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China's Industry-Level Productivity Measurement in a Digitalized Economy

Chunyun Wang

Yafei Wang

China has been experiencing a slowdown in measured productivity growth since 2001 (Wu, 2016). A number of commentators and researchers have suggested that this slowdown is at least in part illusory, because real output data have failed to capture the new and better products of the past decade (Ahmad, Ribarsky, and Reinsdorf, 2017). The major causes are conducted as follows: first, since lacking of market transaction price information, the surplus of important new information and communication technologies and related services may be subject to significant undervaluation (Diewert, Fox, and Schreyer, 2018). Second, the output measures of knowledge-based services industries, like health care and education, are still input based in official GDP statistics. Third, measuring intangible capital presents a host of problems, since much of it is produced with firms on "own account" without a market transaction to fix prices and quantities. R&D, a key component of intangibles, is capitalized in national accounts in OECD countries by input approach.

According to the above analysis, this paper measures Total Factor Productivity (TFP) at three levels, including product, industry and total economy level, to handle intellectual property products, new industries and R&D capitalization appearing in digital economy. Supply-use table is the most appropriate tool to measure TFP at three levels, since it has product-industry structure. Data related TFP measurement should be the most important and difficult issues. This paper measures the Chinese industrial TFP by 19 categories containing 72 sectors from 1978 to 2017, especially focus on TFP in digital industry.

Method

This paper takes Jorgenson's aggregate production possibility frontier (APPF) framework,

incorporating Domar weights to account for gross output-based industry productivity measures (Jorgenson.et.al., 2013), and conducts supply-use tables in digital economy to show input-output accounting relationship from product to industry (Table 1 and Table 2). Supply–use tables are a key element in the construction of industry-level productivity measures and their links to aggregate productivity indicators.

Table 1 Supply of Products in Digital Economy

		Industry		Total supply from domestic production	Imports	Taxes	Trade and transport margins	Total supply at purchasers' prices
		Digital Industry	Other Industry					
Product	**Digital Product**							
	Other product							
Gross output								

Table 2 Use of Products in Digital Economy

		Total supply at purchasers' prices	Deliveries to Industry		Deliveries to Final Demand				
			Digital industry	Other industry	Final consumption	Gross capital formation		Net exports	
						Digitalized investment	Other investment		
Product	**Digital product**								
	Other product								
			Intermediate Inputs						
			Value-added						
			Compensation of employees						
			Gross operating surplus						
			Mixed income						
			Taxes on production						
			Gross output						

Data

This paper gives total economy and industry-level production accounts in China for the period 1978-2017. For the classification of industries, we adopt the 2011 version of the Chinese Standard Industrial Classification (CSIC/2011) and reclassify economy into 19 categories containing 72 sectors. Table 3 gives the data details.

Table 3 Data Category and Source for China's TFP Measurement

Indicator	Category		Source
	Sector	Type	
Output	72 sectors(dividing into digital industry /product and others)	-	SUT developed by National Bureau of Statistics and Yafei Wang (2019)
Intermediate inputs			
Capital		Six types: R&D, Mineral exploration, Software, ICT, Equipment and Instruments, Construction	Yafei Wang and Chunyun Wang (2017;2018)
Labor		Education(5)*Gender(2)*Age(7)	

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