Food Policy 63 (2016) 36–43

Contents lists available at ScienceDirect

Food Policy

journal homepage: www.elsevier.com/locate/foodpol

Matching food with mouths: A statistical explanation to the abnormal decline of per capita food consumption in rural China

Xiaohua Yu [a,b,*], David Abler [c]

[a] School of Management, Zhejiang University, Hangzhou 310058, PR China
[b] Department of Agricultural Economics and Rural Development, 10.121, Platz der Göttinger Sieben 5, 37073 Göttingen, Germany
[c] Department of Agricultural Economics, Sociology and Education, Penn State University, 207 Armsby Building, University Park, PA 16802, USA

ARTICLE INFO

Article history:
Received 24 May 2015
Received in revised form 20 June 2016
Accepted 23 June 2016
Available online 9 July 2016

JEL classification:
Q11
C81
O13

Keywords:
Food demand
Underreporting
Rural China
Food away from home
Off-farm migration

ABSTRACT

This study provides an alternative explanation for the unusual apparent decline in food consumption in rural China after 2000. We find that it is mainly attributable to significant measurement errors in the Chinese Rural Household Survey and the calculation of per capita food consumption. In a household survey, total consumption for a household in a certain period is often well recorded, and per capita consumption is obtained by dividing total consumption by household size. Such a calculation of per capita food consumption is vulnerable to a mismatch between food and mouths. Total consumption may be subject to measurement errors caused primarily by food away from home (FAFH). Also, the household size recorded in the survey is not necessarily the same as the number of mouths (consumption household size), who consume the food recorded in the survey. Our results indicate that per capita food consumption in rural China is currently being underestimated by about 30%. Our results also indicate that income elasticities of food consumption are greater than measured elasticities based on the Rural Household Survey data. A direct policy implication for avoiding statistical errors in calculating per capita consumption would be correctly recording the consumption household size corresponding to total consumption in household surveys.

1. Introduction

Valid and reliable food and agricultural statistics are essential to the design, implementation, and evaluation of policies related to farmer welfare, consumer welfare, macroeconomic stability, nutritional status, food and agricultural trade, food security, and environmental issues related to agriculture (Yu and Abler, 2014). In the case of food consumption, Engel's Law predicts that the share of household income spent on food decreases as household income increases, total expenditure on food typically increases. Increases in household income often lead to higher intakes of protein, calories, and micronutrients. However, phenomena that apparently contradict these tendencies have emerged in the food consumption statistics for many developing countries, such as China (Carter et al., 2012) and India (Deaton and Drèze, 2009; Smith, 2015), where a declining trend of per capita food consumption and nutrition intake has been observed (see Fig. 1).

Though the official statistics in China show that both production and imports of food have continuously increased (Yu and Zhao, 2009), the household surveys in China by the National Bureau of Statistics of China (NBSC) indicate a substantial decline in per capita food grain consumption and a very minor increase in meat and other products both for rural and for urban China since 1990 (Carter et al., 2012). The Urban Household Survey in China shows that per capita grain consumption dropped from 131 kg in 1990 to 81 kg in 2009, while meat consumption only increased from 25 kg to 35 kg during the same period for urban China (Zhou et al., 2015; Liu et al., 2015; Jiang et al., 2015). Similarly, the Rural Household Survey in China, as shown in Table 1, indicates that per capita grain consumption first slightly increased after 1978, then remained steady at about 250 kg/year until 1997, and then declined to less than 190 kg/year in 2009. Rural Household Survey statistics also indicate that per capita vegetable consumption dropped from more than 130 kg/year before 1990 to less than 100 kg/year in 2009, and that per capita meat consumption only increased from 6 kg/year in 1978 to about 20 kg/year in 2009. In

* Corresponding author at: Department of Agricultural Economics and Rural Development, 10.121, Platz der Göttinger Sieben 5, 37073 Göttingen, Germany.
E-mail addresses: xyu@uni-goettingen.de (X. Yu), dave@btnumbers.com (D. Abler).

http://dx.doi.org/10.1016/j.foodpol.2016.06.009
0306-9192/

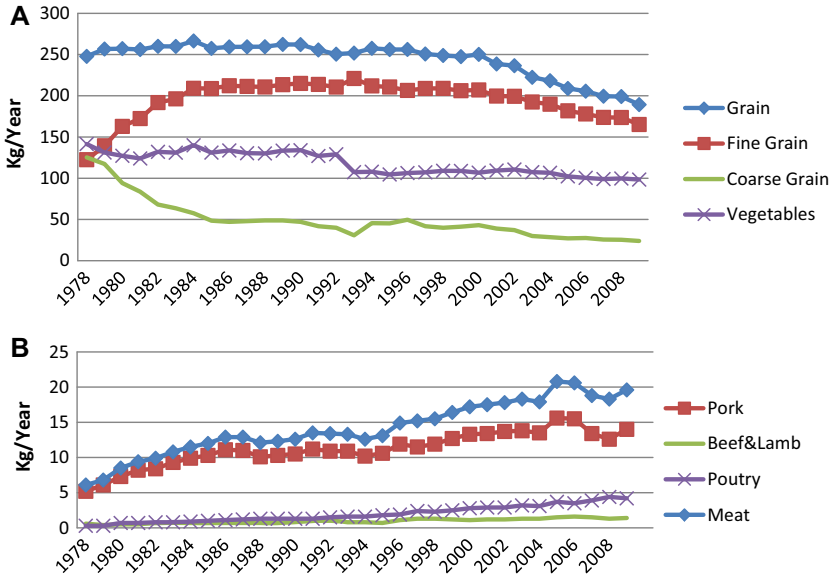

Fig. 1. (A) Changes in per capita grain and vegetables in rural China (1978–2009). (B) Change in per capita meat consumption in rural China (1978–2009). *Source:* China Yearbook of Rural Household Survey (various years).

Table 1
Nutrient consumption in China and rural China. *Sources:* FAO & China Yearbook of Rural Household Survey (2010).

Year		1990–92	1995–97	2000–02	2006–08
Energy (1000 Calories)	China (FAO)	2580	2840	2920	2990
	Rural China (NBSC)	2485	2501	2580	2350
Protein (g/day)	China (FAO)	67	81	86	89
	Rural China (NBSC)	62	68	71	66
Fat (g/day)	China (FAO)	58	72	82	90
	Rural China (NBSC)	49	50	66	75

Notes:
1. The data for China as a whole are from the food balance sheet for China in the FAOSTAT database.
2. The data for rural China are from the Rural Household Survey as reported in the *China Yearbook of Rural Household Survey* (2010).

terms of total caloric intake, the increase in consumption of meat and other products obviously cannot compensate for the apparent decline in grain consumption for both urban and rural China.

Fig. 2 shows the changes over time in calorie, protein and fat consumption in rural China in the official statistics by NBSC, indicating that per capita calorie consumption has sharply decreased in recent years, declining from 2605 kcal per day in 2000–2266 kcal per day in 2009. The 2009 level of consumption is significantly less than 2780 kcal, the dietary energy requirement of a subsistence farmer as calculated by FAO.[1] There are no official statistics on caloric intake for urban households in China. According to our calculations for urban China, per capita calorie consumption in 1990, 2000 and 2010 was respectively 2150, 1736, and 1794 kcal per day. This would seem to imply a substantial decline in per capita food consumption in the 1990 s in urban China, followed by a period of stability after 2000. Similar findings are indicated by Carter et al. (2012, their Table 2). These statistics would seem to suggest that the income elasticity of calorie consumption is negative for the past three decades, which is puzzling and contradictory to the findings in the literature (Chen et al., 2015; Shimokawa, 2010; Tian and Yu, 2013, 2015).

On the other hand, statistics on dietary energy consumption for China as whole, as compiled in FAO's Food Balance Sheet (FBS) statistics, show a much different picture. Table 1 reports trends in calorie, protein and fat consumption in China after 1990 calculated from FAO's food balance sheet (FBS) for China. The statistics indicate that dietary energy increased from 2580 kcal per day in 1990–1992 to 2990 kcal per day in 2006–2008, consistent with increasing grain production and net imports in China (Yu and Zhao, 2009). In addition, Wu (2006) finds that the number of overweight and obese people in China has been increasing significantly, which is also consistent with increasing per capita dietary energy consumption.

What causes the divergence in trends between micro household survey data and macro FBS statistics? Has per capita dietary energy consumption in rural China increased or decreased? It has been known for at least three decades that household survey data for many countries indicate lower levels of per capita food consumption (Dowler and Seo, 1985) and higher levels of food insecurity (Barrett, 2010) than FBS statistics. There are many possible explanations for this, including (1) food waste and spoilage not reflected in FBS statistics, (2) home production of food not captured by household expenditure surveys, and (3) differences in the types of foods covered on household surveys and in the FBS (Jacobs and Sumner, 2002). This paper focuses on a different question, namely, not why levels of per capita food consumption are different between these two data sources but instead why the trends that they indicate for rural China do not agree with each other.

Carter et al. (2012) and Zhong et al. (2012) argue that the recent decrease in per capita energy consumption is reasonable in China, and they attribute it to the changing age structure of the Chinese

[1] Source: http://www.fao.org/docrep/003/AA040E/AA040E06.htm#ch6.1.