

# Market Liberalization, Dairy Intake and Adolescent Height: Results from the Chinese Health and Nutrition Study, 1991 – 2009



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## Introduction

- China witnessed rapid (though internally uneven) economic growth in the late 1990s and early 2000s after the country's accession to the World Trade Organization and the affiliated liberalization of many internal markets.
- We find that adolescents from areas that experienced more intensive market liberalization enjoyed 1.58 cm taller height gains than those from areas experiencing less liberalization.
- We identify increased dairy consumption as a credible causal pathway between market liberalization and height.

## Market liberalization & dairy industrialization in China

- During the market liberalization (ML) period (early 2000s), China's dairy sector grew rapidly (Fig 1). Such growth was achieved through technology adoption and was motivated by increasing dairy product demand fueled by rapid income growth, changes in urban lifestyles and development of marketing channels (Fuller et al 2006).

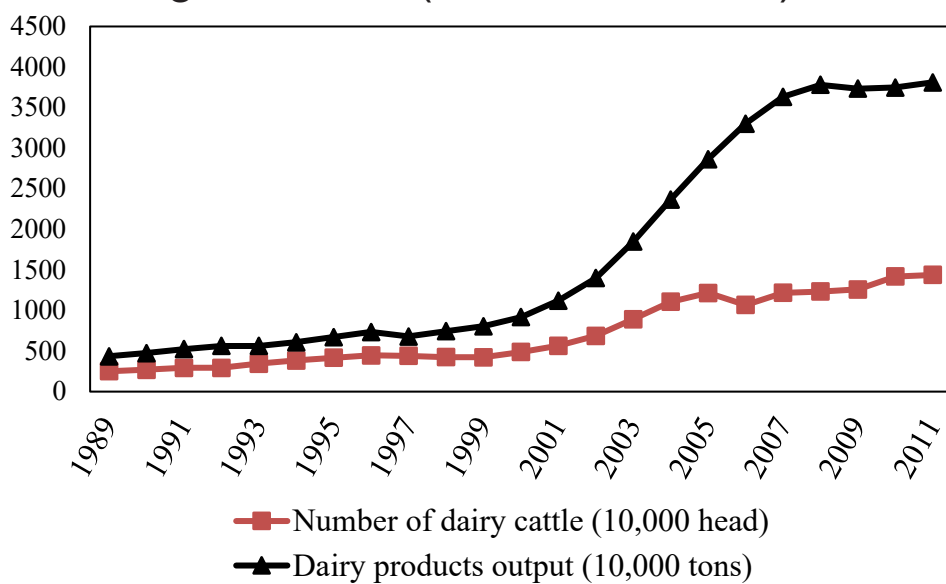


Figure 1: Growth of China's dairy industry

## Data

- We use data from the China Health and Nutrition Survey (CHNS) to estimate the consequences of dairy sector development during the ML period. The survey covers 9 different provinces in China over 9 waves between 1989-2011. Detailed household food consumption are recorded in the 1991 through 2009 survey waves while household demographic information is available in all 9 waves.

## Market liberalization & dairy intake growth in China

- During the liberalization period, Chinese households more than doubled dairy product intake via both intensive and extensive margins and substituted milk powder with fresh milk (Fig 2).

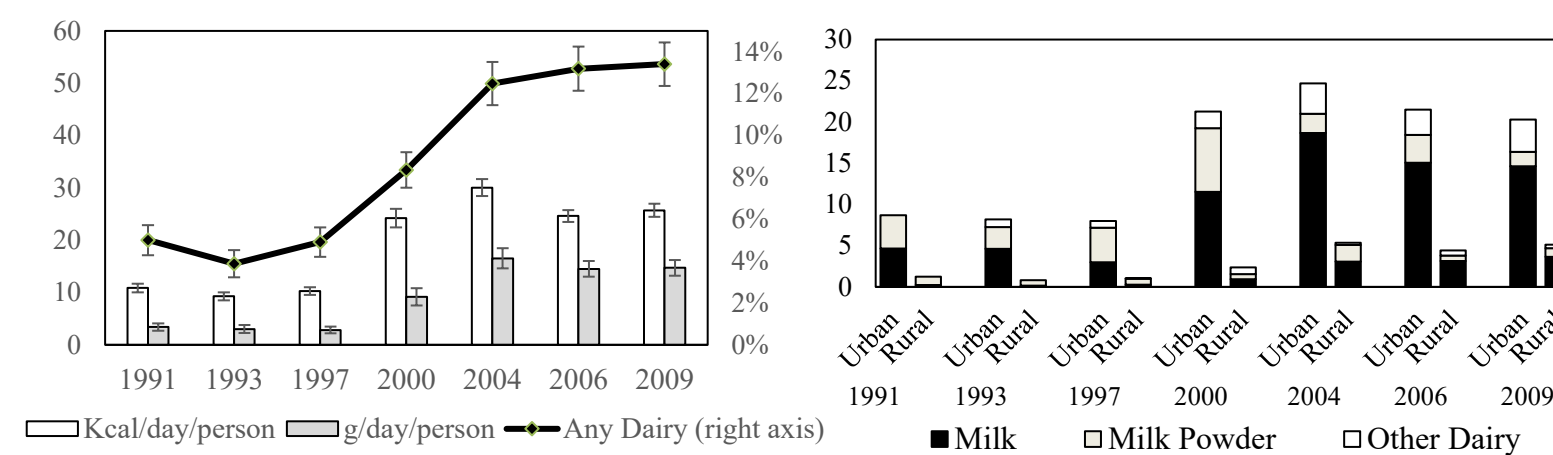


Figure 2: Growth of dairy intake among Chinese households

- Dairy intake increased more among urban households (Fig 3), who had more intensive exposure to liberalized market channels and modern markets.

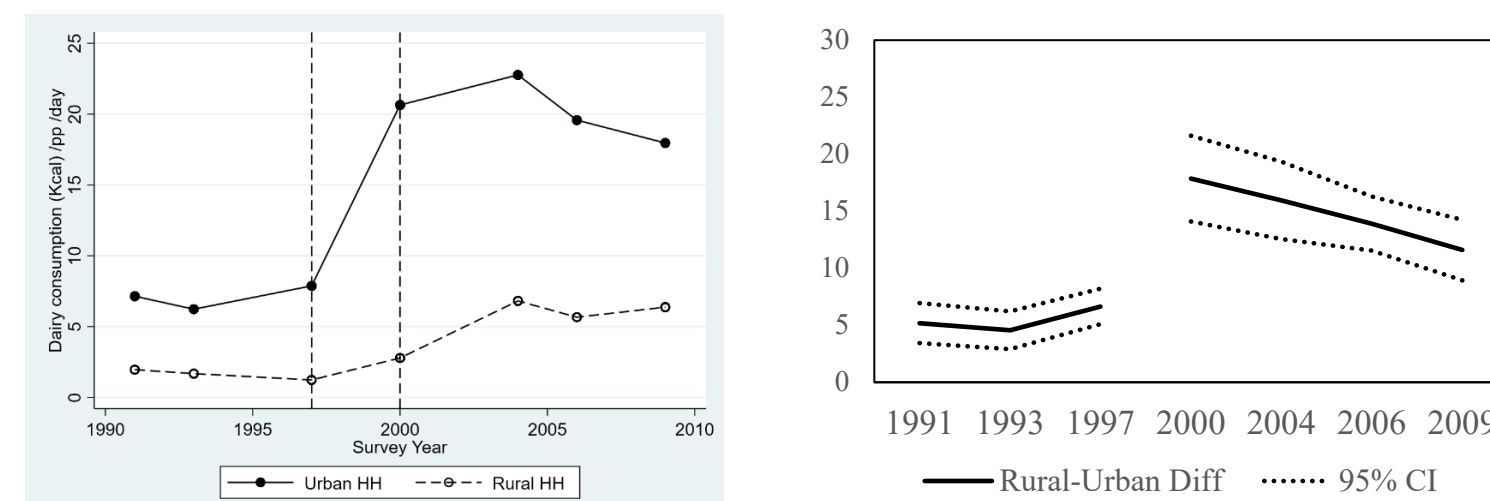


Figure 3: Dairy intake differences between urban and rural Chinese households

- We estimated the distinct dairy intake growth among households in more vs. less liberalized areas in a difference in difference (DiD) model. The development of ML is measured in three approaches including (1) urban status; (2) urbanization index; (3) modern market component scores (CHNS).

$$Dairy_{i,t} = \alpha + \beta_0 Dev_{i,t} + \beta_1 Post_t + \beta_2 Dev_{i,t} \times Post_t + \theta X_{i,t} + HH_i + T_t + \varepsilon_{i,t} \quad (1)$$

	(1)	(2)	(3)
Urbanization Index		-0.177*** (0.046)	
Modern Mrkt Score			-0.197 (0.126)
Since 2000 x Urban	7.622*** (1.570)		
Since 2000 x Urban Index		0.261*** (0.037)	
Since 2000 x Modern Mrkt			0.576*** (0.178)
Observations	25,146	25,146	25,146
R-squared	0.430	0.432	0.429

Table 1: Kcal of dairy intake

- Based on Table 1, since the early 2000s, urban households enjoyed about 7.62g more dairy intake per person per day.
- The conclusions are robust to different ML measures.

## Dairy intake and adolescent height gain

- Existing literature suggests the protein obtained in dairy products promotes growth during childhood (Willett & Ludwig 2020). To estimate the growth effects of ML in the early 2000s in China, we compared heights of CHNS kids and adolescents during 2000-2009 to those who missed dairy sector development during these critical growth years:

$$Height_{i,t} = \alpha + \beta_0 Dev_i + \beta_1 Kid_i + \beta_2 Dev_i \times Kid_i + \theta X_{i,t} + Age_{i,t} + HH_i + FE_{n,t} + \varepsilon_{i,t}$$

Dependent variable:	Between Community (1)	Within Household (2)	Within Household (3)
Urban	1.510*** (0.056)		
Kid [1-16]	1.961*** (0.112)	1.268*** (0.105)	1.299*** (0.112)
Urban x Kid [1-16]	0.546*** (0.133)	0.557*** (0.116)	0.456*** (0.125)
Energy Intake(10 <sup>3</sup> Kcal)			0.774*** (0.038)
Observations	87,755	87,616	75,217 <sup>a</sup>
R-squared	0.889	0.937	0.932

Table 2: Height (cm)

- The gains in height during the ML period were heterogenous by gender and by age. On average, boys enjoyed larger height gains than girls and adolescents between 10-15 years had greater height gains than kids in other ages (Fig 4). The height gains among urban adolescent in early 2000s between 3-16 years is about 1.58 cm greater than those in rural areas.

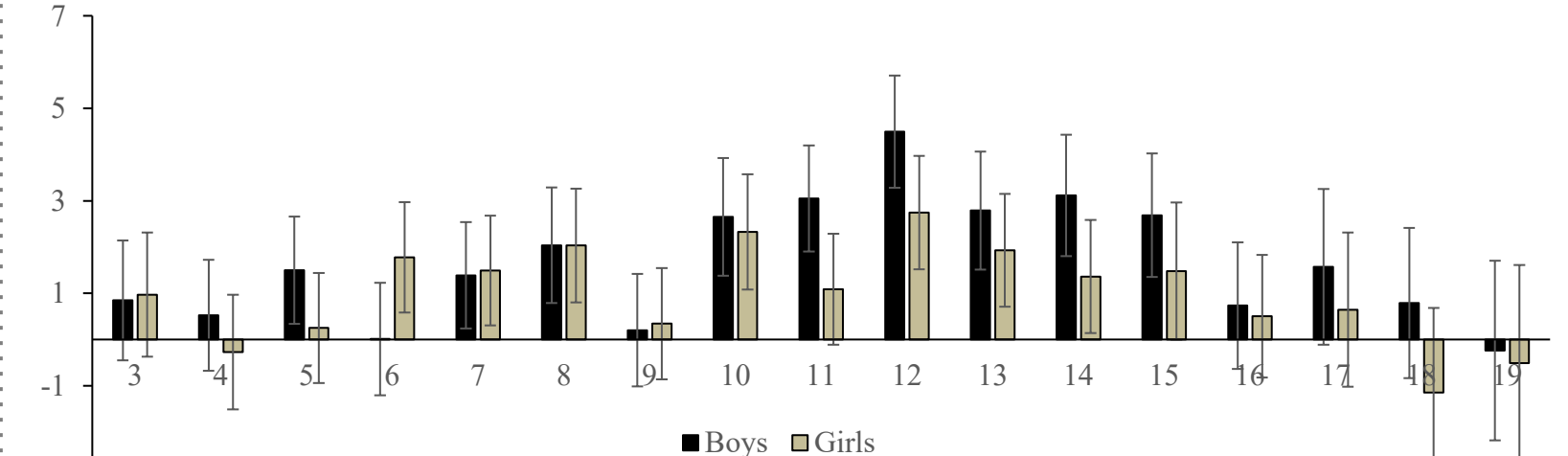


Figure 4: Adolescent height growth gains (cm)

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