China Economic Review 40 (2016) 33–53

Contents lists available at ScienceDirect

China Economic Review

Building original series of physical capital stocks for China's economy methodological problems, proposals for solutions and a new database

Zhiming Long [a], Rémy Herrera [b]

[a] UMR 8174 Centre d'Économie de la Sorbonne, Maison des Sciences économiques de l'Université de Paris 1 Panthéon-Sorbonne, 106-112 boulevard de l'Hôpital, 75013, Paris, France
[b] CNRS (National Center for Scientific Research), UMR 8174 Centre d'Économie de la Sorbonne, Maison des Sciences économiques de l'Université de Paris 1 Panthéon-Sorbonne, 106-112 boulevard de l'Hôpital, 75013, Paris, France

ARTICLE INFO

Article history:
Received 2 November 2015
Received in revised form 21 May 2016
Accepted 21 May 2016
Available online 2 June 2016

JEL classification:
C13
C22
C52
C82
E22
E31
O53

Keywords:
Stock of physical capital
Statistical databases
Time series
Price indices
China

ABSTRACT

There are to date no official Chinese statistics relating to capital stocks. This lacking data hinders econometric studies of growth in this country. Series of such stocks are proposed in the literature, but most available empirical work on this topic suffers multiple deficiencies. The purpose of this article is to build the most reliable and longest possible statistical series of capital stocks for China. Our initial capital stocks are calculated on the basis of an output-capital ratio which is less approximate (and lower) than those generally provided. Our investment flows are consistent with the perimeters of the initial stocks. Our investment price indices are strictly tailored to the content of these stocks, and the unit root tests show that all the indices are non-stationary and cointegrated to the order of 2. This means they cannot be substitutes, as supposed in many other studies. Our depreciation rates are estimated by type of capital, under assumptions consistent with age-efficiency and retirement. Investment shares are used to approximate an overall capital structure and to calculate a total depreciation rate. Built from 1952 to 2014, our original series are available to econometricians seeking to conduct new empirical studies on China, over the long run.

1. Introduction

As of today, there are still no official statistics issued by the People's Republic of China for physical capital stocks, even though this is a fundamental variable for understanding the accumulation and growth dynamics of this economy. Although China is working with the Organisation for Economic Co-operation and Development (OECD), especially in the context of a "resolution of enhanced engagement", there is no plan in the near future for the National Bureau of Statistics (NBS) of China[1] to publish such series, in line with the harmonized standards of the OECD.[2] This lack of referential data greatly hinders the possibilities of performing econometric estimates of growth models using time series, as well as panel-data, for this country. Nevertheless,

E-mail addresses: zhiminglong@gmail.com (Z. Long), herrera1@univ-paris1.fr (R. Herrera).

[1] See: www.stats.gov.cn/english/.

[2] Read, for example: OECD (2001). Also: Ward (1976).

http://dx.doi.org/10.1016/j.chieco.2016.05.002
1043-951X/

many empirical analyses of the current extraordinary expansion of China exist in the literature, but a vast majority of them does not use capital stocks. Of course, some attempts of building China's capital stock series have been made, beginning with those by the Penn World Tables (PWT).[3] However, it must be observed that most of them face difficulties and reveal multiple deficiencies. The purpose of this article is to identify these methodological problems and suggest proposals for solutions in order to build original series of China's physical capital stocks which are as reliable and long as possible.

2. General issues and the construction method of physical capital stocks

In the area that concerns us here, problems stem primarily from the scarcity of historical data prior to 1949 (the date of China's independence). But there are also problems with the recent period, stemming from statistical breaks; the most significant of which occurred in 1993 with the transition from the Chinese accounting established according to balances in the Material Product System (MPS) to the implementation of the System of National Accounts (SNA).[4] This change has made comparisons involving both chronological and transversal series risky. In addition, it is an understatement to say that for people who do not read Chinese, the task is difficult to find the information needed for the construction of new statistics from the abundant but scattered yearbooks published by the Chinese authorities. Several economists, be they foreigners or Chinese (including Gregory C. Chow) have used capital stocks they had built themselves with varying success, at the national, provincial or sectorial level. The series that can be considered as the most credible and seriously conceived are those of Chow (1993) and his co-authors. However, the statistical regime transformation in 1993 led to the suspension of the issuing of the documents used as a basis for elaborating these series, which are now unavailable. The PWT include China. But for many critical points, the explanatory notes provided by their compilers are strangely blurred, by not distinguishing the methodology employed for the country studied here from those applied to the numerous other countries covered by this famous inter-university program. Some other databases are available in the literature (Table 1), but their calculation modalities, even when inspired by the perpetual inventory method (PIM),[5] are frequently tarnished by estimation biases, due to an approximate application of this approach. Our criticisms mainly focus on the questionable parameterization of initial capital stock and of the depreciation rate. They also relate to the uncertain content of investment series and, above all, to inappropriate choices of price indices. (See Table 2.) (See Table 7.) (See Table 10.)

One of the major problems encountered in the current literature is the vagueness of the outlines of the aggregated capital. It is often unclear whether it contains built-up lands or developed real property (B)[6] or not, and/or inventories (V). To avoid such a confusion and provide several series enabling the readers to focus their researches according to the conception of capital they use, we distinguish four categories of physical capital stock: (1) a narrowly-defined productive capital stock, K_{Pe}, excluding the residential buildings and the value of their lands (i.e., built-up land), as well as the inventories; (2) a large stock of productive capital, K_{Pl}, including the inventories, but not the built-up lands as defined above; (3) a fixed capital stock, K_F, including built-up lands, but not the inventories; and (4) a total capital stock, K_T, including built-up lands and inventories.

$$\text{Stock of physical capital} \begin{cases} \text{productive narrowly—defined (no built.up lands, no inventories)} & K_{Pe} \\ \text{productive broadly—defined (no built.up lands, with inventories)} & K_{Pe} + V = K_{Pl} \\ \text{fixed (with built.up lands, without inventories)} & K_{Pe} + B = K_F \\ \text{total (with built.up lands, with inventories)} & K_{Pe} + B + V = K_T \end{cases}$$

To build these series according to the PIM, we use the standard formula of accumulation:

$$K_t = (1-\sigma)\, K_{t-1} + \frac{I_t}{P_t}$$

where K_t is the level of capital stock at the end of year t, I_t the flow of investment in the same year t, P_t the corresponding price index and σ the depreciation rate of capital stock.

Let us examine in turn the four components needed to build our original capital stock series: the level of initial capital; the investment flow; the price index; and the depreciation rate. As usual in Chinese accounting, the monetary unit of measurement of great writing we will use hereafter is hundreds of millions (10^8, or *yì* [in Chinese: 亿]) of yuans (RMB).

2.1. Initial levels of physical capital stocks

To estimate the initial levels of physical capital stocks, we go back to the earliest possible base year, namely 1952. It was then (and not in 1949) that China's mainland territory was completely unified and that the NBS modern statistical system was founded, in order to help prepare calculations of the first five-year plan (1953–1957). The lack of data prior to 1952 prevents

[3] Cf. https://ptw-sas.upenn.edu and, for the most recent version (8.1): www.rug.nl/research/ggdc/data/ptw.
[4] The last revision (2008) of the SNA is available on: unstats/un.org/unsd/nationalaccount/sna2008.asp.
[5] Read here: Goldsmith (1951), Harberger (1978) and OECD (1993).
[6] The component "built-up lands" is unproductive and does not contain agricultural lands – which are considered to be productive, and valuated by land improvement investments.