3, 4, 5, 6; 7) marital status (*mar*), married (with partner) or cohabiting is coded as "1", otherwise as "0"; 8) whether the respondent holds a managerial position (*mgr*), if so, coded as "1", otherwise as "0"; 9) IQ level (*intel*), assigned a value of 1, 2, 3, 4, 5 based on the interviewer's judgement and rating; 10) years of schooling of the household head (*edy*), which is a whole number between 0 and 23; 11) total personal income of the household head (*income*), in thousands of dollars; 12) total household size (*familysize*); 13) annual per capita household income (*pcfi*), in thousands of dollars. Descriptive statistics of the variables are presented in **Table 2**.

This article provides an initial analysis of the sampled statistical data and identifies that household consumption expenses form the largest proportion of total expenditure, amounting to an average of £11,200. Additionally, there appears to be a significant variance between the minimum and maximum values, suggesting substantial diversity in expenditure among households in this locality. Household spending makes up the majority of total expenditure, on average 104,300 yuan. Meanwhile, cultural and educational spending averages at 60,800 yuan among families, but there are notable variances in spending habits. Simultaneously, there is a noteworthy deviation in the average yearly per capita income of families, indicating substantial variations and disparities in household earnings.

Concerning the personality traits of household heads, they obtained higher scores in extraversion, conscientiousness, and openness, with recorded values of 4.051, 3.672, and 3.197, correspondingly, while obtaining lower scores in conformity and neuroticism, with registered values of 2.505 and 1.914, respectively.

Table 2. Results of descriptive statistics for the sample after head of household and family matching.

Variable name	account for	observed value	average value	(statistics) standard deviation	Minimum value	Maximum values
<i>ln_fep</i>	Log of household expenditure on culture and education	9340	6.080	3.834	0	12.390
<i>ln_cpi</i>	Log of household consumption expenditure	8464	10.430	0.930	5.704	14.415
<i>ln_fes</i>	Log of total household expenditure	9339	10.581	1.023	0	14.518
<i>dk</i>	Miles of high-speed railway in provinces	9340	598.319	568.687	0	17.59
<i>inst</i>	Provincial industrial structure	9340	1.090	0.485	0.518	4.237
<i>open</i>	Degree of openness of provincial economies to the outside world	9340	0.023	0.016	0	0.082
<i>gov</i>	Provincial government expenditure intensity	9340	0.214	0.086	0.096	1.283
<i>con</i>	rigour	9340	3.672	0.729	1	5
<i>ext</i>	extraversion	9340	4.051	0.666	1	5
<i>agr</i>	concentricity	9340	2.505	0.619	1	5
<i>ote</i>	openness	9340	3.197	0.997	1	5
<i>neu</i>	neuroticism	9340	1.914	0.780	1	5
<i>urban</i>	Whether urban household	9269	0.569	0.495	0	1
<i>sex</i>	Male or not	9340	0.743	0.437	0	1
Age 16 - 29	Whether 16 - 29 years old	9340	0.307	0.461	0	1
Age 30 - 39	Are 30 - 39 years old	9340	0.292	0.455	0	1
Age 40 - 49	Are 40 - 49 years old	9340	0.243	0.429	0	1
Age 50 - 59	Are 50 - 59 years old	9340	0.119	0.323	0	1
Age 60 - 65	Are 60 - 65 years old	9340	0.028	0.166	0	1
Age 66-	Whether 66 years and over	9340	0.011	0.102	0	1
<i>nation</i>	Han Chinese or not	9338	0.945	0.229	0	1
<i>pol_sta</i>	Is a member of the Communist Party of China (CPC)	9340	0.134	0.341	0	1
<i>aduy</i>	Academic level	8836	2.183	1.332	0	6
<i>mar</i>	Married or not	9281	0.838	0.368	0	1
<i>mgr</i>	Availability of administrative positions	9340	0.103	0.304	0	1
<i>intel</i>	intelligence level	9340	3.851	0.831	1	5
<i>eduy</i>	educational attainment	9340	9.620	4.269	0	23
<i>Income</i>	Total personal income	9340	32122.98	35272.56	1	800,000
<i>familysize</i>	Household size	9340	4.073	1.757	1	26
<i>pcfi</i>	Annual per capita household income	9146	16,835	25213.51	1	2,400,000

From the basic household heads situation, the majority are male, representing 74.3%. Urban and rural household heads account for a similar proportion. The head of the household is mainly composed of individuals aged between 16 and 49, followed by those aged between 50 and 59 years old. The smallest proportion of heads of household aged above 60. The average length of education for the head of the household is 9.62 years; 83.8% of household heads are married. The majority of household heads are of Han Chinese ethnicity, comprising around 94% of the population. Additionally, approximately 10% of household heads hold administrative leadership positions. The average household population is 4.073 individuals, and the average income of household heads is 321.2298 million yuan.

Furthermore, the industrial structure is progressively shifting towards the tertiary sector.

3.2. Modelling and Variable Definition

In line with the prior theoretical analysis, this study aims to examine the influence of industrial structure transformation and upgrading on household spending behaviour. To attain this objective, our paper adopts [Xiao Biyan's \(2020\)](#) approach and conducts regression analysis to construct an empirical model of household consumption expenditure.

$$consume_{it} = \beta_0 + \beta_1 inst_{it} + \beta_2 controls_{it} + \mu_{it}$$

Among them, *consume* denotes the residents' consumption expenditure variables as the explanatory variables. Following the approach of [Zhan et al. \(2023\)](#), this research identifies three notable variables: logarithm of household cultural and educational expenditures (*log_fep*), logarithm of household consumption expenditures (*log_cpi*), and logarithm of the household total expenditures (*log_fes*). These variables are representative of household expenditure categories. At the same time, the paper employs the output value of both the secondary and tertiary industries as representative industry structure explanatory variables.

Second, *denotes* a set of control variables, following the method of [Li \(2006\)](#), in terms of important macroeconomic controls, this paper chooses the number of high-speed railway kilometres, opening up to the outside world and government expenditure as important macroeconomic control variables. The number of high-speed railway kilometres in each province (*dk*) is used to denote the opening up of high-speed railway in each province (in hundred kilometres), the ratio of real foreign capital to is used to denote the opening up to the outside world (*open*), and the ratio of fiscal expenditure to is used to denote government expenditure (*gov*). Meanwhile, considering the control variables in terms of the household head, this paper also chooses 13 control variables about the household head, namely the location of the household (*urban*), gender (*sex*), age group (*age*), ethnic background (*nation*), political identity (*pol_sta*), education

level (*edy*), marital status (*mar*), whether holding a managerial position (*mag*), IQ level (*intel*), years of education of the household head (*eduy*), and the total personal income of the household head (*income*), the total household size (*familysize*), and the annual per capita household income (*pcfi*). Finally, it denotes the error correction term.

Using the above model, the study analysed how industrial structure upgrading affects household consumption expenditure behavior. Additionally, the study considers the impact of control variables, such as personality traits of household heads, to ensure accuracy. To assess the influence of various personality traits of household heads on the impact of industrial structure on household consumption expenditure, this paper investigates the effect of industrial structure transformation and upgrading on household consumption behaviour from a personality trait perspective. The adjustment change of industrial structure serves as a quasi-experiment. The correlation analysis model for this paper is presented below.

$$consume_{it} = \beta_0 + \beta_1 inst_{it} + personality_{it} + \beta_2 inst_{it} + \beta_3 controls_{it} + \mu_{it}$$

where denotes the personality traits of the household head, this paper continues to follow the approach of Li (2006) and includes five explanatory variables representing the personality traits of the household head, namely rigour (*con*), extroversion (*ext*), conformity (*agr*), openness (*ote*) and neuroticism (*neu*).

4. Empirical Results and Analyses

4.1. Benchmark Regression Results

The study began by conducting a regression analysis of household economic behaviour, incorporating the provincial industrial configuration as an explanatory factor. Additionally, specific macroeconomic variables, fundamental household data, and personal information of the household head were considered as control factors. The baseline regression did not account for the impact of the household head's personality traits. The OLS model was employed for regression analysis on household consumption, with consideration for household cultural and educational expenses, household consumption expenses, and overall household expenditures. The reported outcomes are displayed in columns (1) to (9) in Table 3.

Table 3 presents the benchmark regression findings concerning the effects of industrial structure shifts on the behavior of household consumption expenditure. Observing columns (1), (3), and (5), it is evident that the upgrading and transformation of industrial structure immensely positively affects household consumption expenditure behavior. The article introduces additional control variables, included in columns (2), (4), and (6), to account for household expenditure and consumption. As a result, the model's explanatory power is enhanced. Additionally, the article identifies that the coefficient of industrial structure remains significantly positive at the 1% level, indicating that changes in this sector

Table 3. Benchmark regression results.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	ln_fep	ln_fep	ln_cpi	ln_cpi	ln_fes	ln_fes
<i>inst</i>	1.071*** (0.0814)	0.540** (0.230)	0.829*** (0.0193)	0.316*** (0.0487)	0.793*** (0.0205)	0.294*** (0.0487)
<i>dk</i>		0.00007 (0.000149)		0.000458*** (0.0000297)		0.000429*** (0.00003)
<i>open</i>		9.605** (4.213)		2.756*** (0.833)		2.829*** (0.900)
<i>gov</i>		2.641 (2.396)		0.419 (0.491)		0.256 (0.516)
<i>urban</i>		0.0800 (0.251)		0.0467 (0.0505)		0.000543 (0.0553)
Age 16 - 29		-6.453*** (0.849)		-0.997*** (0.188)		-1.102*** (0.204)
Age 30 - 39		-3.626*** (0.737)		-0.710*** (0.168)		-0.860*** (0.177)
Age 40 - 49		-2.372*** (0.635)		-0.416*** (0.152)		-0.533*** (0.152)
Age 50 - 59		-2.687*** (0.529)		-0.312** (0.137)		-0.400*** (0.130)
Age 60 - 65		-1.078** (0.452)		-0.211 (0.135)		-0.255** (0.119)
<i>mar</i>		1.924*** (0.213)		0.165*** (0.0425)		0.195*** (0.0457)
<i>intel</i>		-0.0158 (0.0747)		0.0360** (0.0155)		0.0388** (0.0173)
<i>eduy</i>		-0.0413 (0.0255)		0.00655 (0.00540)		0.00774 (0.00543)
<i>familysize</i>		0.601*** (0.0600)		0.137*** (0.0126)		0.132*** (0.0132)
<i>pcfi</i>		0.00001*** (0.0000)		0.00001*** (0.0000)		0.00001*** (0.0000)
Constant	4.925*** (0.0978)	5.395*** (0.983)	9.531*** (0.0234)	9.227*** (0.218)	9.722*** (0.0247)	9.551*** (0.237)
Observations	9340	9017	8464	8191	9339	9016
Number of id	5734	5617	5510	5395	5734	5617
R-squared		0.201		0.579		0.459

Note: *, **, *** represent 10 percent, 5 percent and 1 percent significance, respectively, with standard errors in parentheses.

maintain a consistent impact on household consumption and expenditure. From the results (2), (4), and (6) columns, For every 1% increase in the ratio of the tertiary industry to the secondary industry in the province where the household is located, the average increase in household cultural and educational, consumption, and total expenditure is 54%, 31.6%, and 29.4% respectively, according to columns (2), (4), and (6). Moreover, household cultural and educational expenditure shows significant positive coefficients at the 5% level, and the coefficients of household consumption expenditure and total household expenditure are significantly positive at the 1% level. Furthermore, household consumption behavior is significantly influenced by control variables such as urban and rural areas, age, marital status, education level, household population size, and per-capita income. The age variable between 16 and 29 years old displays the strongest negative correlation with household cultural and educational expenditure, according to the age data. Marriage, on the other hand, has a significant positive impact on family cultural and educational expenses, with a coefficient of 1.924. Possible improvement. Marriage may considerably elevate family cultural and educational costs related to the schooling of children. Nonetheless, it correlates positively with household consumption and overall expenditure. Additionally, larger household populations have been associated with higher expenses. The upgrading of industrial structure fosters the enhancement of total factor productivity and promotes capital accumulation of micro-entities based on individuals and households. The advancement of the industrial structure has furthered the enhancement of supply side quality, contributing to the increase in household consumption. The benchmark regression substantiates the supposition that the modifications in the industrial structure positively affect the spending behaviours of households.

4.2. Regression Results Considering the Personality of the Head of Household

The benchmark regression confirms the pivotal role of industrial upgrading in influencing household consumption expenditure. Nonetheless, it remains unclear whether personality traits of household heads affect their expenditure behaviour in the context of macroeconomic development. Thus, we examined this by creating an cross-multiplier term between the industrial structure indicators and the personality of the household head. We analysed the impact of the household head's strictness, extroversion, obedience, openness, and neuroticism on household consumption expenditure behaviour and carried out regression analyses accordingly. The regression results are illustrated in **Tables 4-8**.

Tables 4-8 show that in the context of macroeconomic development, specifically changes in industrial structure, each character trait of the head of the household has a significant impact on household expenditure behaviour. When it comes to household consumption, those households exhibiting high levels of rigour, obedience, extroversion, and neuroticism frequently display pioneering

Table 4. Regression results considering the factor of rigorous personality of the head of household.

VARIABLES	(1)	(2)	(3)
	ln_fep	ln_cpi	ln_fes
c. inst# c. con	0.341*** (0.0282)	0.253*** (0.00808)	0.249*** (0.00762)
Constant	4.675*** (0.116)	9.389*** (0.0333)	9.557*** (0.0314)
Control variables	be	be	be
Observations	9017	8191	9016

Note: Same as **Table 3**.

Table 5. Regression results considering extraversion personality factors of household heads.

VARIABLES	(1)	(2)	(3)
	ln_fep	ln_cpi	ln_fes
c. inst #c. ext	0.393*** (0.0357)	0.278*** (0.0108)	0.278*** (0.0103)
Constant	4.349*** (0.158)	9.201*** (0.0479)	9.354*** (0.0453)
Control variables	be	be	be
Observations	9017	8191	9016

Note: Same as **Table 3**.

Table 6. Regression results considering cisgender personality factors of household heads.

VARIABLES	(1)	(2)	(3)
	ln_fep	ln_cpi	ln_fes
c. inst# c. agr	0.348*** (0.0763)	0.297*** (0.0189)	0.269*** (0.0188)
Constant	5.161*** (0.202)	9.644*** (0.0500)	9.869*** (0.0496)
Control variables	be	be	be
Observations	9017	8191	9016

Note: Same as **Table 3**.

Table 7. Regression results considering the factor of open personality of the head of household.

VARIABLES	(1)	(2)	(3)
	ln_fep	ln_cpi	ln_fes
c. inst# c. ote	-0.258* (0.135)	-0.0434* (0.0249)	-0.0644** (0.0292)
Constant	4.469*** (1.107)	9.364*** (0.238)	9.512*** (0.276)
Control variables	be	be	be
Observations	9017	8191	9016

Note: Same as **Table 3**.

Table 8. Regression results considering neurotic personality factors of household heads.

VARIABLES	(1)	(2)	(3)
	ln_fep	ln_cpi	ln_fes
c. inst# c. neu	0.459*** (0.0368)	0.342*** (0.0101)	0.332*** (0.00998)
Constant	5.077*** (0.0803)	9.680*** (0.0221)	9.855*** (0.0218)
Control variables	be	be	be
Observations	9017	8191	9016

Note: Same as **Table 3**.

tendencies in their consumption behaviour. The coefficients for household cultural and educational expenses are 0.341, 0.393, and 0.348 for rigor, obedience, and extroversion, respectively. The corresponding coefficients for household consumption expenditure are 0.253, 0.278, and 0.297, whilst those for total household expenditure are 0.249, 0.278, and 0.269. Under the influence of changes in industrial structure, alterations in income and other factors are likely to facilitate consumption growth among the three personality types of household heads. Furthermore, neurotic household heads demonstrate a significant coefficient of 0.459 for household cultural and educational expenses, while the coefficients for household consumption expenditure and total household expenditure are 0.342 and 0.332, correspondingly. The initial findings show that the head of household's personality plays diverse roles in the upgrading mechanism of industrial structure and has varying impacts on household economic behaviour. Additionally, within the macroeconomic context of industrial structure improvement, significant family members keep influencing consumption and expenditure patterns. Consequently, hypothesis two has been corroborated.

5. Heterogeneity Test Results and Analyses

5.1. Results and Analyses of Regional Heterogeneity Tests

Does the impact of the head of household's personality on household expenditure vary across different regions within a macroeconomic context? Therefore, this study explores regional heterogeneity by dividing the provinces where households are situated into eastern, central, and western provinces based on economic and geographical factors. The model has then regressed with cross-multiplier terms on each group again. The regression outcomes are displayed in **Tables 9-13**.

Table 9. Regression results of the regional heterogeneity test considering the factor of rigorous personality of the head of household.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Eastern Part	Central Section	Western Part	Eastern Part	Central Section	Western Part	Eastern Part	Central Section	Western Part
VARIABLES	ln_cpi	ln_cpi	ln_cpi	ln_fep	ln_fep	ln_fep	ln_fes	ln_fes	ln_fes
c. inst# c. con	0.0608** (0.0236)	0.0269 (0.0367)	0.186*** (0.0409)	-0.0425 (0.114)	0.155 (0.184)	0.284* (0.154)	0.0208 (0.0268)	0.0502 (0.0498)	0.154*** (0.0372)
Constant	8.107*** (0.169)	4.449*** (0.278)	8.116*** (0.197)	2.163*** (0.723)	-1.929 (1.534)	0.852 (0.990)	8.254*** (0.185)	5.288*** (0.385)	8.337*** (0.253)
Control variables	be	be	be	be	be	be	be	be	be
Observations	3842	2577	2045	4292	2825	2223	4291	2825	2223

Note: Same as **Table 3**.

Table 10. Regression results of regional heterogeneity test considering extroverted personality factor of household head.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Eastern Part	Central Section	Western Part	Eastern Part	Central Section	Western Part	Eastern Part	Central Section	Western Part
VARIABLES	ln_cpi	ln_cpi	ln_cpi	ln_fep	ln_fep	ln_fep	ln_fes	ln_fes	ln_fes
c. inst# c. ext	0.0283 (0.0228)	0.0375 (0.0306)	0.0642* (0.0343)	0.112 (0.121)	0.188 (0.173)	0.189 (0.161)	0.0441* (0.0265)	-0.00223 (0.0387)	0.0617* (0.0349)
Constant	7.950*** (0.150)	4.350*** (0.242)	7.531*** (0.168)	2.288*** (0.629)	-2.512* (1.324)	0.0779 (0.876)	8.199*** (0.148)	5.100*** (0.338)	7.909*** (0.211)
Control variables	be	be	be	be	be	be	be	be	be
Observations	3842	2577	2045	4292	2825	2223	4291	2825	2223

Note: Same as **Table 3**.

Table 11. Regression results of the regional heterogeneity test taking into account the cisgender personality factor of the head of household.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Eastern Part	Central Section	Western Part	Eastern Part	Central Section	Western Part	Eastern Part	Central Section	Western Part
VARIABLES	ln_cpi	ln_cpi	ln_cpi	ln_fep	ln_fep	ln_fep	ln_fes	ln_fes	ln_fes
c. inst# c. agr	0.0299 (0.0264)	0.00177 (0.0394)	-0.0642* (0.0379)	0.0341 (0.133)	0.0928 (0.222)	-0.229 (0.201)	0.000389 (0.0285)	-0.0742* (0.0434)	-0.0938* (0.0501)
Constant	7.877*** (0.180)	4.345*** (0.278)	7.642*** (0.184)	2.199*** (0.745)	-2.812* (1.534)	0.474 (0.966)	8.195*** (0.179)	5.343*** (0.397)	8.075*** (0.254)
Control variables	be	be	be	be	be	be	be	be	be
Observations	3842	2577	2045	4292	2825	2223	4291	2825	2223

Note: Same as Table 3.

Table 12. Regression results of the regional heterogeneity test considering the factor of open personality of the household head.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Eastern Part	Central Section	Western Part	Eastern Part	Central Section	Western Part	Eastern Part	Central Section	Western Part
VARIABLES	ln_cpi	ln_cpi	ln_cpi	ln_fep	ln_fep	ln_fep	ln_fes	ln_fes	ln_fes
c. inst# c. ote	-0.0345* (0.0183)	-0.0455** (0.0224)	-0.0820*** (0.0242)	-0.0519 (0.0872)	-0.246* (0.128)	-0.159 (0.125)	-0.00352 (0.0194)	-0.0606** (0.0258)	-0.0870*** (0.0275)
Constant	8.101*** (0.187)	4.608*** (0.282)	7.924*** (0.196)	2.502*** (0.759)	-1.170 (1.481)	0.843 (1.033)	8.211*** (0.170)	5.430*** (0.353)	8.337*** (0.241)
Control variables	be	be	be	be	be	be	be	be	be
Observations	3842	2577	2045	4292	2825	2223	4291	2825	2223

Note: Same as Table 3.

Table 13. Results of regression of regional heterogeneity considering neurotic personality factors of household heads.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Eastern Part	Central Section	Western Part	Eastern Part	Central Section	Western Part	Eastern Part	Central Section	Western Part
VARIABLES	ln_cpi	ln_cpi	ln_cpi	ln_fep	ln_fep	ln_fep	ln_fes	ln_fes	ln_fes
c. inst# c. neu	0.0393 (0.0248)	0.0587* (0.0306)	0.130*** (0.0321)	-0.0425 (0.114)	0.155 (0.184)	0.284* (0.154)	0.0208 (0.0268)	0.0502 (0.0498)	0.154*** (0.0372)
Constant	8.058*** (0.184)	4.583*** (0.273)	7.894*** (0.189)	2.163*** (0.723)	-1.929 (1.534)	0.852 (0.990)	8.254*** (0.185)	5.288*** (0.385)	8.337*** (0.253)
Control variables	be	be	be	be	be	be	be	be	be
Observations	3842	2577	2045	4292	2825	2223	4291	2825	2223

Note: Same as Table 3.

The study findings indicate that the influence of household heads' personality traits on their spending behaviour varies across regions in the context of industrial structural upgrading. Nevertheless, such effects differ. Against the backdrop of growing household cultural and educational expenses and changes in industrial structure, disciplined personalities in the Western region have been notably affected with a coefficient of 0.186. Household consumption expenditure was notably affected for households headed by individuals with both rigorous and neurotic characteristics in the western region, evidenced by a coefficient of 0.284. Additionally, for total household expenditure, those in the western region with rigorous characteristics were also significantly impacted, with a coefficient of 0.154. By contrast, the central and eastern regions displayed less significance compared to the western regions. Possible revision: One possible explanation is that households with strong discipline in the western region may have greater awareness of the functionality and superior quality of recently upgraded products by the industry, leading to increased expenditure on cultural and educational consumption after the transformation of the industrial structure. It is possible that the previous, less diversified industrial structure in the western region contributed to the significant increase in residents' income levels after the optimization of industrial structural transformation. This, in turn, spurred household consumption and total expenditure in the western region. Overall, the modernisation of industrial structure predominantly impacts the Western region, resulting in an emphasis on rigour, assertiveness, and emotional instability, while discouraging compliance and receptivity.

5.2. Results and Analyses of Urban-Rural Heterogeneity Tests

There may be differences between urban and rural households in the impact of the head of household's personality on their spending behaviors amidst industrial restructuring. Additionally, the growth of the tertiary sector is typically more rapid in towns and cities due to disparities in the industrial foundation compared to rural areas. The research investigates the discrepancy between urban and rural households by categorising them accordingly and conducting regression analyses with cross-multiplier terms for each group.

Due to limited space, the regression results of this section have not been reported. There could potentially be discrepancies among spending behaviours impacted by the head of household's personality amidst industrial restructuring between households residing in urban versus rural areas. Furthermore, in comparison to rural regions, towns and cities showcase a more accelerated growth rate of the tertiary sector, due to the dissimilarities in industrial foundation. The study examines the dissimilarity between households located in urban and rural areas by classifying them appropriately and carrying out regression analyses with cross-multiplier terms for each group.

5.3. Results and Analyses of Income Heterogeneity Tests

The impact of personality traits of the household head on household spending

behaviour in the macroeconomic context may be affected by income. The restructuring of industry causes fluctuations in employment, which is the principal revenue source of residents. Income, in turn, plays a crucial role in determining expenditure patterns. Households with higher incomes allocate greater amounts towards developmental and enjoyment expenditure, thus industrial structure upgrading has a more pronounced effect on these households. The investigation analyses income heterogeneity and implements K-means clustering to classify households into two categories: high-income and low-income households. The study regresses the model considering the cross-multiplier term for each group again.

Due to limited space, the regression results of this section have not been reported. The impact of industrial restructuring on household consumption expenditure was different for the high-income and low-income groups. The impact of industrial structure on the high-income group is considerably greater than that on the low-income group regarding the degree to which extraversion and conformity facilitate, and neuroticism inhibits. Conversely, the impact of industrial structure on the low-income group is significantly higher than that on the high-income group in terms of rigour's inhibiting effect. Industrial structure has a noteworthy effect on the total expenses of households in both high and low-income groups, given varying personality traits, with some distinct differences in impact. The inhibiting impact of rigour on industrial structure has a more pronounced effect among the low-income group, whereas among the high-income group, the facilitating impact of conformity and openness, coupled with the inhibiting impact of neuroticism, is more substantial. Overall, the impact of the head of household's personality on household spending habits during industrial structure upgrading is more evident in the high-income bracket and to a lesser extent in the low-income bracket.

6. Innovation, Conclusion and Recommendations

Previous scholars in the study of the relationship between the adjustment of economic structure and economic development have mostly studied the impact of the industrial structure of the province on the macroeconomic factors of the main body of the economy, and few scholars have paid attention to the impact of the industrial structure on the expenditure behaviour of micro-individuals such as households. This paper to some extent makes up for the shortcomings of previous studies in the literature. In addition, this paper provides an idea for the integration and development of regional economics and personality economics.

The results show that the upgrading of industrial structure generally boosts household consumption, culture and education expenditures. Meanwhile, the role of inter-provincial industrial structure on household expenditure behaviour is affected by the personality traits of household heads, and the expenditure beha-

viour of households with strong rigour, conformity, extroversion and neuroticism is biased towards pioneering, while that of households with strong openness is biased towards conservatism. Through the heterogeneity analysis, this paper further finds that the impact of industrial structure upgrading on household expenditure behaviour in general is more significant in western provinces, towns and cities, and households with high incomes. The study further confirms the important influence of economic structure transformation and upgrading on household behaviour, and illustrates in particular the important role played by personality traits in the influencing mechanism, and to a certain extent provides a direction for the development of the integration of the current research on industrial economics and personality economics.

The following policy recommendations are made in response to the findings of this paper:

Firstly, great importance should be attached to the role of upgrading the industrial structure in boosting household expenditure and promoting technological innovation and social renewal in traditional industries. It should give full play to the Government's guiding role in reallocating resources and capital to industries with higher value-added and market competitiveness, so as to make the entire economic system more stable and healthy. At the same time, the Government should also pay close attention to the requirements for the transformation and upgrading of enterprises, increase its support and encourage innovation and development, so as to create more opportunities for families and provide them with better employment opportunities and room for income growth, thereby realising the optimal effect of industrial restructuring on promoting household expenditure.

Secondly, we should pay attention to the effect of the personality characteristics of the head of household on household expenditure. In the era of e-commerce economy, the consumer behavior of online shopping platforms can be obtained through data analysis (including the accuracy of choice, the length of time to buy, the newness of consumer goods, etc.), and the Big Five personality characteristics of consumers can be inferred, then according to the user's personality characteristics recommended in line with the user's own personality and temperament of goods, so as to promote the growth of consumption. For example, rigorous individuals tend to shop around and buy good value for money; open-minded individuals are open to new things and are more likely to buy novelty goods. At the same time, in the process of promoting the transformation and upgrading of industrial structure, relevant departments need to pay attention to the cultivation and enhancement of positive personality characteristics, we should cultivate and develop the positive personality traits of the household heads, such as homology and extroversion, so as to give full play to the role of industrial structure upgrading in promoting consumption and expenditure growth.

Thirdly, when formulating policies related to consumption upgrading, the Government should be aware of the differences in the impact of industrial re-

structuring on the expenditure behaviour of residents and formulate differentiated policy measures. First, in the western region, it should promote the development of the manufacturing and service industries, increase the proportion of secondary and tertiary industries, and raise their value-added, so as to promote the sustainable development of the western region's economy and raise the income level and consumption capacity of local residents. For urban areas, efforts should be made to accelerate the upgrading of the industrial structure in towns and cities, and relevant measures should be taken, such as supporting scientific and technological innovation and high-tech industries, etc. For rural areas, the development of the secondary and tertiary industries in villages should be promoted, taking into account the local economic conditions. In addition, according to the strength of the influence of industrial structure upgrading on the expenditure of different income groups, policies should be formulated in a targeted manner to stimulate the consumption willingness of high-income groups and promote common prosperity in high-quality development.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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