



Available online at www.sciencedirect.com

ScienceDirect



RESEARCH ARTICLE

Technical efficiency and its determinants in China's hog production

TIAN Xu, SUN Fei-fei, ZHOU Ying-heng

College of Economics and Management, Nanjing Agricultural University, Nanjing 210095, P.R.China



Abstract

China's hog production is undergoing a great transformation due to the soaring demand and changing raising system. Regarding the essential role of pork in Chinese diet, a systematic analysis on the productivity and efficiency of hog production can provide significant implications for policy makers. This paper investigates the productivity and efficiency of hog production and the determinants of technical efficiency in China using a household level panel data (2004–2010). A stochastic frontier translog production function with scaling property in inefficiency term is adopted for hog production analysis, and the determinants of technical efficiency are incorporated in a one-step estimation using maximum likelihood estimation. Our results show that the average technical efficiency of hog production in China is 0.5914. More importantly, we find that specialized farmers have higher technical efficiency than others, and technical efficiency in the eastern region is higher than that in Central and West China.

Keywords: technical efficiency, hog production, China

1. Introduction

Meat consumption, particularly pork consumption, has been growing substantially along with the rapid economic development. As part of nutrition transition, traditional Chinese diet which is high in vegetable and staple food is switching to a western diet characterized by intensive meat and dairy products (Ma *et al.* 2004; Rae *et al.* 2006; Yu and Abler 2009, 2014; Xiao *et al.* 2012; Yu 2012; Tian and Yu 2013, 2015). Even though subject to substantial measurement errors (Yu and Abler 2014), the household surveys of the National Bu-

reau of Statistics of China (NBSC) still show that per capita pork purchased by urban households increased substantially from 18.46 kg in 1990 to 21.23 kg in 2012, and the per capita consumption in rural area increased from 10.54 to 14.40 kg during the same period, an increase of 36.62%. At the same time, China also experienced a rapid urbanization that the urban population increased from 301.95 million in 1990 to 711.82 million in 2012. The high economic growth rates and rapid urbanization inevitably boost the demand for pork, and hence offer great opportunities as well as challenges for the hog industry. On the one hand, pork output increased substantially with an annual growth rate of 5.9% in the 1990s and 2.2% in the 2000s (Xiao *et al.* 2012). By 2012, total pork output in China had reached 53.43 million metric tons, accounting for almost half of the world output. On the other hand, China's hog sector undertook a dramatic structural evolution characterized by an increasing role of larger and more commercial and intensive production systems in the past three decades (Somwaru *et al.* 2003; Ma *et al.* 2011; Yu and Abler 2014). According to the *China Agricultural*

Received 25 June, 2014 Accepted 23 September, 2014
TIAN Xu, Mobile: +86-18724010668, E-mail: xutian@njau.edu.cn;
Correspondence ZHOU Ying-heng, Tel: +86-25-84396537,
E-mail: zhouyh@njau.edu.cn

© 2015, CAAS. All rights reserved. Published by Elsevier Ltd.
doi: 10.1016/S2095-3119(14)60989-8

Yearbook (NBSC 2010), backyard hog production¹ once accounted for 91% of total output in 1980, but the share declined to 38.67% in 2009. Meanwhile, the share of specialized households² and commercial enterprises³ rose from less than 9% in 1980 to 61.33% in 2009 (Chen and Rozelle 2003; Somwaru *et al.* 2003; Rae *et al.* 2006; Qiao *et al.* 2011; Xiao *et al.* 2012). However, hog farm size in China is still generally small and a large number of hog farms still follow the traditional way of feeding with intensive labor input and using agricultural and household waste such as crop straw and table left-over (Hu 2004; Xiao *et al.* 2012), which results in a low technological level and production efficiency (MOA 2006). Yu and Abler (2014) claim that feed conversion coefficient in small hog farms in China is around 3.5, which is comparable to those in developed countries such as U.S. (3.54 for farrow-to-finish farm according to the estimation of Key and McBride (2007)). The similar feed conversion coefficients in China and the U.S., however, does not mean that China's hog production is as efficient as that in the U.S. since more labor input is required in China to reach such a conversion coefficient. The *China Agricultural Product Cost-Benefit Compilation* (NDRC 2013) indicates that the average labor input per head in small and scale hog farms in China are 11.06 and 3.55 person-days (8 hours per day) respectively in 2004, while that in the U.S. is only around 1 hour according to the estimation of Key and McBride (2007). Moreover, the low efficiency of China's hog industry can also be reflected from the low carcass weight and litter size. The China Animal Agriculture Association (CAAA 2012) claims that carcass weight of pig in China is only 82.67% of that in U.S. and 84.31% of that in Canada in 2010, and the litter size in China is only 60% of that in the U.S.. Furthermore, labor cost and feed prices have soared up in recent years. Xiao *et al.* (2012) denoted that real labor cost per hog slaughtered doubled in large hog farms between 2000 and 2010, similarly, feed input cost increased by 46.8% between 2005 and 2010. The rising wage and feed prices could affect the hog farmer input behaviors and therefore change technology (Ma *et al.* 2011). In addition, increasing competition from international market also challenged domestic hog producers. Yu and Abler (2014) show that China was a net pork exporter and its imports were very small before 1999. However, imports increased significantly after 1999 and overnumbered exports during 2008–2010.

Regarding the importance of hog sector and the challenges faced by hog production, a number of studies investigate China's hog productivity and production efficiency. For instance, Zhou (1999) adopts a translog production function to analyze the hog production efficiency of specialized households and backyard household in China during the period from 1993 to 1996. He finds that specialized farms are more efficient in labor input while backyard farms are advanced in using concentrated feed. Somwaru *et al.* (2003) parametrically estimate the overall efficiency and scale elasticity of 2500 surveyed hog farms in China, and indicate that the large commercialized farms are the most efficient but the middle size specialized farms with increasing returns to scale production technology are the most profitable. Rae *et al.* (2006) calculate the total factor productivity of pork production in China during the 1980s and 1990s and decompose it into technical efficiency and technology change. Their results show that technology change is the major contributor to total factor productivity (TFP) growth while technical efficiency improvement is relatively slow, especially in specialized and commercial hog producers. Similarly, Jin *et al.* (2010) also find that TFP growth in hog production during 1985–2004 was mainly driven by technology change and technical efficiency was quite low, particularly for specialized and commercial farms. On the contrary, Wang and Li (2011) estimate the technical efficiency for 15 main hog producing areas and find a rather high technical efficiency during 2002 and 2009, which stayed between 0.862 and 0.866. Chen *et al.* (2008) estimate the technology changes and technical efficiency changes for backyard hog farms in 20 provinces from 1991 to 2005 using data envelopment analysis (DEA) methods, and find that hog production efficiency fluctuated and technology change was the major restricting factor for productivity growth. Using the same method, Yan *et al.* (2012) find that the increase in hog productivity in China during 2002–2010 was mainly attributed to input expansion, while technical efficiency improvement also played an important role. Zhang *et al.* (2012) compare the hog productivity between Shandong Province and the whole China, and find that large farms have the highest technical efficiency in Shandong Province. Furthermore, Xiao *et al.* (2012) use stochastic frontier production functions and the Malmquist index to measure TFP in China's hog industry and decompose it into technical efficiency, technological

¹ Backyard farming refers to households breeding a small number of hogs, usually from 3 to 5 heads by traditional farming yearly, as a sideline of family business. After the 1990s backyard farming is defined as the annual hog slaughter below 50 heads by per household or farm (Xiao *et al.* 2012).

² Specialized households denote farms where most members of the family engaged in hog production. They raised the number of hogs from the original ten or scores heads to hundreds or even thousands presently. It was characterized by specialized farming (Xiao *et al.* 2012).

³ Commercial enterprises refers to market-oriented large scale hog farms which adopt advanced technology and management with thousands or ten thousands hogs per farm (Xiao *et al.* 2012).

Download English Version:

<https://daneshyari.com/en/article/4494162>

Download Persian Version:

<https://daneshyari.com/article/4494162>

[Daneshyari.com](https://daneshyari.com)