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E-Commerce Development and Household Consumption Growth in China

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Abstract

China has quickly become the largest e-commerce market in the world. By matching a nationally representative China Family Panel Studies survey with county-level e-commerce information obtained from Alibaba, this paper examines how e-commerce development has shaped household consumption growth in China. The paper presents three major findings. First, e-commerce development is associated with higher consumption growth. Second, the relationship is stronger for the rural sample, inland regions, and poor households, suggesting that e-commerce development helps reduce spatial inequality in consumption. Third, the consumption of durable goods and in-style goods has grown faster than the consumption of local services.

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E-Commerce Development and Household Consumption Growth in China

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I Introduction

The first big move in online sales came with the founding of Amazon.com in 1994. At the time, the company sold only one product, books, but founder Jeff Bezos had bigger plans to sell "Anything with a capital A." By 2016, the company had succeeded in that plan and sold $136 billion in goods.[1] Meanwhile, in 1999, not long after Bezos launched Amazon, Jack Ma established Alibaba.com, a business-to-business marketplace based in China. In 2018, Alibaba set a milestone for online sales with its Singles' Day sale, which netted $30.8 billion in transactions, doubling the combined sales for the two biggest sales days in the United States, Black Friday and Cyber Monday.[2]

E-commerce is a new technology and business mode that allows buyers to make online transactions and receive local package delivery or pickup from sellers. It has reshaped consumption patterns in the years since it was introduced. The welfare implications of e-commerce have been discussed in the literature, mostly focusing on developed countries (Brown and Goolsbee 2000, Hortaçsu et al. 2009, Gorodnichenko and Talavera 2017). On the one hand, e-commerce offers consumers lower search cost and more product variety than traditional retail stores, improving their welfare. Consumers may also gain from accessing merchants online who do not have local brick-and-mortar stores (Dolfen et al. 2019). On the other hand, the intense competition of e-commerce can result in efficiency and welfare gains for the entire society through effects on prices. However, the intense competition may also squeeze out brick-and-mortar stores and smaller retailers, which in turn depresses offline shopping. For example, facing online competition, many physical bookstores have closed (Goldmanis et al. 2010). However, there is a net market expansion effect for consumer electronics, although e-commerce diverts sales from offline, and consumers benefit more than firms from the introduction of e-commerce (Duch-Brown et al. 2017). The net impact of e-commerce depends upon the relative importance of the above factors.

In developing countries, a large proportion of people live in remote areas with limited access to offline retail stores. In these countries, e-commerce may have greater potential to reach a wider range of consumers who are otherwise constrained by limited access to markets than in developed countries. Building a multiregional general equilibrium model and using city-level data, Fan et al. (2016) show that e-commerce development in China disproportionately improves consumer welfare in remote cities. Drawing data from eight counties in three provinces where

[1] http://www.latimes.com/business/la-fi-amazon-history-20170618-htmlstory.html#
[2] https://www.businessinsider.com/black-friday-cyber-monday-vs-singles-day-sales-2018-12.

Alibaba's Rural Taobao program was present, Couture et al. (2017) finds that e-commerce expansion reduces the cost of living for certain groups of the rural population who are induced to use it, though the average effect is muted.

Following the same spirit of Fan et al. (2016) and Couture et al. (2017), our paper examines the relationship between e-commerce development and consumption in China. We extend the model of Startz (2018) to investigate the differential impact of e-commerce on consumption growth by various goods and services. Compared with Fan et al. (2016) and Couture et al. (2017), our paper has a few new features. First, by matching a nationally representative China Family Panel Studies (CFPS) survey with county-level e-commerce information obtained from Alibaba, we can directly examine the impact of e-commerce development on consumption growth at the household level rather than at the aggregate city level as in Fan et al. (2016). Second, our findings are likely more representative because CFPS covers many more counties than the sample used in Couture et al. (2017). Third, using the rich consumption information of the CFPS survey, we can study the heterogenous associations between e-commerce development and various categories of consumption, which were not discussed in Fan et al. (2016) and Couture et al. (2017).

Our paper offers three major findings. First, e-commerce development is associated with higher consumption growth. Lower search cost is a key feature of e-commerce (Bajari and Hortaçsu 2003, Hong and Shum 2006, Brynjolfsson, Dick and Smith 2010, Lieber and Syverson 2011, Levin 2011). Lower search cost makes price discovery easier, bringing the law of one price closer to reality (Gorodnichenko and Talavera 2017). Lower transaction costs increase the level of specialization in the society and create more trade. More competitive prices tend to reduce the cost of living for residents. Couture et al. (2017) show that the expansion of e-commerce to the Chinese countryside is associated with lower cost of living, and for the goods that are available at both the Rural Taobao online terminal and in the village, the median price from the online terminal is cheaper by 15 percent. According to a McKinsey report (McKinsey, 2013), e-tailing may have lowered China's average retail price by 0.2 to 0.4 percent in 2011 and 0.3 to 0.6 percent in 2012. Holding disposable income constant, lower cost of living means more discretionary spending power, which implies higher consumption.

Second, the impact on consumption is conspicuously larger for the rural residents, inland regions, and the poor households, suggesting that e-commerce development helps reduce spatial inequality in consumption. For people in remote areas with limited access to markets, the saving in search costs and the increase in variety of products accessible online compared with in

traditional brick-and-mortar stores can be particularly large. E-tailing is not just a replacement of purchases that would otherwise take place but could spur incremental consumption particularly in small cities and towns where there is pent-up demand for goods that local physical stores cannot deliver (McKinsey, 2013). Couture et al. (2017) show that 62 percent of goods bought through Alibaba's Rural Taobao online terminal were not available in the village, which rises to 84 percent for durable goods. Therefore, they likely benefit more from e-commerce development than their counterparts in more populous and developed regions.

Third, the consumption of durable goods and in-style goods exhibits stronger growth than the consumption of local services. Startz (2018) examines the search and contracting frictions in trade and their role in goods for which sourcing costs and style evolution are of different importance in traditional international trade. Under this framework, by enabling traders to locate nearby producers and sell products directly to consumers, e-commerce can lower travel costs and contracting costs associated with remote ordering. Thanks to the lower costs of travel and contracting, sellers can source more frequently and provide more *a la mode* products and greater variety to consumers. If the cost saving is passed through, consumers will also get lower prices. As the importance of stylishness and degree of cost savings from search and contracting frictions vary by goods and services, the impact of e-commerce on consumer welfare is likely to differ by types of goods and services. Our finding is accordance with the prediction of Startz (2018). Following this introduction, the paper consists of the following parts: Section II describes e-commerce development in China; Section III discusses the theoretical motivation; Section IV presents the empirical model and data; Section V discusses the empirical results; Section VI conducts robustness analysis; and Section VII concludes.

II E-commerce development in China

China has quickly become the largest e-commerce market in the world. The number of Internet users in China reached 772 million in 2017, [3] of which 533 million made purchases online.[4] The annual total e-commerce trade volume in China increased thirtyfold from RMB 930

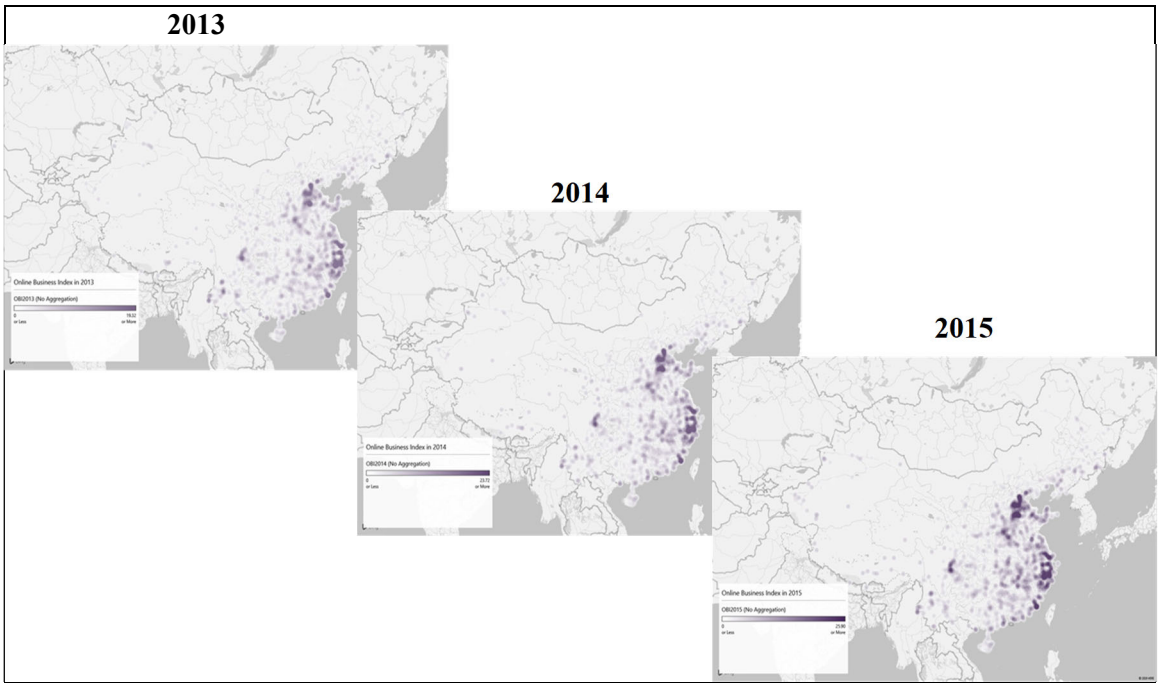
[3] China Internet Network Information Center (CNNIC) (2018). 41st Statistical Report on the Internet Development in China. http://www.cac.gov.cn/files/pdf/cnnic/CNNIC41.pdf
[4] Ministry of Commerce (2017). E-commerce in China 2017. http://cif.mofcom.gov.cn/cif/html/upload/20181101112235744_2017%E5%B9%B4%E4%B8%AD%E5%9B%BD%E7%94%B5%E5%AD%90%E5%95%86%E5%8A%A1%E6%8A%A5%E5%91%8A.pdf

billion in 2004 to RMB 29,160 billion in 2017, a compound annual growth rate of 30 percent.[5] Express mail service exceeded 30 billion pieces in 2016,[6] of which some 60 percent is related to e-commerce.[7] According to a 2017 McKinsey report, China's worldwide e-commerce transaction value grew from less than 1 percent a decade ago to over 40 percent now, exceeding that of France, Germany, Japan, the United Kingdom, and the United States combined (Woetzel et al. 2017). Online retail sales have grown even faster, from RMB 125.7 billion in 2008 to RMB 5,155.6 billion in 2016 – only 1 percent of total retail sales of consumer goods was purchased online in China in 2008, compared with 16 percent in 2016. The number of packages sent through online sales increased tenfold from one billion in 2006 to 10 billion in 2014 (Goldman Sachs 2018). According to the State Post Office, Chinese express firms delivered 40 billion packages in 2017, the majority related to e-commerce.[8]

The development of online retailing, however, remained uneven across Chinese provinces. In 2015, in Beijing, 45 percent of the total retail sales of consumer goods was purchased online, followed by nearly 40 percent in Shanghai, 35 percent in Zhejiang, and 28 percent in Guangdong. However, this share was much lower (less than 2 percent) in nine inland provinces (Figure 1), as measured by the Online Business Index (OBI) and the Online Shopping Index (OSI) developed by AliResearch (map 1 and map 2).[9]

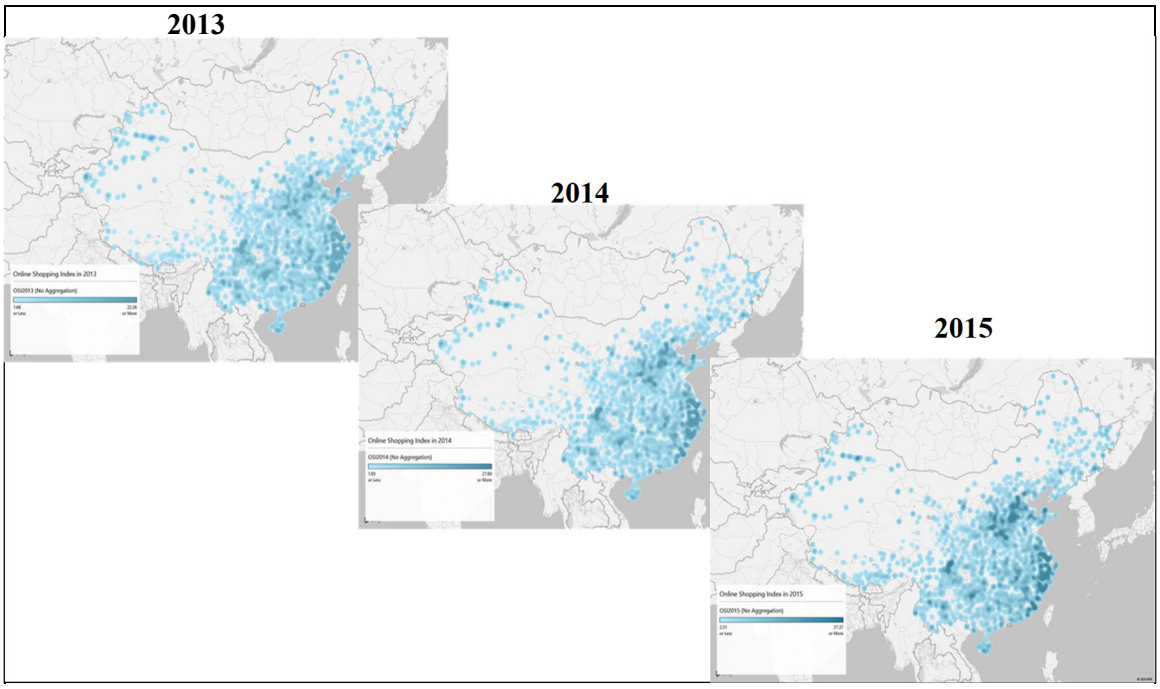
[5] Ministry of Commerce of China. E-Commerce in China (2015, 2016, and 2017).
[6] Source: National Bureau of Statistics of the People's Republic of China, http://www.stats.gov.cn/tjsj/sjjd/201706/t20170626_1506952.html
[7] Source: State Post Bureau of the People's Republic of China, http://www.spb.gov.cn/zy/xxgg/201706/t20170624_1196398.html
[8] http://www.spb.gov.cn/xw/dtxx_15079/201806/t20180604_1581131.html
[9] The OBI and OSI data are obtained from the AliResearch team. OBI is a constructed index measuring the density of online stores and the percent of online stores with annual online sales above RMB 240,000. The value of the index ranges from 0 to 100. The higher the value, the more developed the online sales. OSI is a constructed index measuring the density of online buyers and the percent of online buyers with annual online consumption above RMB 10,000. The value of the index ranges from 0 to 100. The higher the value, the more developed the online purchases. The online transaction numbers are from the Alibaba platform, which accounts for the majority of online transactions in China. The values of the OBI and OSI are not comparable over time due to changes in the methodologies.

Map 1. Online Business Index (county level)



Data source: AliResearch

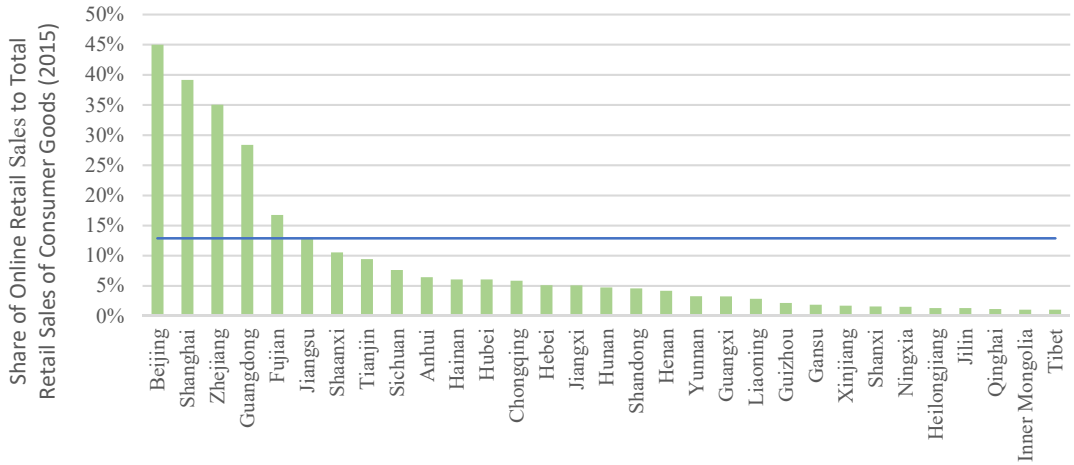
Map 2. Online Shopping Index (county level)



Data Source: AliResearch

There is also a gap in the development of online retail between urban and rural areas**.** Up to December 2016, the rural Internet users in China accounted for 27.4 percent of the national total (731 million), while urban Internet users took up 72.6 percent of the total, much higher than the share of urban population (57 percent). The Internet penetration in urban areas was 69.1 percent, while in rural areas it was only 33.1 percent. Nearly three-quarters of online stores and Internet users were concentrated in urban areas.[10] From a positive perspective, the wide gaps across regions and between rural and urban areas imply large growth potential in the less developed areas. In fact, total online retail transactions have grown faster in rural areas than in urban areas in the past several years. Rural online retail transactions increased from RMB 353 billion in 2015 to RMB 895 billion in 2016, representing 17 percent of the total online retail transactions, an increase from 9 percent in 2015.[11]

Figure 1. Share of online retail sales to total retail sales of consumer goods in provinces (2015)



Source: Staff calculations based on *China Statistical Yearbook 2016*

III Theoretical motivation: Extension of Starts (2018)

In the model developed in Startz (2018), consumers care about both quantities and style of the goods they consume. Traders choose whether to order remotely from suppliers or travel to the suppliers. They also need to decide the optimal stocking period (frequency) to maximize average profit over a period *T*, taking travel cost and the cost of search and contracting associated

[10] Ministry of Commerce of the People's Republic of China 2016. "E-commerce in China, 2016" (中国电子商务报告).
[11] Calculated based on data from the National Bureau of Statistics of China and the Ministry of Commerce of the People's Republic of China, "E-Commerce in China." Total rural online retail transactions refers to the sum of online retail transactions from e-commerce enterprises (including individuals) operated in the administrative regions at the county level or below (excluding city districts) (http://images.mofcom.gov.cn/dzsws/201706/20170611102057O2.pdf).

with remote ordering into account. The optimal stocking period is shorter for varieties evolving more frequently and in greater demand. This holds true also for traders with lower travel cost as the style frontier can only be observed when traders travel to the production location. In a world without e-commerce, traders will choose to travel to the production site if the loss due to search friction and contracting premium overtakes the travel cost, and order less up-to-date varieties remotely otherwise.

E-commerce provides a third option for traders, that is, to locate in the same location as suppliers and sell remotely online to consumers. In this way, they can observe the frontier style without the travel costs, facing lower search friction and contracting costs. In addition, there is a saving in fixed storage cost as they can directly source from suppliers to meet the online order. Therefore, they can keep a limited inventory with minimum cost. In summary, e-commerce can improve consumer welfare in three ways. First, they provide more up-to-date goods. Second, in the face of lower entry cost, more traders will enter the market and sell more varieties. Third, the intense competition may force traders to pass part of the cost saving to consumers, leading to lower prices, which directly improve consumer welfare.

Under this framework, associated with e-commerce development, consumers will purchase more goods that evolve faster in style, such as cosmetics and clothes, as well as durable goods that have high storage costs, particularly in remote areas with higher travel costs. Moreover, e-commerce may yield an indirect income effect thanks to the lower price. Lower prices for goods purchased online mean that consumers have more disposable income. The extra income is likely to be spent on goods and services with high income elasticity not available online, such as travel and dining out.

However, some personal services, such as kindergarten and health care, require frequent interactions between suppliers and consumers. In this case, local service providers enjoy a greater advantage than remote ones. As a result, e-commerce development likely will have little effect on such locally provided personal services.[12]

IV Empirical method and data description

[12] Our discussion here refers to personal services where the product cannot be separated from the supplier, such as teaching, medical service, and personal care. Services such as typing, photo processing, and consulting are not included. The latter kinds of services, where the product can be separated from the labor provider, share the same features as goods.

In this paper, we examine the relationship between e-commerce development and household consumption growth in China using three data sources: Alibaba e-commerce data, household survey data, and official statistics. First, we construct a series of indicators to measure the development of e-commerce at the county level using online sales and purchase information provided by the Alibaba Group, gross domestic product (GDP) from the China Statistical Yearbook, and population drawn from the Population Census 2010. Second, we merge the county-level e-commerce development measures with household consumption data obtained from the CFPS survey administered by Peking University.

Indicator construction

We measure county-level e-commerce development on three dimensions: penetration, intensity, and market size (as a share of the national online market). For each of the three dimensions, we construct two indicators measuring, respectively, the online sales and purchase using the amount of online sales and online purchases (Gross Merchandise Value, or GMV), numbers of online sellers and online purchasers, and numbers of packages sent and received associated with online transactions. The three indicators are comparable over time. Therefore, compared with Alibaba's three official e-commerce indicators, Alibaba e-commerce development indicators (aEDI), OBI, and OSI, which use different weights across years, our three indicators are comparable over years.

We constructed the indicators in three steps. First, we extracted the original indicators for each index. Second, we normalized the indicators and transformed them into z-scores for easy comparison.[13] The number of buyers, annual online purchase GMV, national online purchase GMV, and total number of national online buyers are from Alibaba. GDP is obtained from China Statistical Yearbooks. Residential population is from the Population Census 2010.[14]

The three sets of indicators are defined as follows:

E-commerce penetration indexes:

Share of online buyers in population (%): $\left(\frac{\text{number of online buyers}}{\text{residential population}}\right)_{2013} \times 100$

Share of online purchases in GDP (%): $\left(\frac{\text{annual online purchase GMV}}{\text{GDP}}\right)_{2013} \times 100$

[13] See Appendix 1 for a detailed description of the construction of the indicators.
[14] Measures using different sources of population yield consistent results. We use census population information in our main analysis, rather than the population reported in the statistics year books. In addition, we apply the 2013 residential population at the county level collected from local statistical bureaus as a robust check.

E-commerce intensity indexes:

Per buyer online purchases (yuan): $\left(\frac{annual\ purchase\ GMV}{number\ of\ online\ buyers}\right)_{2013}$

Per capita online purchases (yuan): $\left(\frac{annual\ purchase\ GMV}{residential\ population}\right)_{2013}$

Market size indexes:

National share of online purchases (%):$\left(\frac{annual\ purchase\ GMV}{national\ online\ purchase\ GMV}\right)_{2013} \times 100$

National share of online buyers (%): $\left(\frac{number\ of\ online\ buyers}{total\ number\ of\ national\ online\ buyers}\right)_{2013} \times 100$

Each of the measures is normalized into a z-score:

$\mathrm{z-score\ of\ measure\ x} = \frac{(\mathrm{x_{ct}} - \mathrm{mean\ of\ x})}{\mathrm{standard\ error\ of\ x}}$. [15]

Similar to the OBI and OSI, online purchase and sales intensity (defined as the online purchase GMV or online sales GMV over census population) varies widely across regions.[16] The z-score mean of online purchase intensity in CFPS counties over the period 2013 to 2016 is 0.39 standard deviation above the mean in the east, 0.21 standard deviation below the mean in the central region, and 0.44 standard deviation below the mean in the west. At the same time, the z-score mean of online sales intensity over 2013 to 2016 is 0.38 standard deviation above the mean in the east, 0.27 standard deviation below the mean in the central region, and 0.36 standard deviation below the mean in the west.

Analytical models

We examine the relationship between e-commerce and household consumption growth, controlling for the effects of household consumption of the initial year, key household characteristics (including age and dependency ratio), and regional characteristics (including regional dummies of east, central, and west, as well as urban and rural). Our household data are

[15] The indicators are strongly correlated with one another, we will present the first indicator, e-commerce intensity measured by online purchases per capita (online purchases over census population) in the main model and use the others as robust checks (see discussion in the following section).
[16] We use the population information from the census.

from CFPS 2014, and 2016, covering 156 counties in China.[17] The CFPS data provide household characteristics, total household consumption, and detailed information on 18 categories of subcomponents.[18]

Our basic model is specified as below:

$$Y^{s}_{ic,t} = \beta_0 + \beta_1 zonline\ p_{c,2013}, + \beta_2 logEXP^{s}_{ic,t-2} + \beta_3 dependent\ ratio_{ic,t} + \beta_4 age_{ic,t}/10 + \frac{\beta_5 age^2_{ic,t}}{100} + \beta_6 urban_{ic,t} \quad + \boldsymbol{\delta}_{\mathbf{r}} + \epsilon_{ic,t}$$

where *i* is the index for household, *c* is county, *t* is year, *s* is consumption category.

The dependent variable $Y^{s}_{ic,t} = logEXP^{s}_{ic,t} - logEXP^{s}_{ic,t-2}$ is the growth of log consumption per capita of category *s* in household *i* located in county *c* between two waves of the CFPS survey. It is the difference between two adjacent waves –2014 and 2016.

Our variable of interest is $zonline\ p_{c,2013}$. It is the z-score of the e-commerce development indicators. To measure the consumer side of e-commerce development in county *c*, we start by using $zonline\ purpop_{c,2013}$, online purchases over the 2010 census population in county *c* in 2013.[19] For readability, we present the empirical results of the online purchases intensity indicator, $\left(\frac{annual\ purchase\ GMV}{residential\ population}\right)_{2013}$, in the main analysis, and the results of other e-commerce development indicators – another measure of the intensity indicators, two other measures of the penetration indicators, and two other measures of the market size indicators – as robustness checks.[20]

We include, besides the dummy variables to capture the difference between the east, central, and west regions, and between rural and urban areas, the following variables of control at the household level:

$logEXP^{s}_{ic,t-2}$: the lag of log consumption per capita of category s in household i located in county c, that is the consumption per capita two years ago obtained from the previous wave of CFPS.

[17] The CFPS covers 162 counties in 25 provinces. Due to administrative change, eventually, we are able to merge 156 counties with our county-level e-commerce data from Alibaba.
[18] The 18 categories of consumption do not add up to the total household consumption, but they comprise the majority of consumption.
[19] The e-commerce data in 2013 are the earliest year available from Alibaba. We use this to minimize reverse causality between e-commerce development and household consumption growth.
[20] Results are largely consistent with those of the main indicators. Details available upon request.

$dependent\ ratio_{ic,t}$: the dependent ratio in household i located in county c in year t.

$$dependent\ ratio_{ic,t} = \frac{number\ of\ adults\ that\ are\ not\ working + number\ of\ children}{family\ size}$$

$age_{ic,t}$: the average adult age in household *i* in county *c*, year *t*.

$urban_{ic,t}$: 1 if household i is an urban household and 0 otherwise.

$\boldsymbol{\delta_r}$: the region fixed effect according to the National Bureau of Statistics region definition of east, west, and central China.

ϵ_{ic} : the error term. Standard errors are clustered on the county level to account for correlation within a county.

Our extended model includes more control variables to capture the possible impact on household consumption growth of other key factors, with cross-section data for 2014-2016:

$$\begin{aligned} Y^{s}_{ic,t} = \beta_0 + \beta_1 zonline\ purpop_{c,2013}, + \beta_2 logEXP^{s}_{ic,t-2} + \beta_3 dependent\ ratio_{ic,t} \\ + \beta_4 age_{ic,t}/10 + \beta_5 age^2/100 \\ + \beta_6 urban_{ic,t} + \beta_7 ysch_{ic,t} + \beta_8 gender\ ratio_{ic,t} + \boldsymbol{\sigma_t} + \boldsymbol{\delta_r} + \epsilon_{ic,t} \end{aligned}$$

The additional variables of control include:

$ysch_{ic,t}$: average years of schooling in household *i*, located in county *c*, year *t*.

$gender\ ratio_{ic,t}$:is the male over female gender ratio in household *i*.

$\boldsymbol{\sigma_t}$: the year fixed effect. [21]

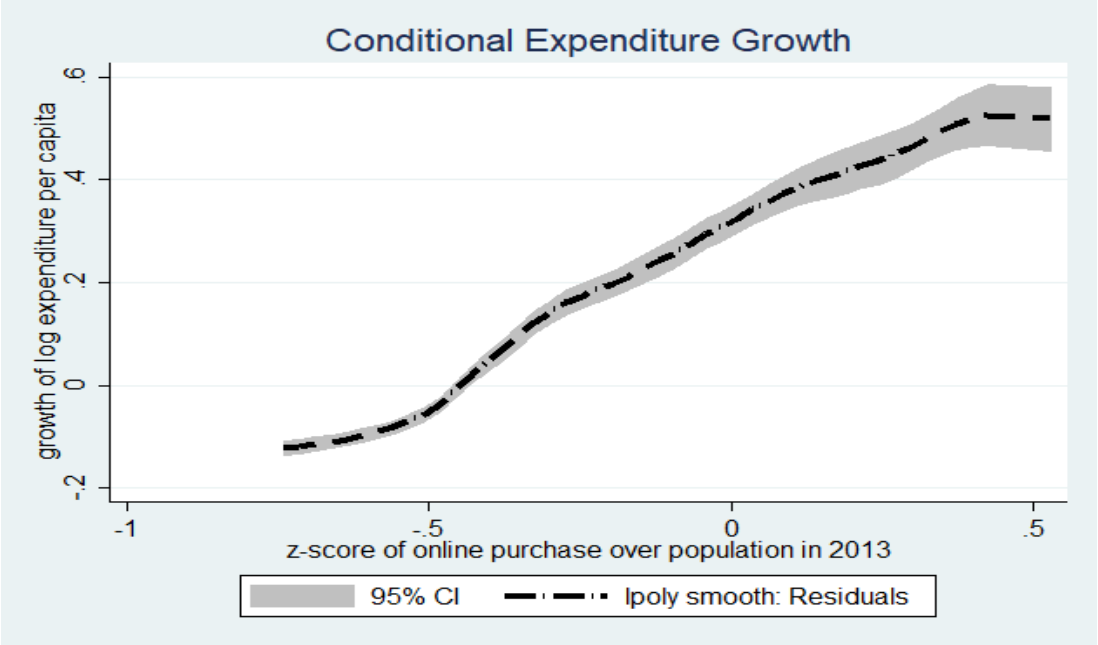
We run the model for per capita total consumption, different consumption components, and subsamples by quartile, respectively. Drawing from the information in CFPS, we include 18 categories of household consumption: cosmetics and beauty, food (which includes two subcategories, food at home and dining out), clothes, utilities, communications, local transport, travel, entertainment, automobiles, other vehicles, durable goods, medical, health and fitness, education, home repairs, and gifts.

[21] We include year fixed effects for total consumption and most of the consumption categories, except house repair expenditure and gift expenditure. Since there are no questions about house repair expenditure and gift expenditure in CFPS 2012, we cannot calculate the growth of these two categories for 2012–2014. Therefore, for these two consumption categories, we do not include year fixed effects in the model.

V Empirical Results

The growth rate of household consumption per capita is higher when online purchasing intensity measured by online purchases over population is greater, others being equal (Figure 2).

Figure 2. Growth rate of household consumption per capita and e-commerce intensity level in China



Note: Extreme value dropped at 5 percent.

Table 1 presents the results from our basic model nationwide and by rural-urban areas, as well as by regions. The role of e-commerce development is significant in all estimations. A one standard deviation above the mean of e-commerce intensity measured by purchases over census population is associated with 0.303 increase in log annual household expenditure per capita growth. The associated increase is more than twice larger among rural households (0.718) than that among urban households (0.247). Across regions, the magnitude is the largest in the west (0.538), followed by the central region (0.313) and the smallest in the east (0.267). The variables of control are of the expected signs. The log of household consumption expenditure in the initial year is negatively associated with household consumption growth in a significant manner. Average age of household members and its square terms are both positively associated with household consumption growth, while the dependency ratio is negatively associated with household consumption growth.

Table 1. E-commerce development and total household expenditure per capita

VARIABLES	(1) All	(2) Urban	(3) Rural	(4) East	(5) Central	(6) West
Z-score of purchase/ population	0.303***	0.247***	0.718***	0.267***	0.313**	0.538***
	(0.067)	(0.061)	(0.098)	(0.083)	(0.119)	(0.157)
Lag log household expenditure per capita	-0.596***	-0.548***	-0.664***	-0.581***	-0.582***	-0.641***
	(0.015)	(0.019)	(0.016)	(0.026)	(0.024)	(0.025)
Average age of household members/10	-0.057***	-0.049***	-0.099***	-0.064***	-0.056***	-0.068***
	(0.009)	(0.014)	(0.014)	(0.015)	(0.017)	(0.019)
Square of average age of household members/100	0.001***	0.000***	0.002***	0.001***	0.001**	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Household dependent ratio	-0.131***	-0.045	-0.244***	-0.103**	-0.133***	-0.185**
	(0.033)	(0.039)	(0.044)	(0.049)	(0.043)	(0.090)
Urban/rural area dummy (Urban=1)	0.242***			0.254***	0.204***	0.302***
	(0.028)			(0.055)	(0.043)	(0.050)
West	0.033	0.047	0.035			
	(0.051)	(0.061)	(0.059)			
Central	0.063	0.035	0.111**			
	(0.046)	(0.055)	(0.048)			
Constant	6.092***	5.795***	7.152***	5.963***	6.038***	6.720***
	(0.169)	(0.227)	(0.187)	(0.258)	(0.292)	(0.297)
Observations	11,107	5,183	5,924	4,457	3,486	3,163
Adjusted R-squared	0.319	0.285	0.368	0.319	0.321	0.285	0.301	0.368	0.338	0.321	0.301	0.33

Note: Robust standard errors clustered at the county level in parentheses. *** p<0.01, ** p<0.05, * p<0.1

We examine the pattern of association between e-commerce development and each of the 18 categories of subcomponents of household consumption in Table 2. For most of the 18 categories of consumption, the association with e-commerce development is positive, stronger in the less developed regions and in rural areas. Three patterns are apparent from the table.

Table 2. E-commerce development and various categories of household expenditure per capita by region

	(1) All	(2) Urban	(3) Rural	(4) East	(5) Central	(6) West
Cosmetics and beauty	0.490***	0.449***	0.983***	0.510***	0.415***	1.391***
	(0.121)	(0.125)	(0.235)	(0.162)	(0.152)	(0.476)
Food	0.355***	0.288***	0.842***	0.336***	0.352***	0.673**
	(0.066)	(0.061)	(0.118)	(0.081)	(0.111)	(0.298)
Of which: Food at home	0.389***	0.348***	0.805***	0.357***	0.412***	0.606**
	(0.073)	(0.066)	(0.144)	(0.094)	(0.111)	(0.263)

Of which: Dining out	0.580***	0.501***	1.260***	0.423**	0.777***	1.528***
	(0.164)	(0.165)	(0.267)	(0.211)	(0.231)	(0.495)
Clothes	0.306***	0.269***	0.720***	0.257*	0.376***	0.590**
	(0.102)	(0.103)	(0.163)	(0.131)	(0.125)	(0.287)
Utilities	0.181***	0.180***	0.275**	0.183***	0.154***	0.469
	(0.033)	(0.032)	(0.138)	(0.040)	(0.047)	(0.314)
Communications	0.242***	0.210***	0.565***	0.184***	0.309***	0.545***
	(0.051)	(0.050)	(0.078)	(0.058)	(0.069)	(0.198)
Local transport	0.435***	0.384***	0.732***	0.328***	0.502***	0.518**
	(0.092)	(0.093)	(0.138)	(0.115)	(0.096)	(0.253)
Travel	0.872***	0.770***	1.595***	0.751**	0.899***	2.131***
	(0.211)	(0.214)	(0.250)	(0.283)	(0.157)	(0.583)
Entertainment	0.655***	0.547***	1.171***	0.546**	0.852***	0.441
	(0.169)	(0.174)	(0.325)	(0.235)	(0.163)	(0.404)
Automobiles	0.474***	0.394***	1.406***	0.285*	0.615***	1.329***
	(0.127)	(0.115)	(0.291)	(0.148)	(0.202)	(0.323)
Other vehicles	0.182	0.116	0.841**	0.071	0.380	0.162
	(0.136)	(0.126)	(0.377)	(0.137)	(0.371)	(0.566)
Durable goods	0.444***	0.357***	1.029**	0.371**	0.420**	0.621
	(0.118)	(0.104)	(0.397)	(0.158)	(0.181)	(0.958)
Medical	0.166**	0.154*	0.309	0.071	0.287**	0.672
	(0.075)	(0.085)	(0.201)	(0.086)	(0.127)	(0.432)
Health and fitness	0.395***	0.327***	0.534***	0.351*	0.381***	0.636**
	(0.126)	(0.123)	(0.195)	(0.188)	(0.138)	(0.299)
Education	-0.102	-0.091	0.008	-0.157*	0.100	-0.165
	(0.118)	(0.125)	(0.274)	(0.091)	(0.204)	(0.402)
Home repair	-0.043	-0.072	0.116	-0.001	-0.109	-0.280
	(0.083)	(0.086)	(0.314)	(0.131)	(0.149)	(0.707)
Gifts	0.061	0.073	0.454	0.013	0.210*	0.281
	(0.107)	(0.099)	(0.276)	(0.140)	(0.120)	(0.545)

Note: The model of estimation is the same as Table 1, the dependent variable is the logarithmic form of household per capita consumption growth, and the variables of control include lagged log value of household expenditure per capita, average age/10, age squared/100, dependency ratio, urban-rural dummies, and regional dummies. For readability, we present only the results of interest - the coefficients of the z-score of online purchase / population in 2013. Fully results available upon request. Robust standard errors clustered at the county level are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

First, for goods and services regularly consumed by most households,[22] including expenditures on cosmetics and beauty, food, clothes, utilities, communication, local transportation, and entertainment, we see a positive association between the z-score of online purchases over

[22] From the CFPS data, over 50 percent of the households reported such consumption expenditures.

population and log expenditure growth across both rural and urban areas and all three regions in most cases.[23] The coefficients are larger among rural households and in the interior region than in urban areas and in the east systematically.[24] A one standard deviation increase of online purchases over population is associated with a 0.490 increase in growth of log annual household expenditure per capita on cosmetics and beauty products.[25] The magnitude is larger among rural households (0.983) than that among urban households (0.449). And the magnitude is the largest in the west, which is as high as 1.391. The relationship between the z-score and food consumption follows a similar pattern. When online purchases over population increases by one standard deviation above the mean, log household food consumption per capita growth increases by 0.355. The increase is 0.288 among urban households and almost three times that among rural households (0.842). In the east, it is 0.336 while in the central, it is similar to that in the east (0.352) and in the west, it is twice as large as that in the east (0.673). When purchases over population increases by one standard deviation above the mean, log household dining out consumption per capita growth increases by 0.580. In rural areas, it is as high as 1.260 and, in the west, it is as high as 1.528. A one standard deviation increase of online purchases over population is associated with 0.306 increase in growth of log annual household expenditure on clothes. The magnitude among rural households is almost threefold as large as that among urban households (0.729 and 0.269 respectively for rural and urban). And across the three regions, it is the largest in the west, which is 0.590, followed by the central region, which is 0.376 and is the smallest in the east, which is 0.257. When the z-score increases by one, log household communication consumption per capita growth increases by 0.242 for the whole sample, 0.210 for urban households, 0.565 for rural households, 0.184 in the east, 0.309 in the central region, and 0.545 in the west.[26] When the z-score increases by one, log household entertainment consumption per capita growth increases by 0.655 for the whole sample, 0.547 for urban households, 1.171 for rural households, 0.546 in the east, 0.852 in the central region, and 0.441 in the west.

Second, for goods and services that require a larger payment at one time and are less frequently purchased,[27] i.e., travel, automobiles, and durable goods, we also see a positive

[23] The coefficient of health and fitness expenditure is about 0.3 for all households. As only roughly 10 percent of households reported health and fitness expenditure, we do not discuss this in the paper.
[24] The coefficient of utility expenditure is about 0.18 for all households, smaller than those of other variables. This might be related to the nature of utility consumption.
[25] Cosmetic and beauty products, including a wide range in prices from the very low end in the spectrum, are becoming a popular purchase online, in particular, among young female online buyers.
[26] We do not have information on whether dining out refers to sit-down dining only or includes fast food consumed outside or home delivery. One possible explanation for the large coefficient of dining out is the rapid increase of the availability of online food delivery.
[27] From the CFPS data, less than 50 percent of the households reported such consumption expenditures.

association between the z-score of online purchases over population and log expenditure growth across both rural and urban areas and all three regions in most cases. The magnitude of the coefficient is larger, above 0.4 for all households, and the coefficients of some categories can be as high as 2 or more for rural households and households in the west. The correlation between log automobile purchases consumption growth and the z-score of online purchases over population is 0.474 for the whole sample, 0.394 among urban households, 1.406 among rural households, 0.285 in the east, 0.615 in the central region, and 1.329 in the west. Similarly, a one standard deviation increase above the mean of online purchases over population is associated with 0.444 of the log durable goods consumption growth all over the country. The coefficient is 0.357 among urban households and 1.029 among rural households. Across regions, the coefficient is 0.371 in the east, 0.420 in the central region, but not statistically significant in the west.

Third, for personal services, such as expenditure on vehicles other than purchasing automobiles,[28] household repair, and education, the role of e-commerce intensity, measured by online purchases over census population, is not significant.[29] However, for health and fitness, there is a positive association between the z-score of online purchases over population and across urban and rural, as well as the three regions, since health and fitness consumption could be a combination of both personal service and purchased goods such as equipment and supplements. The magnitude is also larger in rural areas in the west. As for medical expenses, which is also a combination of personal services and purchased goods, with the former more important, we see a positive association among the population, urban households and in the central region, but not among rural households, neither in the east nor the west.

Table 3 presents the results of the basic model at the national level by household expenditure levels.[30] For the growth in total household consumption per capita, e-commerce matters the most for the poorest quartile with a coefficient of 0.266, followed by the 25 percent–75 percent quartile with a coefficient of 0.198, compared to a coefficient of 0.126 for the richest quartile. E-commerce purchase intensity has a positive effect in 12 of 16 household consumption categories and the effect is the strongest among the poorest quartile for half of them (cosmetics and beauty, food, utilities, travel, medical, health and fitness). For three household consumption

[28] Consumption on vehicles other than automobiles might also fall into this category, while the coefficient is smaller than 0.5. It is a combination of buying goods and personal services, as it includes repairing vehicles and communication devices. As for consumption on vehicles other than automobile purchase, the coefficient is not significantly different from zero for the whole sample, across the three regions and among urban households, 0.841 among rural households, as shown in Table 2.
[29] We do not have information on whether the slower growth in education expenditure is related to the availability of free or lower priced online information and books, or other emerging patterns on education expenditure.
[30] Extreme value is dropped at 1 percent.

categories, including cosmetics and beauty, food, , and travel, e-commerce purchase intensity is associated with positive consumption growth for households of all income groups, and for two household consumption categories – medical, and health and fitness consumption – the effect is positive only for the poorest quartile. The effect of e-commerce on the consumption of durable goods and vehicles other than automobiles is not significant in any income group. For two household consumption categories – communication and entertainment , the magnitude of the correlation is the largest for the middle-income group. For local transport and automobile purchases, it is the largest for the top income group. Similar to the results of Table 2, the effect of online purchases over population is not significant for most consumption groups in three categories: education, home repair, and gifts.

Table 3. E-commerce development and various categories of household expenditure per capita by household consumption level

	(1) All	(2) Bottom 25%	(3) 25%-75%	(4) Top 25%
Total household expenditure	0.303***	0.325***	0.157***	0.112***
	(0.067)	(0.091)	(0.049)	(0.037)
Cosmetics and beauty	0.490***	0.568**	0.239*	0.179**
	(0.121)	(0.227)	(0.133)	(0.086)
Food	0.355***	0.489***	0.253***	0.129***
	(0.066)	(0.120)	(0.063)	(0.042)
Of which: Food at home	0.389***	0.516***	0.293***	0.195***
	(0.073)	(0.148)	(0.077)	(0.056)
Of which: Dining out	0.580***	0.274	0.202	0.208*
	(0.164)	(0.220)	(0.159)	(0.125)
Clothes	0.306***	0.199	0.068	0.013
	(0.102)	(0.223)	(0.090)	(0.082)
Utilities	0.181***	0.294**	0.128***	0.041
	(0.033)	(0.124)	(0.036)	(0.028)
Communications	0.242***	0.028	0.138**	0.111***
	(0.051)	(0.116)	(0.056)	(0.031)
Local transport	0.435***	0.175	0.178**	0.257**
	(0.092)	(0.252)	(0.080)	(0.121)
Travel	0.872***	0.695**	0.443**	0.535***
	(0.211)	(0.297)	(0.174)	(0.181)
Entertainment	0.655***	0.133	0.386*	0.367***
	(0.169)	(0.144)	(0.206)	(0.115)
Automobiles	0.474***	0.135	0.171	0.326**
	(0.127)	(0.173)	(0.136)	(0.145)
Other vehicles	0.182	-0.088	0.029	-0.017

	(0.136)	(0.273)	(0.193)	(0.113)
Durable goods	0.444***	0.016	0.061	0.092
	(0.118)	(0.389)	(0.115)	(0.121)
Medical	0.166**	0.552**	-0.028	0.166
	(0.075)	(0.230)	(0.116)	(0.154)
Health and fitness	0.395***	0.445**	-0.006	0.160
	(0.126)	(0.210)	(0.108)	(0.117)
Education	-0.102	-0.392	-0.105	0.080
	(0.118)	(0.324)	(0.115)	(0.224)
Home repair	-0.043	-0.218	-0.091	-0.372***
	(0.083)	(0.281)	(0.120)	(0.122)
Gifts	0.061	0.501	-0.002	-0.272*
	(0.107)	(0.411)	(0.116)	(0.144)

Note: The model of estimation is the same as Table 1, the dependent variable is the logarithmic form of household per capita consumption growth, and the variables of control include lagged log value of household expenditure per capita, average age/10, age squared/100, dependency ratio, urban-rural dummies, and regional dummies. For readability, we present only the results of interest - the coefficients of the z-score of online purchase / population in 2013. Fully results available upon request. Robust standard errors clustered at the county level are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Similar to the findings in Table 2, the z-score of online purchases over population is associated with an increase of consumption for food, cosmetics and beauty, utilities, clothes, travel, and health and fitness, with the largest increase for the poorest segment of the population. The sizes of the coefficients of the z-scores are moderate. When the z-score of online purchases over population increases by one, log household food consumption per capita growth increases by 0.489 for the poorest quartile, by 0.253 for the middle two quartiles, and by 0.179 for the richest quartile; log household cosmetics and beauty consumption per capita growth increases by 0.568 for the poorest quartile, by 0.239 for the middle two quartiles, and 0.179 for the richest quartile; log household utilities consumption per capita growth increases by 0.294 for the poorest quartile, by 0.128 for the middle two quartiles, but has no significant change for the richest quartile;. When the z-score of online purchases over population increases by one, log household medical expenditure growth increases by 0.552 for the poorest quartile, and log household health and fitness expenditure growth increases by 0.445 for the poorest quartile, while the association among the middle two quartiles and the top quartile for these two categories is not significant and smaller in size. The marginal effects tend to decline as the income quartiles move up. This suggests that online access to a larger selection of products (including potentially products at different quality and price levels) can have a stronger stimulation effect in household

consumption for the poor by unlocking the potential demand for basic goods that are not available (or available at a higher price) at the traditional local markets. When the z-score of online purchases over population increases by one, log household travel expenditure growth is associated with 0.695 increase for the poorest quartile, 0.443 for the middle two quartiles and 0.535 for the richest quartile. For communication and entertainment consumption expenditure, the coefficient for the e-commerce indicator is the highest for the middle two quartiles (0.138 and 0.386 respectively).

When online purchases over population increases by one standard deviation for the poorest quartile, log household consumption growth on cosmetics and beauty products increases by 0.568, log household consumption growth on travel increases by 0.695.[31] The large magnitudes of the coefficients suggest that online purchases over population has strong effects on the consumption growth of the goods and services of higher income elasticity / higher in style consumption nature (such as travel and cosmetics and beauty products), particularly for the poorer households, whose demand might have been disproportionately limited by their poor access to markets through traditional markets.

Consistent with the prediction of the model in Startz (2018), the results show that e-commerce development is associated with stronger growth in consumption of goods with rapidly evolving styles (such as cosmetics and beauty products, clothes, and entertainment), and goods with higher storage costs (such as durable goods that require more resources for stocking for local traders). We also see higher consumption growth of goods and services with higher income elasticities, such as travel and dining out, even though these are not online products or services. In the meantime, there is some indication that e-commerce development benefits consumers in areas with high travel costs (such as in the interior regions).

Across the different categories of consumption of goods and services, the association between e-commerce development and food consumption growth is particularly strong. From 2012 to 2016, China's e-grocery sales saw a compound annual growth rate of 52.9 percent, according to a recent report by Agriculture and Agri-Food Canada.[32] The extremely strong growth of online food consumption in China seems to defy the Engel curve. The puzzle is likely

[31] Health and fitness consumption is different from medical treatment consumption. The former does not include medical necessities but only healthy supplements and fitness while the latter is associated with treatment in hospital or medicines bought from a pharmacy. The results are consistent with expectations as health and fitness expenditure might have a stronger income elasticity while medical expenditure is more need-based.

[32] Source: http://www.agr.gc.ca/eng/industry-markets-and-trade/international-agri-food-market-intelligence/asia/market-intelligence/e-grocery-market-in-china/?id=1504037238257.

due to the large increase in online consumption of baby food. Baby food and formula are the top two package foods sold online in China.[33] Using the CFPS data, we find that breast feeding is negatively correlated with e-commerce development; the coefficient between food consumption and e-commerce z-score is larger for households with young children under three years old.[34] This is consistent with the Chinese culture and the strong willingness of parents to spend on children, while the judge is still out for the impact on nutrition.

The fast growth in food consumption may also stem from the online purchases of food varieties by higher-end consumers. In more developed areas, particularly tier one and tier two cities, people can purchase online specialty fresh produce, meat, or seafood (which are not available in traditional markets) with guaranteed fast delivery. End-to-end value chain digitalization, such as the Alibaba's Hema store, which sells online high-end groceries and ready-made food with guaranteed fast delivery, is one example that might be changing the pattern of online-offline retails in the future.[35] However, the contribution of such high-end online-offline grocery purchases to food consumption is likely to be limited for the period of our analysis given the limited coverage and the high requirement of logistics, although this might increase in the future, particularly in more developed areas.

As to personal services, such as education, medical, fitness, and health services for which personal interaction is more important, consumption growth is not associated with e-commerce development.[36] These services involve strong personal interactions. For example, high quality of service in education often requires instructor customization of teaching strategy, content, and speed according to students' needs and feedback. As labor mobility is lower than the mobility of goods, it is costly to send service providers to distant customers.

VI Robustness

[33] See https://www.newyorker.com/magazine/2018/07/23/how-e-commerce-is-transforming-rural-china
[34] Additional results on the relations between food consumption and whether the household has young children and those on the breastfeeding and e-commerce z-scores are available upon request. Forthcoming in another research paper.
[35] https://www.pwccn.com/en/retail-and-consumer/publications/global-consumer-insights-survey-2018-china-report.pdf
[36] Due to data limitation, we cannot examine the use of online education or health services, such as interactive online learning program for children and health monitoring apps, which may have a spillover effect over time for consumers to consume more of not just online consumption goods but also get exposed to the kind of goods and services that can potentially enhance human capital.

To check robustness, we conducted a series of alternative specifications to examine the possible effects of other variables on the growth rate of household per capita total consumption as well as that of each of the 18 categories of consumption.

We first tested the various indicators measuring the penetration, intensity, and market size of e-commerce from both the purchase and selling aspects. Table A1 in the Appendix presents the empirical results of the baseline model using other constructed indicators measuring e-commerce penetration, intensity, and market size. The results are similar to those presented in Table 1 – e-commerce development, measured in different ways, plays a positive role in shaping household consumption, with a stronger correlation in inland regions and rural areas, and in households with lower income levels.

We introduced several additional variables of control to test whether the relation between e-commerce development and household consumption growth is a result of variables missing in the basic model.

Tables A.2 and A.3 present the results of an extended model, with additional household control variables, including lagged log value of household expenditure per capita of the consumption category in question, household average years of schooling, household gender ratio, average age, age squared/100, dependency ratio, urban-rural dummies, and regional dummies.

Tables A.4 and A.5 present the results of a further extended model, with additional variables of control, including the lagged log household per capita income growth, lagged log value of household expenditure per capita of the consumption category in question, household average years of schooling, household gender ratio, average age, age squared/100, dependency ratio, urban-rural dummies, and regional dummies.

Tables A.6 and A.7 present the results of an alternative extended model, with additional variables of control, including the lagged log household per capita income per capita (2010 value), lagged log value of household expenditure per capita in the consumption category in question, household average years of schooling, household gender ratio, average age, age squared/100, dependency ratio, urban-rural dummies, and regional dummies.

Tables A.8 and A.9 present the results of another alternative extended model, with additional variables of control, including consumer price index (CPI) by category, lagged log value of household expenditure per capita in the consumption category in question, household

average years of schooling, household gender ratio, average age, age squared/100, dependency ratio, urban-rural dummies, and regional dummies.

The results of the alternative models in the robustness tests are largely consistent with those in Tables 1 and 2, which suggests that after controlling for household demographic characteristics, as well as income growth, initial income level, or inflation, the relation between e-commerce development and household consumption growth remains largely the same: e-commerce development is associated with strong household consumption growth.

VII Conclusion

Our results show that, in China, household consumption growth is positively associated with initial local e-commerce development. The relationship is stronger for households in the less developed inland regions and in rural areas than in the coastal regions and urban areas, in particular for the poorer households than for the richer ones. E-commerce development reduces consumption inequality across regions and income groups. Thanks to the lower search and transaction costs, more products become tradable online at lower price, if the cost saving is passed on to consumers due to competition. The potential decline in price, increase in variety and smaller travel cost are likely the main channels that contribute to an increase in consumer welfare, as argued by Couture et. al. (2018). Income increase associated with e-commerce business development in an area is also a potential channel of the consumption growth. We tested this in Table 4. For the poorest quartile, the coefficient of the z-core of online purchases over population on log household income per capita growth is not significantly different from zero. This implies that the impact of e-commerce on consumption mainly stems from price and variety channels for the poor. We cannot rule out the income channel for other groups.

Table 4. E-commerce development and log household income per capita growth

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
VARIABLES	All	Urban	Rural	East	Central	West	bottom 25%	25%-75%	top 25%
Z-score of purchase/ population	0.353***	0.288***	0.824***	0.344***	0.315***	0.710***	-0.146	0.147***	0.081**
	(0.0701)	(0.062)	(0.099)	(0.087)	(0.104)	(0.144)	(0.128)	(0.025)	(0.035)
Lag log household expenditure per capita	-0.735***	-0.722***	-0.764***	-0.706***	-0.740***	-0.780***	-0.931***	-0.919***	-0.952***
	(0.0172)	(0.024)	(0.019)	(0.033)	(0.023)	(0.033)	(0.018)	(0.008)	(0.021)

Average age of household members/10	-0.006	0.057***	-0.090***	-0.022	-0.003	-0.204	0.000	0.002	-0.003
	(0.013)	(0.018)	(0.021)	(0.017)	(0.025)	(0.126)	(0.022)	(0.007)	(0.013)
Square of average age of household members/100	0.000	-0.001***	0.001***	0.000	-0.000	0.021	0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.014)	(0.000)	(0.000)	(0.000)
Household dependent ratio	-0.269***	-0.250***	-0.381***	-0.209***	-0.285***	-0.312***	-0.226***	-0.067***	-0.126***
	(0.0348)	(0.050)	(0.050)	(0.051)	(0.056)	(0.077)	(0.064)	(0.022)	(0.039)
Average years of schooling	0.059***	0.068***	0.047***	0.064***	0.050***	0.067***	0.014**	0.016***	0.010***
	(0.004)	(0.005)	(0.005)	(0.006)	(0.005)	(0.009)	(0.006)	(0.002)	(0.004)
Urban/rural area dummy (Urban=1)	0.185***			0.158***	0.190***	0.216***	-0.020	0.020	0.010
	(0.0312)			(0.055)	(0.038)	(0.069)	(0.058)	(0.014)	(0.031)
West	-0.081	-0.065	-0.103				-0.002	-0.003	0.015
	(0.058)	(0.077)	(0.062)				(0.069)	(0.025)	(0.047)
Central	0.011	-0.011	0.056				0.125*	0.029	-0.021
	(0.052)	(0.061)	(0.058)				(0.067)	(0.018)	(0.038)
Constant	6.808***	6.484***	7.827***	6.572***	6.916***	7.711***	7.290***	8.595***	10.036***
	(0.194)	(0.262)	(0.245)	(0.350)	(0.266)	(0.288)	(0.244)	(0.094)	(0.221)
Observations	10,138	4,709	5,429	4,055	3,224	2,858	2,062	5,180	2,896
Adjusted R-squared	0.501	0.472	0.540	0.469	0.520	0.530	0.756	0.887	0.760
F test	215.7	126	219.5	85.36	168.8	157.4	436	1751	330.9

Robust standard errors clustered at the county level are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

The positive association between e-commerce and consumption growth is significant not only for total household consumption, but also for most consumption categories, ranging from basic consumption, such as food, clothes, and local transportation, to consumption of durable goods, travel, and entertainment. The magnitude of the association of e-commerce intensity is larger for the second consumption group than for the first. For most of the consumption categories, the association between e-commerce development and consumption growth is largest for the poorest quartile and declines as household income level moves up. While we have tried to control for as many factors as possible, some variables correlated with both the outcome variable and e-commerce indicator may have been omitted, which may bias the estimates of the e-commerce variable. Our findings imply only associations and not causality. More studies are needed to tease out the causal relationship between e-commerce development and consumption growth.

Developing e-commerce requires not only Internet, but also many other factors, such as infrastructure and logistics services, skills and entrepreneurship, and an overarching enabling business environment facilitating online and offline business. China has been on a fast track of e-commerce development in recent years. With the right policies, further development of e-

commerce can help accelerate consumption growth and narrow the regional gaps in e-commerce development, which in turn can lead to a more inclusive spatial development pattern.

Due to data limitations, our study cannot separate total household consumption into online consumption and offline consumption, and therefore cannot examine the effects of e-commerce development on these two types of consumption separately. Studies on whether e-commerce results in additional offline consumption or online consumption substitutes for offline consumption will be interesting future research topics. Of equal if not more importance, studies on how e-commerce contributes to entrepreneurship and employment, and how this varies across sectors, regions, and individuals of different characteristics, will be crucial to understanding the role of e-commerce in the production and income aspects. In what areas and to what extent e-commerce adds to or substitutes for traditional offline business, and as a result, the net effect on the economy remains an important question for more empirical studies.

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Appendix 1. E-Commerce Index Construction

To measure county-level e-commerce development, we constructed three sets of indicators: e-commerce penetration, e-commerce intensity, and e-commerce market size, following the two steps below:

Step 1 Construct original indicators

1 E-commerce penetration

The penetration index includes four indicators.

Share of online sellers in population (%): $\left(\frac{\text{number of online sellers}}{\text{population}}\right) \times 100$

Share of online buyers in population (%): $\left(\frac{\text{number of online buyers}}{\text{population}}\right) \times 100$

Share of online sales in GDP (%): $\left(\frac{\text{annual online sales GMV}}{\text{GDP}}\right) \times 100$

Share of online purchase in GDP (%): $\left(\frac{\text{annual online purchase GMV}}{\text{GDP}}\right) \times 100$

2 E-commerce intensity

The intensity index includes four indicators.

Per seller online sales (yuan): $\frac{annual\ sales\ GMV}{number\ of\ online\ sellers}$

Per buyer online purchase (yuan): $\frac{annual\ purchase\ GV}{number\ of\ online\ buyers}$

Per capita online sales (yuan): $\frac{annual\ sales\ GMV}{population}$

Per capita online purchase (yuan): $\frac{annual\ purchase\ GMV}{population}$

3 E-commerce market size

The market size index includes four indicators.

National share of online sales (%): $\left(\frac{annual\ sales\ GMV}{national\ online\ sales\ GMV}\right) \times 100$

National share of online sellers (%): $\left(\frac{number\ of\ online\ sellers}{total\ number\ of\ national\ online\ sellers}\right) \times 100$

National share of online purchase (%): $\left(\frac{annual\ purchase\ GMV}{national\ online\ purchase\ GMV}\right) \times 100$

National share of online buyers (%): $\left(\frac{number\ of\ online\ buyers}{total\ number\ of\ national\ online\ buyers}\right) \times 100$

Step 2 Normalize the original indicators to z-score

We normalized each indicator to a z-score. The z-score is the difference between the raw value and the population mean divided by the population standard deviation. It is calculated using the formula below.

$$z = \frac{(\text{raw value} - \text{mean})}{\text{standard deviation}}$$

The z-score is the signed number of standard deviations by which the value of an observation is above or below the population mean value. It is an abstract value that is only used to represent the position in the population distribution of a data point. The mean of the z-score is 0 and the standard deviation of it is 1. The z-score is 0 for observed values at the mean level, positive above the mean and negative below the mean. The absolute value of the z-score measures the distance between a value and the mean value. The advantages of using the z-score are that it makes different indicators more comparable and that we could not infer the original value of each indicator.

The constructed z-score indicators serve as proxy of e-commerce development level derived from the original raw data, including the gross merchandise values of online sales and online purchases, numbers of online sellers and online purchasers, and numbers of packages sent and received due to online sales and online purchases. Meanwhile, the constructed indicators preserve the confidentiality of the original data since the z-score reflects only the position of a data point in a distribution but not the value. If two observed values are from two identical distributions at the same relative position in each distribution, their z-score should be the same regardless of the difference in the raw value of the observation. Hence, the z-scores of the indicators cannot be used to infer the raw purchase/sales GMV, number of buyers/sellers, number of packages.

Appendix 2. Robustness Check

Table A.1. E-commerce development and total household expenditure per capita using alternative measures

VARIABLES	(1) All	(2) Urban	(3) Rural	(4) East	(5) Central	(6) West
Z-score of purchase/census pop in 2013	0.303***	0.247***	0.718***	0.267***	0.313**	0.538***
	(0.0671)	(0.061)	(0.098)	(0.083)	(0.119)	(0.157)
Z-score of buyers/census population in 2013	0.189***	0.150***	0.455***	0.127**	0.344***	0.422***
	(0.064)	(0.057)	(0.145)	(0.057)	(0.104)	(0.117)
Z-score of buyers share in the national market in 2013	0.208***	0.175***	0.734***	0.179***	0.660***	0.664***
	(0.064)	(0.051)	(0.143)	(0.040)	(0.206)	(0.194)
Z-score of purchase share in national market in 2013	0.136***	0.114***	0.545***	0.118***	0.485**	0.649***
	(0.042)	(0.033)	(0.117)	(0.026)	(0.185)	(0.199)
Z-score of purchase over GDP in 2013	0.275***	0.269***	0.266***	0.431***	0.171**	0.252**
	(0.067)	(0.079)	(0.088)	(0.097)	(0.084)	(0.105)
Z-score of per consumer purchase in 2013	0.126***	0.149***	0.093***	0.148***	0.112***	0.022
	(0.021)	(0.026)	(0.029)	(0.028)	(0.036)	(0.049)
Observations	11,107	5,183	5,945	4,458	3,486	3,163

Note: The model of estimation is the same as Table 1, the dependent variable is the logarithmic form of household per capita consumption growth, and the variables of control include lagged log value of household expenditure per capita, average age/10, age squared/100, dependency ratio, urban-rural dummies, regional dummies, and year fixed effect except for gift and house repair and upgrading. For readability, we present only the results of interest - the coefficients of the z-score each measure in 2013. Fully results available upon request. Robust standard errors clustered at the county level are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.2. E-commerce development and various categories of household expenditure per capita by region (Extended Model 1)

VARIABLES	(1) All	(2) Urban	(3) Rural	(4) East	(5) Central	(6) West
Total household expenditure	0.257***	0.194***	0.695***	0.248***	0.247*	0.538***
	(0.067)	(0.058)	(0.103)	(0.080)	(0.126)	(0.157)
Observations	10,872	5,072	5,800	4,359	3,428	3,163
Adjusted R square	0.343	0.320	0.379	0.346	0.320	0.338
Cosmetics and beauty	0.404***	0.339***	0.945***	0.462***	0.289*	0.996***
	(0.115)	(0.112)	(0.235)	(0.151)	(0.154)	(0.334)
Observations	10,764	5,023	5,741	4,312	3,399	3,053
Adjusted R square	0.344	0.367	0.326	0.330	0.361	0.361
Food	0.311***	0.238***	0.816***	0.308***	0.283**	0.523**
	(0.065)	(0.056)	(0.121)	(0.079)	(0.116)	(0.229)
Observations	10,720	4,993	5,727	4,279	3,396	3,045
Adjusted R square	0.345	0.343	0.360	0.359	0.309	0.386
Of which: Food at home	0.345***	0.288***	0.773***	0.322***	0.331***	0.458**
	(0.071)	(0.060)	(0.160)	(0.092)	(0.116)	(0.224)
Observations	10,717	4,991	5,726	4,277	3,395	3,045
Adjusted R square	0.389	0.400	0.388	0.333	0.379	0.475
Of which: Dining out	0.424***	0.286**	1.275***	0.302*	0.561**	1.168**
	(0.142)	(0.136)	(0.272)	(0.168)	(0.240)	(0.453)
Observations	10,878	5,075	5,803	4,363	3,430	3,085
Adjusted R square	0.332	0.323	0.364	0.322	0.328	0.357
Clothes	0.217**	0.155*	0.671***	0.196	0.243*	0.489*
	(0.095)	(0.089)	(0.171)	(0.129)	(0.128)	(0.262)
Observations	10,606	4,922	5,684	4,225	3,342	3,039
Adjusted R square	0.325	0.342	0.319	0.327	0.350	0.292
Utilities	0.156***	0.153***	0.251*	0.188***	0.094*	0.417
	(0.035)	(0.035)	(0.148)	(0.045)	(0.049)	(0.309)
Observations	10,658	4,945	5,713	4,282	3,363	3,013
Adjusted R square	0.305	0.294	0.317	0.312	0.297	0.325
Communications	0.189***	0.150***	0.523***	0.149***	0.223***	0.402**
	(0.044)	(0.038)	(0.078)	(0.052)	(0.069)	(0.190)
Observations	10,546	4,902	5,644	4,212	3,344	2,990
Adjusted R square	0.337	0.353	0.335	0.308	0.387	0.313
Local transport	0.353***	0.295***	0.659***	0.277**	0.402***	0.307
	(0.083)	(0.078)	(0.153)	(0.114)	(0.088)	(0.291)
Observations	10,490	4,865	5,625	4,188	3,323	2,979
Adjusted R square	0.306	0.318	0.299	0.290	0.321	0.318
Travel	0.713***	0.549***	1.495***	0.668**	0.643***	1.768***
	(0.192)	(0.177)	(0.260)	(0.284)	(0.162)	(0.508)

Observations	10,667	4,950	5,717	4,287	3,369	3,011
Adjusted R square	0.297	0.289	0.340	0.288	0.276	0.355
Entertainment	0.550***	0.409***	1.159***	0.461**	0.650***	0.040
	(0.145)	(0.145)	(0.339)	(0.210)	(0.164)	(0.284)
Observations	10,641	4,940	5,701	4,270	3,363	3,008
Adjusted R square	0.283	0.285	0.305	0.272	0.281	0.315
Automobiles	0.388***	0.265**	1.434***	0.302**	0.516**	0.929***
	(0.124)	(0.109)	(0.289)	(0.148)	(0.218)	(0.332)
Observations	10,534	4,885	5,649	4,218	3,325	2,991
Adjusted R square	0.234	0.243	0.230	0.232	0.238	0.238
Other vehicles	0.154	0.119	0.869**	0.074	0.366	-0.001
	(0.141)	(0.129)	(0.359)	(0.129)	(0.372)	(0.586)
Observations	10,626	4,936	5,690	4,263	3,357	3,006
Adjusted R square	0.396	0.400	0.395	0.399	0.395	0.397
Durable goods	0.320***	0.184*	1.004**	0.317**	0.254	0.281
	(0.120)	(0.105)	(0.396)	(0.135)	(0.193)	(0.916)
Observations	10,841	5,049	5,792	4,336	3,423	3,082
Adjusted R square	0.429	0.424	0.442	0.420	0.446	0.425
Medical	0.170**	0.130	0.442**	0.093	0.321**	0.471
	(0.082)	(0.094)	(0.179)	(0.117)	(0.136)	(0.410)
Observations	10,733	5,004	5,729	4,279	3,395	3,059
Adjusted R square	0.377	0.366	0.396	0.388	0.382	0.358
Health and fitness	0.273**	0.143	0.544***	0.211	0.257	0.529
	(0.110)	(0.102)	(0.185)	(0.142)	(0.153)	(0.325)
Observations	10,844	5,055	5,789	4,349	3,422	3,073
Adjusted R square	0.303	0.286	0.367	0.302	0.320	0.290
Education	-0.143	-0.116	0.093	-0.215**	0.079	-0.305
	(0.114)	(0.126)	(0.268)	(0.085)	(0.203)	(0.373)
Observations	10,775	5,026	5,749	4,314	3,406	3,055
Adjusted R square	0.222	0.232	0.224	0.227	0.220	0.236
Home repair	-0.089	-0.126	0.055	-0.068	-0.172	-0.359
	(0.080)	(0.085)	(0.310)	(0.089)	(0.143)	(0.629)
Observations	10,666	4,961	5,705	4,282	3,372	3,012
Adjusted R square	0.450	0.433	0.470	0.476	0.456	0.408
Gifts	-0.004	-0.005	0.390	-0.045	0.126	0.106
	(0.101)	(0.096)	(0.273)	(0.132)	(0.127)	(0.577)
Observations	8,839	4,143	4,696	3,452	2,817	2,570
Adjusted R square	0.111	0.113	0.114	0.078	0.118	0.165

Note: Extended model with additional variables of control, including, lagged log value of household expenditure per capita of the consumption category in question, household average years of schooling, household gender ratio, average age/10, age squared/100, dependency ration, and urban-rural dummies. Robust standard errors clustered at the county level are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.3. E-commerce development and various categories of household expenditure per capita by region (Extended Model 1)

	(1) All	(2) bottom 25%	(3) 25%-75%	(4) top 25%
Total household expenditure	0.257***	0.305***	0.143***	0.053
	(0.067)	(0.102)	(0.049)	(0.048)
Observations	10,872	2,984	5,627	2,232
Adjusted R square	0.343	0.416	0.440	0.446
Cosmetics and beauty	0.404***	0.643**	0.197	0.164*
	(0.115)	(0.246)	(0.133)	(0.084)
Observations	10,764	2,956	5,578	2,201
Adjusted R square	0.344	0.330	0.370	0.423
Food	0.311***	0.502***	0.243***	0.108**
	(0.065)	(0.128)	(0.058)	(0.045)
Observations	10,720	2,929	5,558	2,204
Adjusted R square	0.345	0.428	0.353	0.445
Of which: Food at home	0.345***	0.538***	0.279***	0.177***
	(0.071)	(0.159)	(0.071)	(0.057)
Observations	10,717	2,929	5,555	2,204
Adjusted R square	0.389	0.463	0.401	0.391
Of which: Dining out	0.424***	0.169	0.144	0.111
	(0.142)	(0.214)	(0.147)	(0.118)
Observations	10,878	2,987	5,630	2,232
Adjusted R square	0.332	0.455	0.341	0.380
Clothes	0.217**	0.190	0.036	-0.043
	(0.095)	(0.247)	(0.085)	(0.085)
Observations	10,606	2,920	5,475	2,182
Adjusted R square	0.325	0.328	0.384	0.348
Utilities	0.156***	0.305**	0.118***	0.038
	(0.035)	(0.131)	(0.039)	(0.031)
Observations	10,658	2,956	5,532	2,141
Adjusted R square	0.305	0.341	0.311	0.328
Communications	0.189***	0.023	0.118**	0.087***
	(0.044)	(0.137)	(0.049)	(0.032)
Observations	10,546	2,913	5,478	2,128
Adjusted R square	0.337	0.302	0.382	0.431
Local transport	0.353***	0.048	0.148*	0.235*
	(0.083)	(0.244)	(0.080)	(0.119)
Observations	10,490	2,911	5,437	2,113
Adjusted R square	0.306	0.338	0.327	0.310
Travel	0.713***	0.811**	0.371**	0.411**
	(0.192)	(0.322)	(0.147)	(0.190)

Observations	10,667	2,957	5,536	2,145
Adjusted R square	0.297	0.437	0.346	0.283
Entertainment	0.550***	0.159	0.335*	0.341***
	(0.145)	(0.146)	(0.179)	(0.107)
Observations	10,641	2,952	5,516	2,144
Adjusted R square	0.283	0.315	0.303	0.326
Automobiles	0.388***	0.229	0.132	0.330**
	(0.124)	(0.177)	(0.154)	(0.144)
Observations	10,534	2,935	5,465	2,106
Adjusted R square	0.234	0.333	0.233	0.243
Other vehicles	0.154	-0.048	0.025	0.022
	(0.141)	(0.295)	(0.196)	(0.119)
Observations	10,626	2,947	5,507	2,144
Adjusted R square	0.396	0.412	0.403	0.396
Durable goods	0.320***	-0.225	0.024	0.062
	(0.120)	(0.358)	(0.122)	(0.128)
Observations	10,841	2,984	5,610	2,218
Adjusted R square	0.429	0.488	0.445	0.409
Medical	0.170**	0.548**	-0.041	0.192
	(0.082)	(0.247)	(0.120)	(0.158)
Observations	10,733	2,947	5,550	2,207
Adjusted R square	0.377	0.379	0.384	0.382
Health and fitness	0.273**	0.322*	-0.044	0.057
	(0.110)	(0.164)	(0.104)	(0.107)
Observations	10,844	2,980	5,615	2,220
Adjusted R square	0.303	0.434	0.335	0.287
Education	-0.143	-0.552**	-0.124	0.040
	(0.114)	(0.228)	(0.113)	(0.223)
Observations	10,775	2,954	5,573	2,219
Adjusted R square	0.222	0.230	0.219	0.279
Home repair	-0.089	-0.144	-0.112	-0.400***
	(0.080)	(0.328)	(0.120)	(0.131)
Observations	10,666	2,959	5,531	2,147
Adjusted R square	0.450	0.435	0.462	0.453
Gifts	-0.004	0.437	0.002	-0.310**
	(0.101)	(0.413)	(0.115)	(0.145)
Observations	8,839	2,258	4,701	1,857
Adjusted R square	0.111	0.140	0.117	0.160

Note: Extended model with additional variables of control, including, lagged log value of household expenditure per capita of the consumption category in question, household average years of schooling, household gender ratio, average age/10, age squared/100, dependency ration, and urban-rural dummies. Robust standard errors clustered at the county level are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.4. E-commerce development and various categories of household expenditure per capita by region (Extended Model 2)

VARIABLES	(1) All	(2) Urban	(3) Rural	(4) East	(5) Central	(6) West
Total household expenditure	0.245***	0.176***	0.722***	0.231***	0.234**	0.538***
	(0.062)	(0.052)	(0.096)	(0.078)	(0.107)	(0.157)
Observations	9,502	4,402	5,100	3,808	3,018	3,163
Adjusted R square	0.341	0.314	0.383	0.336	0.325	0.338
Cosmetics and beauty	0.406***	0.327***	1.011***	0.419***	0.311*	1.259***
	(0.125)	(0.118)	(0.248)	(0.155)	(0.181)	(0.302)
Observations	9,422	4,366	5,056	3,772	2,997	2,653
Adjusted R square	0.342	0.367	0.323	0.317	0.368	0.362
Food	0.289***	0.219***	0.764***	0.302***	0.233**	0.479*
	(0.063)	(0.053)	(0.122)	(0.079)	(0.099)	(0.243)
Observations	9,398	4,346	5,052	3,751	2,998	2,649
Adjusted R square	0.326	0.321	0.341	0.333	0.302	0.360
Of which: Food at home	0.342***	0.279***	0.814***	0.338***	0.291**	0.453*
	(0.067)	(0.059)	(0.126)	(0.086)	(0.108)	(0.257)
Observations	9,395	4,344	5,051	3,749	2,997	2,649
Adjusted R square	0.375	0.385	0.375	0.316	0.372	0.459
Of which: Dining out	0.349**	0.214	1.202***	0.234	0.464*	1.165**
	(0.146)	(0.132)	(0.265)	(0.173)	(0.240)	(0.496)
Observations	9,503	4,402	5,101	3,808	3,019	2,676
Adjusted R square	0.329	0.321	0.359	0.308	0.331	0.359
Clothes	0.211**	0.144	0.738***	0.195	0.233	0.502*
	(0.103)	(0.096)	(0.178)	(0.137)	(0.146)	(0.289)
Observations	9,297	4,285	5,012	3,704	2,951	2,642
Adjusted R square	0.321	0.341	0.312	0.312	0.349	0.304
Utilities	0.149***	0.141***	0.321**	0.190***	0.076*	0.486
	(0.034)	(0.034)	(0.141)	(0.044)	(0.041)	(0.307)
Observations	9,469	4,376	5,093	3,787	3,012	2,670
Adjusted R square	0.298	0.284	0.313	0.311	0.292	0.309
Communications	0.190***	0.154***	0.547***	0.148**	0.233***	0.375**
	(0.045)	(0.040)	(0.084)	(0.057)	(0.061)	(0.177)
Observations	9,382	4,338	5,044	3,734	2,996	2,652
Adjusted R square	0.341	0.364	0.334	0.303	0.397	0.324
Local transport	0.364***	0.297***	0.807***	0.300**	0.410***	0.281
	(0.083)	(0.077)	(0.165)	(0.117)	(0.083)	(0.299)
Observations	9,335	4,308	5,027	3,708	2,979	2,648
Adjusted R square	0.299	0.307	0.296	0.285	0.315	0.303
Travel	0.704***	0.534***	1.609***	0.638**	0.657***	1.888***
	(0.198)	(0.184)	(0.257)	(0.285)	(0.189)	(0.567)
Observations	9,478	4,382	5,096	3,794	3,014	2,670
Adjusted R square	0.296	0.291	0.333	0.286	0.279	0.350
Entertainment	0.528***	0.379**	1.158***	0.398*	0.687***	0.106
	(0.151)	(0.147)	(0.348)	(0.212)	(0.186)	(0.287)
Observations	9,455	4,371	5,084	3,778	3,011	2,666
Adjusted R square	0.289	0.291	0.314	0.270	0.292	0.325
Automobiles	0.384***	0.247**	1.600***	0.291*	0.505**	0.979***

	(0.133)	(0.119)	(0.339)	(0.169)	(0.222)	(0.329)
Observations	9,370	4,328	5,042	3,733	2,981	2,656
Adjusted R square	0.233	0.237	0.238	0.229	0.234	0.248
Other vehicles	0.179	0.123	0.994**	0.101	0.352	0.097
	(0.137)	(0.125)	(0.387)	(0.130)	(0.348)	(0.677)
Observations	9,448	4,371	5,077	3,773	3,008	2,667
Adjusted R square	0.393	0.394	0.396	0.391	0.397	0.392
Durable goods	0.348***	0.201*	1.039**	0.315**	0.314	0.298
	(0.130)	(0.120)	(0.400)	(0.145)	(0.224)	(0.871)
Observations	9,476	4,381	5,095	3,787	3,015	2,674
Adjusted R square	0.429	0.422	0.444	0.420	0.446	0.422
Medical	0.146*	0.095	0.459***	0.069	0.281*	0.458
	(0.082)	(0.096)	(0.171)	(0.110)	(0.143)	(0.410)
Observations	9,395	4,350	5,045	3,748	2,989	2,658
Adjusted R square	0.362	0.350	0.385	0.375	0.370	0.339
Health and fitness	0.222**	0.095	0.514**	0.100	0.322*	0.610*
	(0.107)	(0.099)	(0.215)	(0.132)	(0.165)	(0.353)
Observations	9,478	4,384	5,094	3,798	3,014	2,666
Adjusted R square	0.299	0.278	0.371	0.294	0.313	0.301
Education	-0.142	-0.127	0.167	-0.232***	0.087	0.082
	(0.116)	(0.130)	(0.269)	(0.083)	(0.201)	(0.396)
Observations	9,417	4,359	5,058	3,767	2,997	2,653
Adjusted R square	0.217	0.228	0.219	0.221	0.210	0.245
Home repair	-0.065	-0.153*	0.393	-0.082	-0.186	0.088
	(0.082)	(0.084)	(0.349)	(0.103)	(0.134)	(0.648)
Observations	9,470	4,386	5,084	3,785	3,017	2,668
Adjusted R square	0.452	0.437	0.469	0.483	0.445	0.420
Gifts	-0.013	-0.031	0.545**	-0.050	0.115	0.170
	(0.101)	(0.098)	(0.243)	(0.137)	(0.113)	(0.495)
Observations	7,802	3,626	4,176	3,039	2,525	2,238
Adjusted R square	0.111	0.113	0.116	0.079	0.120	0.167

Note: Extended model with additional variables of control, including the lagged household per capita income growth, lagged log value of household expenditure per capita of the consumption category in question, household average years of schooling household gender ratio, average age/10, age squared/100, dependency ration, and urban-rural dummies. Robust standard errors clustered at the county level are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.5. E-commerce development and various categories of household expenditure per capita by household consumption level (Extended model 2)

	(1) All	(2) bottom 25%	(3) 25%-75%	(4) top 25%
Total household expenditure	0.245***	0.371***	0.142***	0.039
	(0.062)	(0.078)	(0.047)	(0.050)
Observations	9,502	2,590	4,945	1,946
Adjusted R square	0.341	0.407	0.431	0.456
Cosmetics and beauty	0.406***	0.540**	0.214	0.177*
	(0.125)	(0.272)	(0.146)	(0.098)
Observations	9,422	2,569	4,905	1,927
Adjusted R square	0.342	0.322	0.370	0.425
Food	0.289***	0.447***	0.226***	0.104**
	(0.063)	(0.134)	(0.055)	(0.043)
Observations	9,398	2,551	4,895	1,931
Adjusted R square	0.326	0.395	0.331	0.457
Of which: Food at home	0.342***	0.502***	0.267***	0.203***
	(0.067)	(0.170)	(0.071)	(0.056)
Observations	9,395	2,551	4,892	1,931
Adjusted R square	0.375	0.447	0.384	0.382
Of which: Dining out	0.349**	0.155	0.097	0.034
	(0.146)	(0.245)	(0.155)	(0.118)
Observations	9,503	2,590	4,946	1,946
Adjusted R square	0.329	0.458	0.335	0.364
Clothes	0.211**	0.187	0.062	-0.054
	(0.103)	(0.267)	(0.096)	(0.093)
Observations	9,297	2,536	4,833	1,907
Adjusted R square	0.321	0.325	0.374	0.353
Utilities	0.149***	0.337**	0.105***	0.051
	(0.034)	(0.129)	(0.036)	(0.032)
Observations	9,469	2,584	4,935	1,929
Adjusted R square	0.298	0.321	0.303	0.349
Communications	0.190***	0.029	0.123**	0.094***
	(0.045)	(0.135)	(0.052)	(0.034)
Observations	9,382	2,557	4,888	1,918
Adjusted R square	0.341	0.312	0.378	0.434
Local transport	0.364***	-0.053	0.181**	0.261**
	(0.083)	(0.263)	(0.086)	(0.120)
Observations	9,335	2,555	4,855	1,904
Adjusted R square	0.299	0.339	0.315	0.302
Travel	0.704***	0.966**	0.376**	0.393**
	(0.198)	(0.380)	(0.162)	(0.186)
Observations	9,478	2,586	4,936	1,935
Adjusted R square	0.296	0.420	0.350	0.277
Entertainment	0.528***	0.244	0.290	0.338***
	(0.151)	(0.175)	(0.180)	(0.115)
Observations	9,455	2,580	4,921	1,933
Adjusted R square	0.289	0.332	0.308	0.321
Automobiles	0.384***	0.297	0.170	0.298*

	(0.133)	(0.203)	(0.164)	(0.162)
Observations	9,370	2,567	4,881	1,902
Adjusted R square	0.233	0.329	0.233	0.238
Other vehicles	0.179	0.279	0.002	0.051
	(0.137)	(0.309)	(0.205)	(0.117)
Observations	9,448	2,578	4,917	1,933
Adjusted R square	0.393	0.406	0.405	0.388
Durable goods	0.348***	-0.113	0.075	0.057
	(0.130)	(0.428)	(0.149)	(0.134)
Observations	9,476	2,588	4,930	1,937
Adjusted R square	0.429	0.486	0.444	0.403
Medical	0.146*	0.584**	-0.049	0.169
	(0.082)	(0.290)	(0.113)	(0.145)
Observations	9,395	2,559	4,887	1,928
Adjusted R square	0.362	0.381	0.363	0.367
Health and fitness	0.222**	0.151	-0.047	-0.012
	(0.107)	(0.144)	(0.107)	(0.114)
Observations	9,478	2,587	4,934	1,936
Adjusted R square	0.299	0.419	0.334	0.284
Education	-0.142	-0.414*	-0.158	0.086
	(0.116)	(0.241)	(0.119)	(0.203)
Observations	9,417	2,563	4,899	1,934
Adjusted R square	0.217	0.226	0.215	0.271
Home repair	-0.065	-0.064	-0.010	-0.447***
	(0.082)	(0.383)	(0.130)	(0.131)
Observations	9,470	2,586	4,931	1,932
Adjusted R square	0.452	0.434	0.463	0.460
Gifts	-0.013	0.562	-0.009	-0.306**
	(0.101)	(0.387)	(0.119)	(0.154)
Observations	7,802	1,983	4,172	1,631
Adjusted R square	0.111	0.142	0.117	0.162

Note: Extended model with additional variables of control, including the lagged log household per capita income growth, lagged log value of household expenditure per capita of the consumption category in question, household average years of schooling, household gender ratio, average age squared/100, dependency ratio, and urban-rural dummies. Robust standard errors clustered at the county level are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.6. E-commerce development and various categories of household expenditure per capita by region (Extended Model 3)

VARIABLES	(1) All	(2) Urban	(3) Rural	(4) East	(5) Central	(6) West
Total household expenditure	0.210***	0.151***	0.623***	0.207***	0.189	0.538***
	(0.061)	(0.054)	(0.103)	(0.067)	(0.124)	(0.157)
Observations	10,171	4,740	5,431	4,049	3,185	3,163
Adjusted R square	0.366	0.345	0.395	0.374	0.347	0.338
Cosmetics and beauty	0.328***	0.256**	0.845***	0.387***	0.221	0.879***
	(0.110)	(0.107)	(0.226)	(0.128)	(0.165)	(0.320)
Observations	10,069	4,695	5,374	4,006	3,157	2,906
Adjusted R square	0.349	0.376	0.326	0.338	0.362	0.367
Food	0.268***	0.205***	0.718***	0.280***	0.218*	0.444**
	(0.059)	(0.052)	(0.124)	(0.070)	(0.113)	(0.218)
Observations	10,037	4,673	5,364	3,982	3,155	2,900
Adjusted R square	0.358	0.360	0.367	0.373	0.337	0.384
Of which: Food at home	0.289***	0.245***	0.639***	0.289***	0.240**	0.362*
	(0.063)	(0.055)	(0.165)	(0.086)	(0.107)	(0.214)
Observations	10,034	4,671	5,363	3,980	3,154	2,900
Adjusted R square	0.399	0.416	0.390	0.340	0.410	0.470
Of which: Dining out	0.330**	0.171	1.192***	0.207	0.444*	1.092**
	(0.134)	(0.127)	(0.266)	(0.151)	(0.241)	(0.493)
Observations	10,176	4,742	5,434	4,052	3,187	2,937
Adjusted R square	0.337	0.328	0.370	0.326	0.333	0.362
Clothes	0.137	0.079	0.513***	0.128	0.155	0.304
	(0.087)	(0.082)	(0.169)	(0.115)	(0.131)	(0.254)
Observations	9,924	4,603	5,321	3,926	3,104	2,894
Adjusted R square	0.338	0.359	0.327	0.346	0.359	0.301
Utilities	0.130***	0.130***	0.191	0.174***	0.037	0.408
	(0.034)	(0.037)	(0.141)	(0.041)	(0.042)	(0.307)
Observations	9,972	4,623	5,349	3,979	3,125	2,868
Adjusted R square	0.305	0.302	0.311	0.313	0.303	0.319
Communications	0.156***	0.117***	0.481***	0.126**	0.175**	0.334
	(0.041)	(0.034)	(0.080)	(0.049)	(0.066)	(0.200)
Observations	9,868	4,582	5,286	3,915	3,108	2,845
Adjusted R square	0.348	0.373	0.338	0.322	0.407	0.311
Local transport	0.292***	0.235***	0.527***	0.223**	0.319***	0.137
	(0.075)	(0.068)	(0.160)	(0.102)	(0.090)	(0.289)
Observations	9,812	4,546	5,266	3,886	3,087	2,839
Adjusted R square	0.319	0.335	0.309	0.305	0.335	0.327
Travel	0.579***	0.395***	1.270***	0.518**	0.489***	1.697***
	(0.164)	(0.146)	(0.200)	(0.239)	(0.153)	(0.484)

Observations	9,978	4,626	5,352	3,982	3,131	2,865
Adjusted R square	0.304	0.300	0.342	0.301	0.280	0.352
Entertainment	0.519***	0.394***	1.020***	0.417**	0.618***	0.036
	(0.139)	(0.141)	(0.310)	(0.194)	(0.181)	(0.300)
Observations	9,955	4,616	5,339	3,967	3,126	2,862
Adjusted R square	0.284	0.288	0.299	0.271	0.281	0.319
Automobiles	0.311***	0.204*	1.234***	0.210	0.423*	0.846***
	(0.118)	(0.106)	(0.273)	(0.135)	(0.219)	(0.295)
Observations	9,850	4,565	5,285	3,912	3,088	2,850
Adjusted R square	0.241	0.250	0.238	0.240	0.239	0.252
Other vehicles	0.085	0.062	0.728**	0.007	0.288	-0.061
	(0.146)	(0.139)	(0.364)	(0.132)	(0.395)	(0.561)
Observations	9,940	4,614	5,326	3,960	3,119	2,861
Adjusted R square	0.397	0.403	0.395	0.402	0.399	0.392
Durable goods	0.187	0.052	0.853**	0.176	0.121	0.181
	(0.118)	(0.110)	(0.389)	(0.121)	(0.188)	(0.929)
Observations	10,141	4,718	5,423	4,027	3,180	2,934
Adjusted R square	0.435	0.432	0.443	0.423	0.455	0.429
Medical	0.136	0.097	0.442**	0.040	0.291**	0.515
	(0.089)	(0.101)	(0.195)	(0.134)	(0.142)	(0.388)
Observations	10,045	4,679	5,366	3,978	3,154	2,913
Adjusted R square	0.376	0.369	0.389	0.383	0.383	0.359
Health and fitness	0.183*	0.055	0.345*	0.118	0.179	0.383
	(0.098)	(0.093)	(0.195)	(0.116)	(0.163)	(0.307)
Observations	10,144	4,722	5,422	4,040	3,179	2,925
Adjusted R square	0.309	0.293	0.372	0.304	0.330	0.300
Education	-0.142	-0.131	0.174	-0.231***	0.035	-0.089
	(0.114)	(0.126)	(0.274)	(0.086)	(0.196)	(0.358)
Observations	10,081	4,695	5,386	4,007	3,165	2,909
Adjusted R square	0.221	0.231	0.220	0.226	0.217	0.236
Home repair	-0.124	-0.156*	0.033	-0.114	-0.263	-0.213
	(0.087)	(0.091)	(0.342)	(0.081)	(0.162)	(0.660)
Observations	9,975	4,633	5,342	3,975	3,134	2,866
Adjusted R square	0.452	0.434	0.471	0.483	0.455	0.407
Gifts	-0.062	-0.054	0.227	-0.115	0.053	0.011
	(0.100)	(0.098)	(0.275)	(0.134)	(0.133)	(0.608)
Observations	8,279	3,870	4,409	3,214	2,623	2,442
Adjusted R square	0.111	0.108	0.118	0.078	0.122	0.165

Note: Alternative extended model, with additional variables of control, including the lagged household per capita income, legged log of household expenditure per capita of the consumption category in question, household average years of schooling household gender ratio, average age, age squared/100, dependency ration, and urban-rural dummies. Robust standard errors clustered at the county level are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.7. E-commerce development and various categories of household expenditure per capita by household consumption level (Extended model 3)

	(1) All	(2) bottom 25%	(3) 25%-75%	(4) top 25%
Total household expenditure	0.210***	0.289***	0.114**	0.047
	(0.061)	(0.105)	(0.046)	(0.043)
	10,171	2,770	5,287	2,088
	0.366	0.427	0.449	0.458
Cosmetics and beauty	0.328***	0.555**	0.176	0.128*
	(0.110)	(0.251)	(0.137)	(0.071)
Observations	10,069	2,743	5,239	2,061
Adjusted R square	0.349	0.332	0.365	0.436
Food	0.268***	0.466***	0.227***	0.094**
	(0.059)	(0.131)	(0.055)	(0.044)
Observations	10,034	2,720	5,225	2,063
Adjusted R square	0.399	0.464	0.406	0.400
Of which: Food at home	0.289***	0.492***	0.264***	0.144**
	(0.063)	(0.167)	(0.069)	(0.055)
Observations	10,034	2,018	5,116	2,877
Adjusted R square	0.399	0.464	0.366	0.410
Of which: Dining out	0.330**	0.141	0.081	0.061
	(0.134)	(0.220)	(0.135)	(0.123)
Observations	9,924	2,712	5,144	2,042
Adjusted R square	0.338	0.329	0.393	0.376
Clothes	0.137	0.165	-0.002	-0.066
	(0.087)	(0.248)	(0.090)	(0.075)
Observations	9,924	2,061	5,178	2,911
Adjusted R square	0.338	0.479	0.362	0.343
Utilities	0.130***	0.279**	0.111***	0.023
	(0.034)	(0.126)	(0.040)	(0.030)
Observations	9,972	2,743	5,198	2,005
Adjusted R square	0.305	0.330	0.313	0.328
Communications	0.156***	0.033	0.106**	0.081***
	(0.041)	(0.131)	(0.049)	(0.029)
Observations	9,868	2,704	5,148	1,991
Adjusted R square	0.348	0.294	0.398	0.436
Local transport	0.292***	0.030	0.121	0.220**
	(0.075)	(0.243)	(0.082)	(0.110)
Observations	9,812	2,703	5,105	1,978
Adjusted R square	0.319	0.344	0.335	0.325
Travel	0.579***	0.771**	0.299**	0.322*
	(0.164)	(0.327)	(0.126)	(0.170)

Observations	9,978	2,745	5,199	2,008
Adjusted R square	0.304	0.450	0.345	0.288
Entertainment	0.519***	0.190	0.298*	0.374***
	(0.139)	(0.144)	(0.178)	(0.098)
Observations	9,850	2,722	5,132	1,971
Adjusted R square	0.241	0.336	0.240	0.248
Automobiles	0.311***	0.199	0.094	0.307**
	(0.118)	(0.172)	(0.150)	(0.125)
Observations	9,850	2,722	5,132	1,971
Adjusted R square	0.241	0.336	0.240	0.248
Other vehicles	0.085	-0.129	0.046	-0.030
	(0.146)	(0.288)	(0.206)	(0.131)
Observations	9,940	2,735	5,173	2,007
Adjusted R square	0.397	0.416	0.401	0.399
Durable goods	0.187	-0.275	-0.019	0.010
	(0.118)	(0.380)	(0.120)	(0.132)
Observations	10,141	2,770	5,270	2,075
Adjusted R square	0.435	0.496	0.446	0.412
Medical	0.136	0.498*	-0.051	0.181
	(0.089)	(0.257)	(0.118)	(0.172)
Observations	10,045	2,737	5,216	2,066
Adjusted R square	0.376	0.367	0.386	0.385
Health and fitness	0.183*	0.229*	-0.059	-0.007
	(0.098)	(0.135)	(0.107)	(0.111)
Observations	10,144	2,766	5,276	2,076
Adjusted R square	0.309	0.424	0.338	0.294
Education	-0.142	-0.410*	-0.160	0.024
	(0.114)	(0.213)	(0.123)	(0.202)
Observations	10,081	2,744	5,235	2,076
Adjusted R square	0.221	0.229	0.217	0.275
Home repair	-0.124	-0.090	-0.169	-0.325**
	(0.087)	(0.341)	(0.128)	(0.136)
Observations	9,975	2,746	5,196	2,007
Adjusted R square	0.452	0.435	0.465	0.451
Gifts	-0.062	0.505	-0.014	-0.376**
	(0.100)	(0.379)	(0.115)	(0.152)
Observations	8,279	2,094	4,425	1,738
Adjusted R square	0.111	0.133	0.119	0.150

Note: Alternative extended model, with additional variables of control, including the lagged log household per capita, income per capita lagged log value of household expenditure per capita of the consumption category in question, household average years of schooling, household gender ratio, average age squared/100, dependency ratio, and urban-rural dummies. Robust standard errors clustered at the county level are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.8. E-commerce development and various categories of household expenditure per capita by region (Extended Model 4)

VARIABLES	(1) All	(2) Urban	(3) Rural	(4) East	(5) Central	(6) West
Total household expenditure	0.226***	0.155***	0.692***	0.170**	0.238*	0.538***
	(0.064)	(0.056)	(0.105)	(0.069)	(0.125)	(0.157)
Observations	10,701	5,072	5,629	4,253	3,428	3,163
Adjusted R square	0.344	0.324	0.378	0.351	0.320	0.338
Cosmetics and beauty	0.353***	0.280***	0.914***	0.396**	0.258*	1.004***
	(0.113)	(0.106)	(0.251)	(0.150)	(0.150)	(0.328)
Observations	10,597	5,023	5,574	4,210	3,399	2,988
Adjusted R square	0.343	0.368	0.322	0.332	0.361	0.353
Food	0.283***	0.229***	0.737***	0.238***	0.269**	0.479**
	(0.063)	(0.056)	(0.121)	(0.070)	(0.117)	(0.217)
Observations	10,550	4,993	5,557	4,174	3,396	2,980
Adjusted R square	0.347	0.343	0.365	0.366	0.310	0.390
Of which: Food at home	0.304***	0.266***	0.682***	0.240***	0.309**	0.425*
	(0.067)	(0.058)	(0.164)	(0.084)	(0.115)	(0.224)
Observations	10,547	4,991	5,556	4,172	3,395	2,980
Adjusted R square	0.390	0.400	0.390	0.339	0.380	0.476
Of which: Dining out	0.424***	0.267*	1.258***	0.210	0.589**	1.137**
	(0.148)	(0.147)	(0.273)	(0.161)	(0.245)	(0.446)
Observations	10,707	5,075	5,632	4,257	3,430	3,020
Adjusted R square	0.331	0.322	0.361	0.324	0.329	0.353
Clothes	0.192**	0.125	0.634***	0.145	0.232*	0.433*
	(0.094)	(0.091)	(0.186)	(0.131)	(0.129)	(0.251)
Observations	10,437	4,922	5,515	4,121	3,342	2,974
Adjusted R square	0.326	0.342	0.319	0.327	0.350	0.295
Utilities	0.171***	0.138***	0.321**	0.169***	0.122**	0.432
	(0.041)	(0.036)	(0.153)	(0.048)	(0.057)	(0.281)
Observations	10,493	4,945	5,548	4,178	3,363	2,952
Adjusted R square	0.308	0.295	0.329	0.313	0.300	0.337
Communications	0.177***	0.132***	0.525***	0.119**	0.210***	0.396**
	(0.044)	(0.038)	(0.086)	(0.052)	(0.066)	(0.178)
Observations	10,383	4,902	5,481	4,110	3,344	2,929
Adjusted R square	0.337	0.354	0.334	0.308	0.387	0.316
Local transport	0.332***	0.272***	0.601***	0.217*	0.407***	0.215
	(0.081)	(0.077)	(0.160)	(0.111)	(0.090)	(0.289)
Observations	10,327	4,865	5,462	4,086	3,323	2,918
Adjusted R square	0.306	0.318	0.298	0.290	0.321	0.321
Travel	0.650***	0.465***	1.423***	0.496*	0.626***	1.743***
	(0.187)	(0.169)	(0.273)	(0.272)	(0.156)	(0.515)

Observations	10,502	4,950	5,552	4,183	3,369	2,950
Adjusted R square	0.297	0.291	0.337	0.291	0.276	0.355
Entertainment	0.495***	0.342**	1.065***	0.383*	0.600***	0.016
	(0.143)	(0.142)	(0.356)	(0.215)	(0.156)	(0.291)
Observations	10,477	4,940	5,537	4,167	3,363	2,947
Adjusted R square	0.284	0.287	0.305	0.275	0.282	0.315
Automobiles	0.310**	0.158	1.465***	0.213	0.458**	0.905***
	(0.120)	(0.105)	(0.305)	(0.160)	(0.196)	(0.318)
Observations	10,372	4,885	5,487	4,116	3,325	2,931
Adjusted R square	0.235	0.245	0.230	0.231	0.239	0.245
Other vehicles	0.057	-0.023	0.818**	-0.103	0.304	-0.022
	(0.143)	(0.128)	(0.387)	(0.123)	(0.372)	(0.591)
Observations	10,461	4,936	5,525	4,159	3,357	2,945
Adjusted R square	0.397	0.403	0.396	0.402	0.396	0.398
Durable goods	0.178	0.025	0.929**	0.125	0.172	0.220
	(0.114)	(0.101)	(0.426)	(0.112)	(0.195)	(0.917)
Observations	10,670	5,049	5,621	4,230	3,423	3,017
Adjusted R square	0.430	0.427	0.439	0.422	0.447	0.422
Medical	0.163**	0.124	0.407**	0.085	0.327**	0.429
	(0.082)	(0.097)	(0.192)	(0.135)	(0.123)	(0.391)
Observations	10,562	5,004	5,558	4,173	3,395	2,994
Adjusted R square	0.378	0.366	0.397	0.387	0.382	0.359
Health and fitness	0.221**	0.059	0.563***	0.148	0.217	0.519
	(0.106)	(0.093)	(0.200)	(0.138)	(0.144)	(0.327)
Observations	10,673	5,055	5,618	4,243	3,422	3,008
Adjusted R square	0.303	0.288	0.366	0.301	0.321	0.289
Education	-0.151	-0.156	0.095	-0.185**	0.010	-0.248
	(0.117)	(0.130)	(0.274)	(0.085)	(0.201)	(0.369)
Observations	10,604	5,026	5,578	4,208	3,406	2,990
Adjusted R square	0.221	0.232	0.222	0.227	0.221	0.232
Home repair	-0.121	-0.202**	0.077	-0.121	-0.209	-0.458
	(0.091)	(0.095)	(0.319)	(0.095)	(0.158)	(0.616)
Observations	10,505	4,961	5,544	4,182	3,372	2,951
Adjusted R square	0.449	0.433	0.468	0.473	0.456	0.409
Gifts	-0.028	-0.023	0.353	-0.031	0.074	0.121
	(0.107)	(0.107)	(0.286)	(0.156)	(0.128)	(0.565)
Observations	8,716	4,143	4,573	3,377	2,817	2,522
Adjusted R square	0.112	0.113	0.116	0.077	0.121	0.171

Note: Alternative extended model, with additional variables of control, including provincial CPI of the corresponding consumption category, lagged value of log household per capita in consumption category in question, household average years of schooling household gender ratio, average age, age squared/100, dependency ration, and urban-rural dummies. Robust standard errors clustered at the county level are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.9. E-commerce development and various categories of household expenditure per capita by household consumption level (Extended model 4)

	(1) All	(2) bottom 25%	(3) 25%-75%	(4) top 25%
Total household expenditure	0.226***	0.287***	0.131***	0.043
	(0.064)	(0.100)	(0.048)	(0.051)
Observations	10,701	2,959	5,547	2,166
Adjusted R square	0.344	0.417	0.439	0.442
Cosmetics and beauty	0.353***	0.570**	0.194	0.141
	(0.113)	(0.248)	(0.135)	(0.089)
Observations	10,597	2,931	5,500	2,137
Adjusted R square	0.343	0.330	0.367	0.425
Food	0.283***	0.442***	0.236***	0.098**
	(0.063)	(0.129)	(0.058)	(0.048)
Observations	10,550	2,904	5,478	2,139
Adjusted R square	0.347	0.428	0.356	0.447
Of which: Food at home	0.304***	0.456***	0.264***	0.149**
	(0.067)	(0.154)	(0.070)	(0.060)
Observations	10,547	2,904	5,475	2,139
Adjusted R square	0.390	0.465	0.401	0.392
Of which: Dining out	0.424***	0.191	0.172	0.143
	(0.148)	(0.218)	(0.147)	(0.137)
Observations	10,707	2,962	5,550	2,166
Adjusted R square	0.331	0.453	0.341	0.379
Clothes	0.192**	0.204	0.036	-0.068
	(0.094)	(0.254)	(0.086)	(0.089)
Observations	10,437	2,895	5,396	2,117
Adjusted R square	0.326	0.330	0.386	0.348
Utilities	0.171***	0.347**	0.145***	0.027
	(0.041)	(0.134)	(0.047)	(0.033)
Observations	10,493	2,931	5,457	2,076
Adjusted R square	0.308	0.345	0.313	0.333
Communications	0.177***	0.049	0.116**	0.071**
	(0.044)	(0.138)	(0.049)	(0.035)
Observations	10,383	2,888	5,404	2,064
Adjusted R square	0.337	0.302	0.384	0.432
Local transport	0.332***	0.045	0.139*	0.233*
	(0.081)	(0.247)	(0.079)	(0.128)
Observations	10,327	2,886	5,362	2,050
Adjusted R square	0.306	0.340	0.327	0.309
Travel	0.650***	0.841**	0.358**	0.305*
	(0.187)	(0.325)	(0.146)	(0.182)

Observations	10,502	2,932	5,461	2,080
Adjusted R square	0.297	0.437	0.347	0.282
Entertainment	0.495***	0.168	0.279	0.328***
	(0.143)	(0.147)	(0.174)	(0.109)
Observations	10,477	2,927	5,441	2,080
Adjusted R square	0.284	0.313	0.304	0.327
Automobiles	0.310**	0.199	0.063	0.308**
	(0.120)	(0.175)	(0.151)	(0.155)
Observations	10,372	2,910	5,391	2,043
Adjusted R square	0.235	0.333	0.234	0.243
Other vehicles	0.057	-0.102	-0.050	-0.073
	(0.143)	(0.302)	(0.199)	(0.111)
Observations	10,461	2,922	5,432	2,079
Adjusted R square	0.397	0.413	0.404	0.400
Durable goods	0.178	-0.256	-0.072	-0.063
	(0.114)	(0.373)	(0.128)	(0.127)
Observations	10,670	2,959	5,530	2,152
Adjusted R square	0.430	0.489	0.445	0.409
Medical	0.163**	0.538**	-0.083	0.274
	(0.082)	(0.237)	(0.116)	(0.173)
Observations	10,562	2,922	5,470	2,141
Adjusted R square	0.378	0.378	0.385	0.383
Health and fitness	0.221**	0.328**	-0.070	0.024
	(0.106)	(0.163)	(0.108)	(0.106)
Observations	10,673	2,955	5,535	2,154
Adjusted R square	0.303	0.432	0.337	0.284
Education	-0.151	-0.578**	-0.137	0.028
	(0.117)	(0.233)	(0.112)	(0.243)
Observations	10,604	2,929	5,493	2,153
Adjusted R square	0.221	0.230	0.217	0.278
Home repair	-0.121	-0.128	-0.140	-0.436***
	(0.091)	(0.336)	(0.128)	(0.135)
Observations	10,505	2,934	5,456	2,086
Adjusted R square	0.449	0.434	0.463	0.446
Gifts	-0.028	0.357	-0.005	-0.299*
	(0.107)	(0.419)	(0.118)	(0.159)
Observations	8,716	2,240	4,643	1,810
Adjusted R square	0.112	0.142	0.117	0.160

Note: Alternative extended model with additional variables of control, including CPI of the corresponding consumption category, lagged log value of household expenditure per capita of the consumption category in question, household average years of schooling, household gender ratio, average age squared/100, dependency ratio, , and urban-rural dummies. Robust standard errors clustered at the county level are presented in parentheses. *** p<0.01, ** p<0.05, * p<0.1.