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Department of Agricultural and Consumer Economics, University of Illinois Urbana-Champaign

China, India, the Food Transition, and Future Demand Growth

Carl Zulauf

Department of Agricultural, Environmental and Development Economics
Ohio State University

July 2, 2015

***farmdoc daily* (5):122**

Recommended citation format: Zulauf, C. "China, India, the Food Transition, and Future Demand Growth." *farmdoc daily* (5):122, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, July 2, 2015.

Permalink http://farmdocdaily.illinois.edu/2015/07/china-india-the-food-transition-future-demand.html

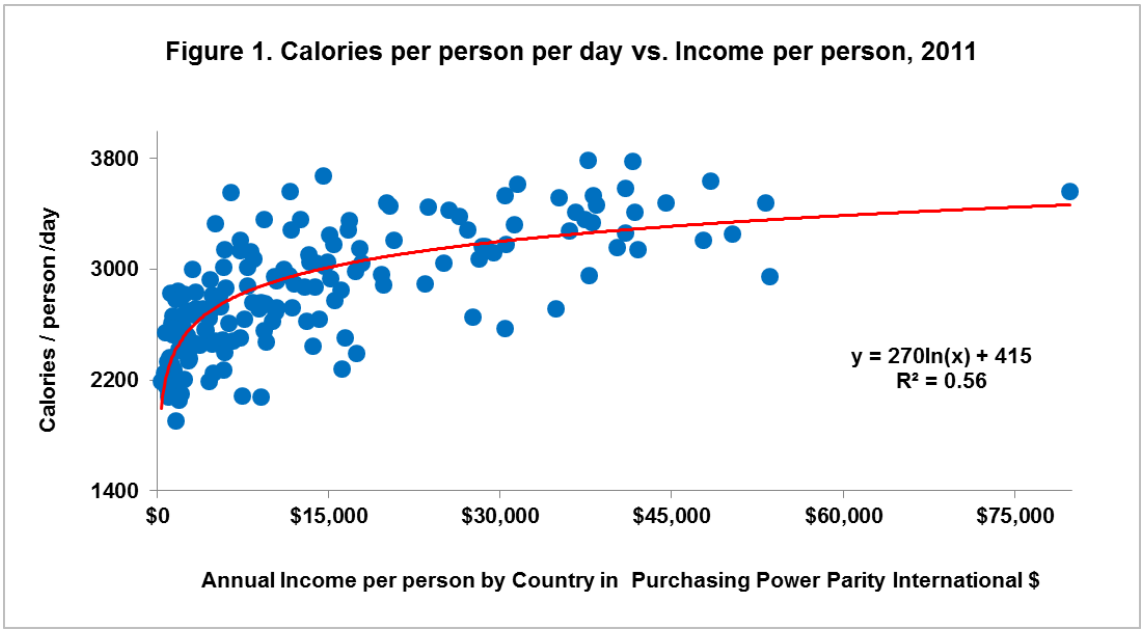
Overview

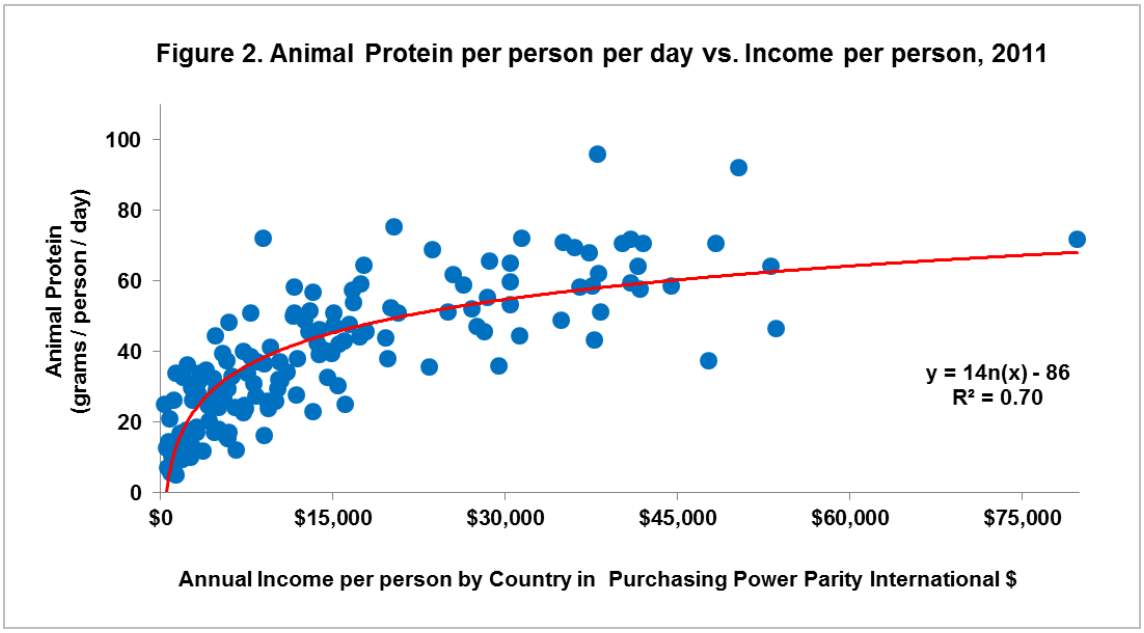
China and India's food transition since 1980 is examined. Observations and implications for future growth in global food demand are drawn.

Data on food consumption and population come from the United Nations, Food and Agriculture Organization's (FAO) FAOSTAT database. Data on country and per person (per capita) gross domestic product (GDP) come from the International Monetary Fund's (IMF) April 2015 World Economic Outlook database. GDP is measured in international dollars adjusted for the purchasing power parity of the country's currency. Most economists consider this measure to be the most appropriate when comparing economic variables across countries. The data spans 1980 through 2013 - 1980 is the first year FAOSTAT reports data on GDP; 2013 is the last year food consumption data are available for China and India although 2011 is the last year for many countries.

The Food Transition

As income per capita of a country increases, its food consumption transitions. Key features of this food transition are increased caloric intake and increased consumption of animal protein. Although tied to increasing per capita income over time, the food transition can be illustrated by comparing food consumption across countries at a point of time. The cross sections for 2011 calories and animal protein consumed per capita per day are presented in Figures 1 and 2, respectively. Both increase as per capita income increases, but the increase is not constant. A plateau marked by small incremental increases in consumption exists. In 2011, the plateaus occur around 3,000 calories per day and 50 grams of protein per day. Food consumption plateaus are associated with what economists call Engel's Law. It states that, as per capita income increases, a smaller share of a person's budget is spent on food. The variation in annual per capita income across countries explains 56% (R^2 = 0.56, Figure 1) of the variation in daily calories consumed per capita and 70% (R^2 = 0.70, Figure 2) of the variation in daily animal protein consumed per capita. The explained share is high for a single variable and underscores the importance of per capita income to food demand. Economists refer to the shape of these curves as logarithmic. Please note (1) food consumption plateaus are easier to identify for broader food groups than for individual foods and (2) the value at which these plateaus occur has increased over time.





China's and India's Food Transition

Daily caloric intake increased at a similar rate in China and India early in the observation period but then began to diverge with China growing faster (see Figure 3). The same general story holds for animal protein consumed per capita per day (see Figure 4). Divergence is more pronounced for animal protein. Between 1980 and 2013, per capita consumption of animal protein increased by 82% in India but by 426% in China while per capita caloric intake increased by 23% in India vs. 44% in China. By 2013, per capita caloric intake was 26% higher in China than India while per capita consumption of animal protein was 231% higher in China than India. The divergence in food consumption is consistent with the divergence in per capita income. After adjusting for purchasing power parity, per capita income in China was 47% lower in 1980 than in India but 118% higher in 2013. In essence, the ratio of China to India inverted over 43 years, underscoring the more rapid increase of per capita income in China than in India (see Figure 5).

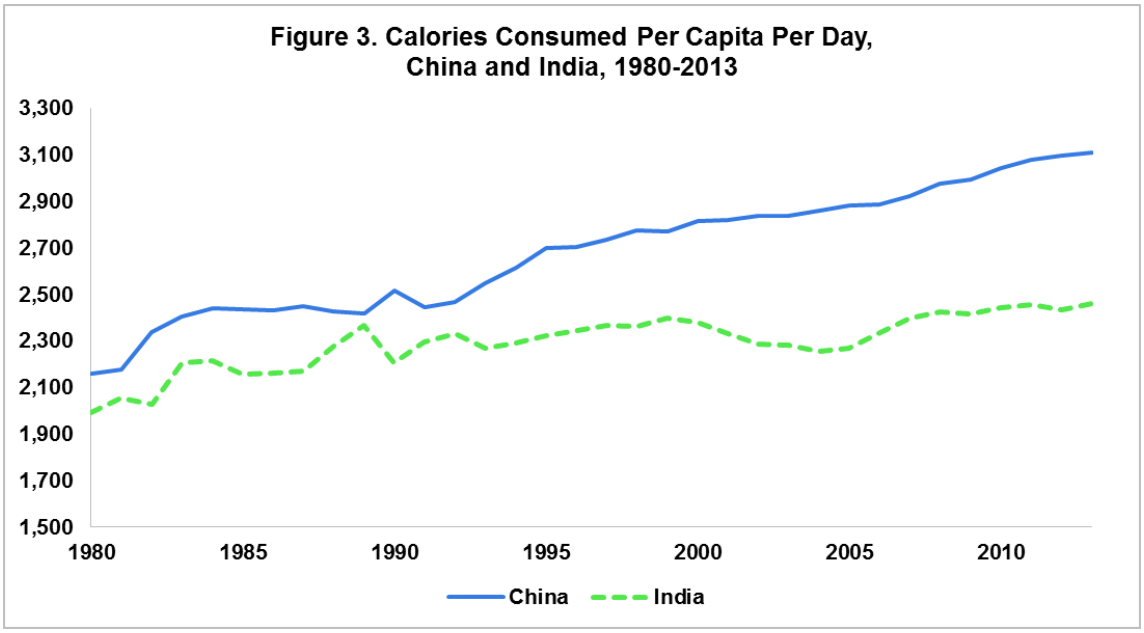


Figure 3. Calories Consumed Per Capita Per Day,
China and India, 1980-2013
3,300
3,100
2,900
2,700
2,500
2,300
2,100
1,900
1,700
1,500
1980
1985
1990
1995
2000
2005
2010
China
India

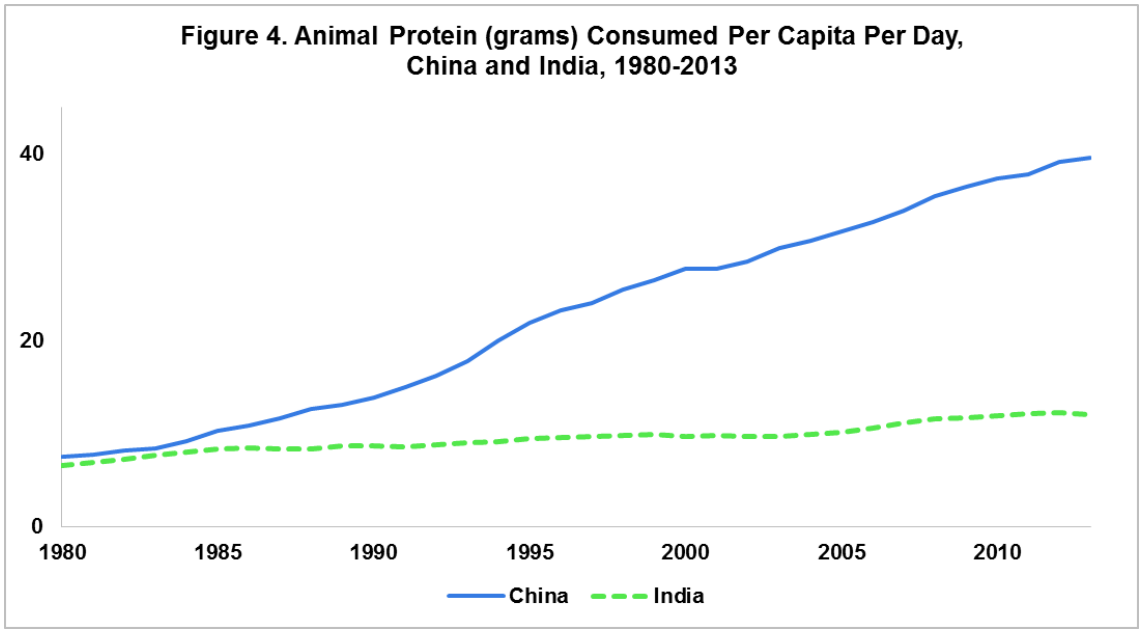
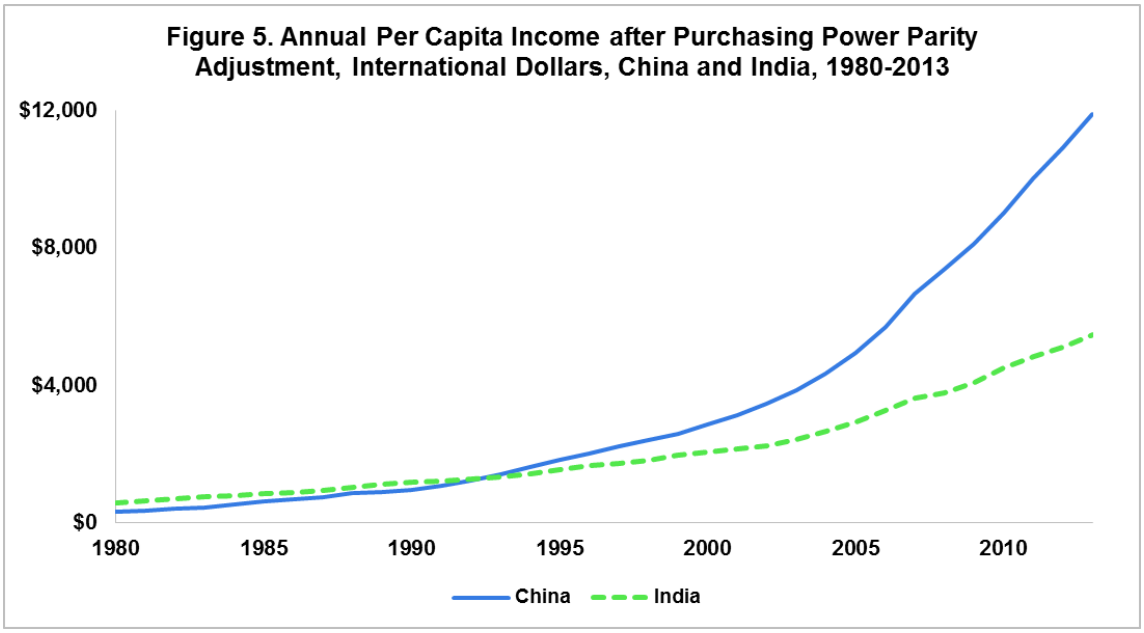
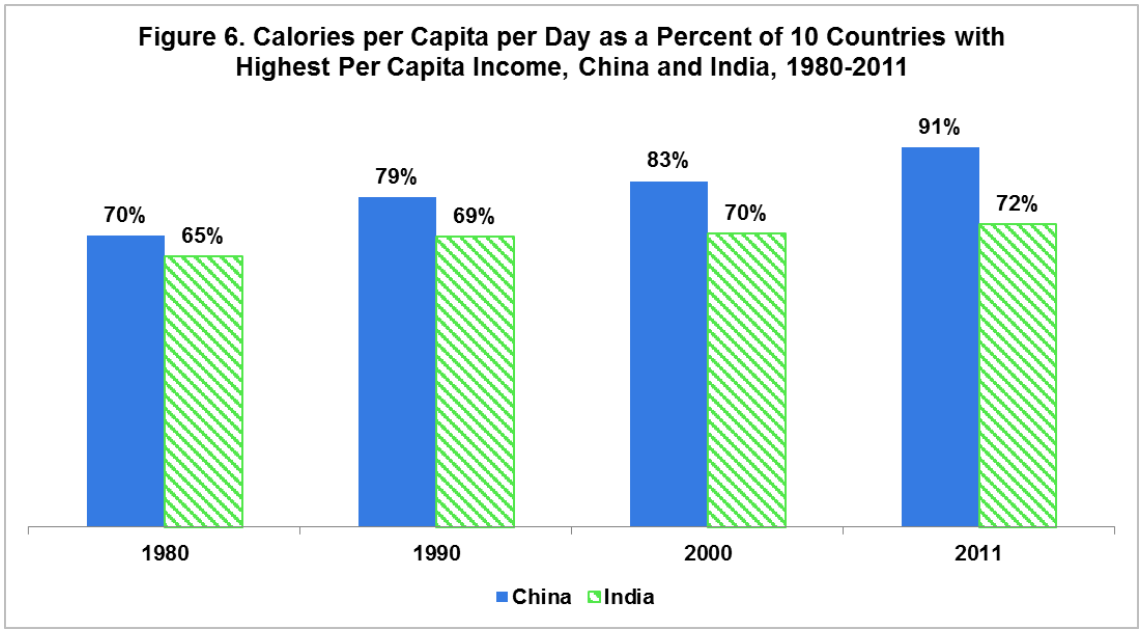
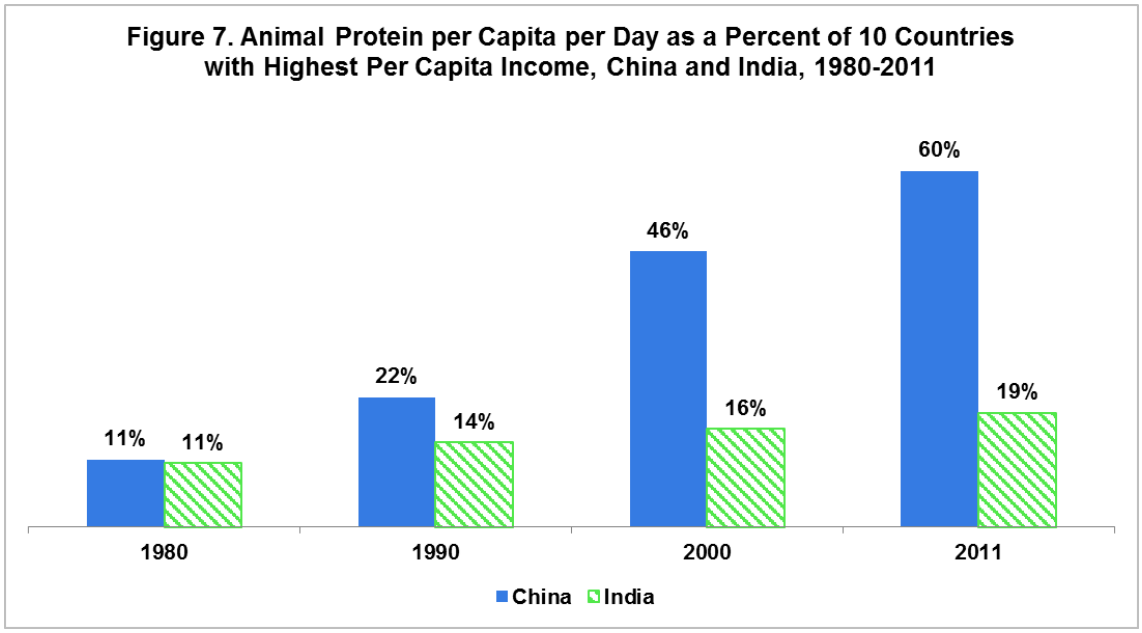


Figure 4. Animal Protein (grams) Consumed Per Capita Per Day,
China and India, 1980-2013
40
20
0
1980
1985
1990
1995
2000
2005
2010
China
India

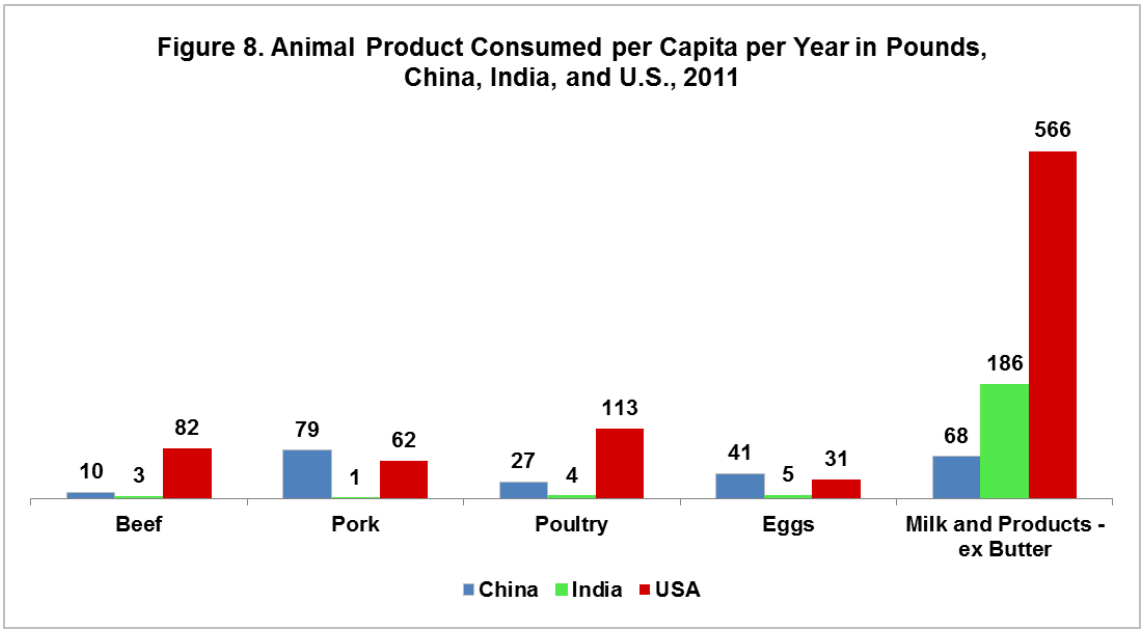


A useful perspective on China's and India's food transition is to calculate the ratio of their caloric intake and animal protein consumption to the averages for the 10 countries with the highest per capita income in a given year. Since 1980, these ratios have increased only slightly for India but have increased dramatically for China (see Figures 6 and 7). Ratio of per capita caloric intake of China to the 10 countries with the highest per capita income increased from 70% in 1980 to 91% in 2011. Stated alternatively, China has reduced the gap that existed in 1980 by 70% ((91%-70%)/30%). China's per capita consumption of animal protein increased from 11% to 60% of per capita consumption in the 10 countries with the highest per capita income between 1980 and 2011. Thus, China has reduced the gap that existed in 1980 by 55% ((60%-11%)/89%).





The slower growth of animal protein consumption in India than China is not just a function of slower growth in per capita income. It also reflects cultural and religious factors. Vegetarianism is a part of most but not all sects of Hinduism, the primary religion in India. An estimated 20% to 30% of Hindus are vegetarians. Hindu vegetarians usually consume dairy products but not eggs. Source for this information is Wikipedia. This discussion is reflected in Figure 8, which compares per capita consumption of various animal products in China, India, and the U.S. Note the much higher consumption of dairy products excluding butter in India than China and the single digit consumption in pounds of beef, pork, poultry, and eggs in India.



The last point regarding China's and India's food transition is that the annual rate of increase in per capita caloric intake has not yet started to slow in either country (Figure 9). In contrast, the annual rate of increase in per capita consumption of animal protein is slowing in China (see Figure 10). A linear trend line regression suggests the rate of slowing is around -0.16 percentage points per year.

Figure 9. Annual Rate of Change in Calories Consumed Per Capita Per Day, China and India, 1980-2013

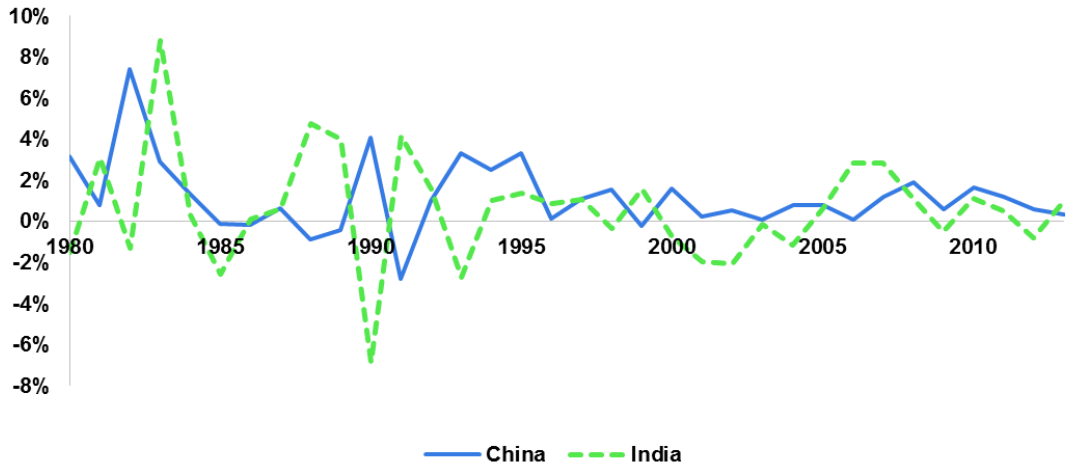
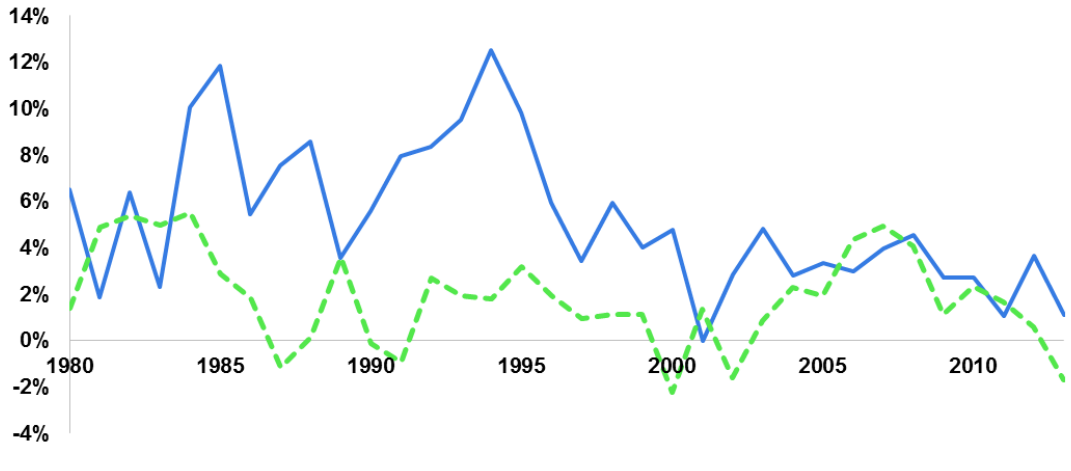


Figure 10. Annual Rate of Change in Animal Protein (grams) Consumed Per Capita Per Day, China and India, 1980-2013



Summary Observations:

1. With biofuel demand for farm commodities likely slowing materially, future demand growth for farm commodities will depend more on the growth in demand for food.

2. China has undergone a historically unprecedented food transition since 1980. China's food transition is not complete, especially its consumption of animal protein. Nevertheless, its food

transition is past the halfway point and annual growth in animal protein consumption is slowing. Over the next decade China's growth in food demand is likely to slow irrespective of the performance of its economy. While slower economic growth will further slow its food demand growth, this effect may be offset by food assistance policies to dampen the threat of public unrest, a concern of Chinese governments for millennia.

3. Countries currently identified by FAO as low income food deficit countries offer a potential source of increased food demand. Their population totaled 2.4 billion in 2011, with 48% in India and the rest spread across 48 countries, most in Africa. As a comparison, China's population in 2011 was 1.4 billion. India could clearly emerge as a large future source of growth in food demand, especially if the pro-economic growth agenda of its current government can be implemented. However, India is unlikely to provide the stimulus to food demand, especially via animal protein, that China did because of its cultural and religious heritage. Moreover, as China illustrates national policies toward economic growth matter. Because differences in policies are likely across countries, it is too much to expect the other 48 countries to grow simultaneously.

4. In summary, clear potential exists for continued growth in global food demand over the next few years, but sustained growth at the rates of the last 10 to 20 years seems unlikely. Thus, annual increases in yield are more likely to meet increased food demand. This is a strategic perspective. Weather and other short run factors are the predominant determent of price in the short run. But, this short run price determination is likely to be framed by a return to the more common historical farm economy situation of a tendency for farm prices adjusted for inflation to decline over the longer run (see *farmdoc daily*, June 4, 2015 for additional discussion of this topic).

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