



# Capital accumulation, profit rates and cycles in China from 1952 to 2014: lessons from the evolution of Chinese industry

Rémy Herrera, Zhiming Long

IN **JOURNAL OF INNOVATION ECONOMICS & MANAGEMENT** 2017/2 No 23 , PAGES 59 TO 82  
PUBLISHER **DE BOECK SUPÉRIEUR**

ISBN 9782807391123

DOI 10.3917/e.jie.pr1.0010

Uploaded: 05/15/2017

Article available online at

<https://shs.cairn.info/journal-of-innovation-economics-2017-2-page-59?lang=en>



Discover the contents of this issue, follow the journal by email, subscribe...  
Scan this QR code to access the page for this issue on Cairn.info.



**Electronic distribution Cairn.info for De Boeck Supérieur.**

You are authorized to reproduce this article within the limits of the terms of use of Cairn.info or, where applicable, the terms and conditions of the license subscribed to by your institution. Details and conditions can be found at [cairn.info/copyright](http://cairn.info/copyright).

Unless otherwise provided by law, the digital use of these resources for educational purposes is subject to authorization by the Publisher or, where applicable, by the collective management organization authorized for this purpose. This is particularly the case in France with the CFC, which is the approved organization in this area.

---

# CAPITAL ACCUMULATION, PROFIT RATES AND CYCLES IN CHINA FROM 1952 TO 2014: LESSONS FROM THE EVOLUTION OF CHINESE INDUSTRY

Rémy HERRERA

*CNRS, UMR 8174 – Centre d'Économie de la Sorbonne, France  
herrera1@univ-paris1.fr*

LONG Zhiming

*UMR 8174 Centre d'Économie de la Sorbonne, France  
zhiminglong@gmail.com*

## ABSTRACT

Based on the construction of our own new statistical series of stocks of productive physical capital and of enterprises' fixed assets, and on a rigorously-defined scope of the industrial sector, we calculated various indicators of profit rates at the micro- and macroeconomic levels for China from 1952 to 2014. Such indicators of profit rates are extremely rare in the literature – while there exist numerous studies on the rates of return of capital within the neoclassical mainstream. The results obtained by these two methods (micro and macro) are quite original and can be summarized as follows: *i*) a tendency of the profit rate to fall is observed over the long period, for the two levels of analysis. *ii*) At the macro level, short-term fluctuations in the profit rates show a succession of (often incomplete) cycles whose amplitude decreases with time. *iii*) More than a third of the period is affected by recessive years for the cyclical component of the profit rates. The largest declines are recorded, in descending order, after the rupture between China and the Soviet Union (1961-63), during the Cultural Revolution (1968), in the course of the 1950s, during the post-Mao transition (1976-77), when a neoliberal experiment was tried (1989-91), and with the spread of globalization crises (which affected China in 1998, 2001, 2009, then since 2012). *iv*) It is mainly the increasing organic composition of capital that tendentially pushes down the macro rate of profit.

*Keywords:* China, Economic Growth, Capital Stocks, Capital Accumulation, Profit Rate, Decomposition Filters, Cycles, Long-Term Trend, Short-Term Fluctuations, Micro and Macro Analyses

**JEL Codes:** C13, C22, C52, C82, E22, N15, O53, P31

The growth path of the Chinese economy has been remarkable for its strength and its relative stability in recent years. However, this phenomenon has raised many questions, along with numerous academic studies.<sup>1</sup> These questions concern not only the causes, the mechanisms and the drivers of such dynamism, but also its sustainability and the likely consequences of the rise (or so-called “emergence”) of China in the hierarchy of countries within the capitalist world system. Most of these issues relate to the *sui generis* – and complex – nature of this economy. The latter has in fact adopted many features of capitalism since its opening in 1978, while it retained some characteristics of socialism, particularly in terms of land tenure, intellectual property, or massive investments and proactive interventions by the state. Besides, this state itself remained under the authority of a powerful Communist Party. In the case of China, our interpretation encourages us to speak of a “state capitalism,” under conditions which remain those of a transition to socialism.<sup>2</sup>

This article does not attempt to define the nature of the current Chinese economic system; and still less to deal with all the facets that such a definition would require. It will aim more modestly to offer some thoughts on the role played by the rates of profit in the dynamics of capital accumulation in China’s economy over the long period. As a matter of fact, our premise is that today, the functioning of this economic system shares sufficiently (and increasingly) common features with capitalism to allow us to methodologically use the concept of “profit rate” in order to study it. Such research will be conducted within a Marxist framework, quite original in this school of thought, because it is performed through two methods; more precisely, and alternatively, by “microeconomic” and “macroeconomic” analyses. Here, we conceive these two levels of analysis very simply: “micro” means led by using statistical data taken from the accounts of the enterprises, and “macro” by using data from series characterizing the national economy. These two methods intersect at the level of the industrial sector, studied from two distinctive angles. We chose such an approach after having written a series of research contributions on China’s economic growth, in which we emphasized the limits – insurmountable, we believe – of the tools provided by the neoclassical mainstream, or its dependencies.<sup>3</sup>

---

1. See, for example: Chow (1993), Maddison (1995), Chow and Li (2002), or Ding and Knight (2009).

2. See: Andreani and Herrera (2013, 2015).

3. Here, the reader is invited to consult our previous works on China’s economy: Long and Herrera (2015, 2016), Herrera and Long (2015, 2016). For a theoretical critique of the “new” neoclassical growth: Herrera (2011).

First, it should be stressed that the different indicators of profit rates that we will build, by comparing a “surplus” or profit, and a stock of capital or of fixed assets, cannot be interpreted in the same terms as in the cases of developed capitalist countries. However, the attention devoted to profit rate indicators is important if we are to explain the reproduction dynamics of the Chinese economy in the long term, even over the period when it was largely planned. Consequently, once the core of our subject is clearly identified – the industry – (Part 1), our efforts will focus on the calculations of profit rates of industrial enterprises at the microeconomic level (Part 2), and of profit rates of the industrial sector at the macro level (Part 3). Then we will explain the changes in these indicators, as well as those in their technical and economic decompositions, shedding light on a succession of cycles which has punctuated the capital accumulation process of the economy over the last six decades (Part 4).

## THE INDUSTRIAL SECTOR IN CHINESE ACCOUNTING SYSTEMS

The contours of the “industrial sector” should be carefully defined, because this concept has been understood in different ways in the successive accounting systems in China (*Table 1*). Similarly to the Soviet planning model, the balances of the Material Product System (MPS) remained in force from 1952 to 1992. This recognized the productive contributions of both agriculture and industry, but not services – whose value added was not included then in the calculation of the national income. Therefore, all non-agricultural activities identified in the classification of that period could be considered as “industrial”. Following the reforms of the late 1970s, the MPS was gradually replaced by the System of National Accounts (SNA), which has introduced a distinction between three economic sectors: primary for agriculture, secondary for industries and construction, tertiary for everything else (among other activities, transport, post and telecommunications, commerce, social services, etc.).

The complete transition from the MPS to the SNA was achieved in 1993 and, the following year, the National Bureau of Statistics of China (NBS) released an “Industry Classification of National Economy”, called “GB/T4754-1994” (国民经济行业分类). The secondary sector had been divided into four sections under the titles “B” for mining and extractive industries, “C” for manufacturing industries, “D” for the production and distribution of electricity, gas and water, and “E” for construction. Thus, aggregation of the sections B, C and D fits well with the traditional concept of “industry”. In

2004, the “GB/T4754-2002” classification was adopted, based on the typology of the “2003 Three-Sector Classification Rules” (三次产业划分规定).<sup>4</sup> The modifications then introduced (with new delimitations of subsections, or “divisions”, within the secondary sector, or between the latter and the tertiary sector) did not call into question the previous definition of industry. The same applied to the changes which accompanied the new “GB/T4754-2011”,<sup>5</sup> in application since 2012, and mostly concerned agricultural activities (section “A”) and services (strictly identified with the tertiary sector, and including additional divisions transferred from the secondary sector).

Table 1 – Evolutions in the scope and classification criteria of industrial activities

Period	Scope	Criteria	Comments
1952-1992	All activities, except agriculture	Material Product System (MPS)	Non-recognition of the productive contribution of activities in the tertiary sector by the NBS
1993-2003	Sections B + C + D, excluding construction	System of National Accounts (SNA) “GB/T4754-1994”	Recognition of the productive contribution of activities in the tertiary sector by the NBS
2004-2011	Sections B + C + D, excluding construction	“GB/T4754-2002” and “2003 Three-Sector Classification Rules”	Redistribution of the divisions in the secondary sector, significant changes in the tertiary sector
2012-Present	Sections B + C + D, excluding construction	“GB/T4754-2011” and “2012 Three-Sector Classification Rules”	Some divisions in the secondary sector moved to the tertiary sector, more identified with services

The statistical consistency of the “GB / T4754” Classifications and the relative stability of the scope of industry in the different periods of their formulation led us to define the “industrial enterprises” as those belonging to all the sections B + C + D, as the NBS conceives them. Clearly, here we retain the productive entities whose activities are primarily performed within the sections of “mines” (B), “manufacturing industries” (C) and “production and distribution of electricity, gas and water” (D), that is, all the secondary components, except construction. This is an interpretation that is relatively close to that of the 2008 International Standard Industrial Classification (ISIC). Finally, we see that the successive adjustments recorded in the Chinese accounting systems have had only limited impacts on the contours of the fundamental concept of industry.

4. [http://www.stats.gov.cn/tjgz/tjdt/200305/t20030519\\_16460.html](http://www.stats.gov.cn/tjgz/tjdt/200305/t20030519_16460.html)

5. [http://www.stats.gov.cn/tjsj/tjbz/201301/t20130114\\_8675.html](http://www.stats.gov.cn/tjsj/tjbz/201301/t20130114_8675.html)

## CALCULATION OF INDUSTRIAL PROFIT RATES: MICROECONOMIC LEVEL

First of all, we will calculate microeconomic profit rates from data collected at the level of enterprises in the industrial sector, as defined above. This calculation requires the availability of two types of variables: the profits of these enterprises, and the value of their capital stocks. Regarding these capital stocks, we follow the approach proposed by Gregory C. Chow (1993), which used cumulated data in order to determine the stocks of fixed assets of industrial enterprises. The aim of this author was to evaluate stocks at the national scale. Nevertheless, the series that he used are no longer made available to the public by the NBS since the transition from the MPS to the SNA in 1993; so it is not possible to extend them beyond that date. But, thanks to the existence of *Enterprise Accounting Standards* (standardized business accounting balances), continuous data on cumulated depreciations allow us to reconstruct the stocks of fixed assets of the industrial enterprises, as undertaken by Chow. The *Enterprise Accounting Standards* that we use are those established for 2006 (会计准则 2006). All productive entities are, indeed, supposed to comply with this accounting system, but a significant number of them are still registered with reference to the 1992 standards in the documents of the NBS, as well as in those of the Ministry of Finance.

The capital stocks which are considered here are those of tangible assets with a serving life of more than one fiscal year. These are, among others, buildings, equipment, machinery, tools, means of transport, which are held by enterprises for their production of goods and services, rental or administrative purposes. Concerning the total value of fixed assets of the industrial enterprises, noted  $K_{AT}$  and recorded at year-end values in the *Tables of Assets and Liability of Enterprises*,<sup>6</sup> the *Enterprise Accounting Standards 2006* adopt the following definition:

$$K_{AT} = K_{AO} - A_C - L_A$$

with  $K_{AO}$  the original value of fixed assets,<sup>7</sup> corresponding to their initial cost, that is to say, to the total expenditure spent by the enterprises through the purchase, construction, installation, transformation, expansion or technical upgrading of these tangible assets. From this value are deduced the cumulated depreciations during the years of functioning<sup>8</sup> and the impairments of assets

6. For the *Enterprise Accounting Standards*, the data come from the *Tables of Assets and Liability of Enterprises*.

7. This value is reported according to the year-end debit balance of fixed assets in the accounting records.

8. Value reported according to the year-end credit balance of cumulated depreciations in the accounting records.

recorded in the accounts over the period. When the NBS did not provide data on these impairment losses, these were recalculated for the missing years.<sup>9</sup>

The total profits realized during the accounting period,<sup>10</sup> noted  $P_T$ , are calculated by the following formula:

$$P_T = B_E + R_E - D_E$$

where  $R_E$  and  $D_E$  represent the operating revenues and expenses respectively, while  $B_E$  corresponds to the operating benefits, to be interpreted themselves as corporate income (including those earned from investments), less the sum of the charges, various taxes, other expenses of the financial year and impairment losses of the assets.

Table 2 – Definitions of the four microeconomic profit rates of industrial enterprises

<b>Criterion 2: Taxation</b> <b>Criterion 1: Depreciation</b>	<b>Taxes not deducted from profits</b>	<b>Taxes deducted from profits</b>
<b>Cumulated depreciations included in the capital of fixed assets</b>	Nominal profit rate before taxation: $r_1$	Nominal profit rate after taxation: $r_2$
<b>Cumulated depreciations excluded from the capital of fixed assets</b>	Real profit rate before taxation: $r_3$	Real profit rate after taxation: $r_4$

Thus, we are able to calculate four profit rates for industrial enterprises at the micro level. Two criteria are retained here (Table 2): *i*) whether the cumulated depreciations are included in the capital of fixed assets (nominal rate of profit) or not (real rate of profit), and *ii*) whether taxes are deducted from the profits (profit rate after taxation) or not (before taxation rate). These four profit rates are written:

$$\text{Micro} \left\{ \begin{array}{l} \text{nominal profit rate of the industrial enterprises before taxation : } r_1 = \frac{P_T}{K_{AO}} \\ \text{nominal profit rate of the industrial enterprises after taxation : } r_2 = \frac{P_T - T_E}{K_{AO}} \\ \text{real profit rate of the industrial enterprises before taxation : } r_3 = \frac{P_T}{K_{AT}} \\ \text{real profit rate of the industrial enterprises after taxation : } r_4 = \frac{P_T - T_E}{K_{AT}} \end{array} \right.$$

9. In most cases, the NBS provided the data of “total value of fixed assets” and “original value of fixed assets”.

10. The amounts of total profits are found in the “Profit Tables” in the accounting records of the enterprises.

where  $T_E$  represents income taxes on the industrial enterprises.

In China, tax regulation has undergone significant changes since the founding of the People's Republic. These changes have accompanied those of the ownership structure of the whole economy. The "Great Socialist Transformations" were launched in 1952; they consisted more notably of expanding the scope of the state and collective enterprises, which extended to almost all the productive entities of the country (more than 99%) as soon as at the end of 1956. A major tax reform was decided in 1984; it was implemented in parallel to the Chinese government's decision to once again allow private property in the industrial sector. We will use as an indicator of taxation the "industrial" component of the industrial and commercial tax between 1952 and 1984. From 1985 onwards, *i.e.*, just after the introduction of the tax on corporate income, levied on the state and collective enterprises,<sup>11</sup> we have chosen this last tax. Nevertheless, after 2001, all national companies were subject to this tax.<sup>12</sup>

In a large majority of cases, the statistical series provided by the NBS are incomplete and only allowed the calculation of rates of profit since 1978. Thus, we ourselves had to add all the missing data. For those of the "total value of fixed assets" prior to 2000, instead we used the "net value of fixed assets", which is a very similar series. The latter is recorded at year-end value in the yearbooks of the NBS prior to 1993 – as is also recorded the "total value of fixed assets". However, between 1994 and 1999, the "net value of fixed assets" is presented as an average annual indicator. To correct the bias that characterizes this period and to be able to recalculate "net values of fixed assets" at the end of the year, we assume here that the growth rate of one half-year is equal to half the growth rate of the year.

Table 3 – Types of enterprises taken into account for the calculation of profit rates by period

	$r_1$	$r_2$	$r_3$	$r_4$
<b>1952-1978</b>	All industrial enterprises owned by the state			
<b>1979-1984</b>	All industrial enterprises	All industrial enterprises owned by the state		
<b>1985-1997</b>	All industrial enterprises, whatever their accounting system			
<b>1998-2006</b>	All state-owned enterprises with annual revenues from their main business exceeding 5 million yuans			
<b>2007-2010</b>	All enterprises with annual revenues from their main business exceeding 5 million yuans			
<b>2011-2014</b>	All enterprises with annual revenues from their main business exceeding 20 million yuans			

11. See the "Notes" in the *China Finance Yearbook 2012* (p. 452).

12. Cf. the *China Finance Yearbook 2000* (p. 401).

As indicated in *Table 3*, the accounting documents which were available to build our original series of micro capital stocks do not include the enterprises of a size smaller than a certain threshold of assets. As the weight of these small production units is limited, our calculations can be seen as acceptable approximations of the profit rates of the industrial enterprises as a whole. The omission of the smaller companies is probably sufficiently significant to induce a bias in our results for the micro profit rates, but this is limited to the period after 1998 and remains under control.

Three arguments can be advanced in support of this choice:

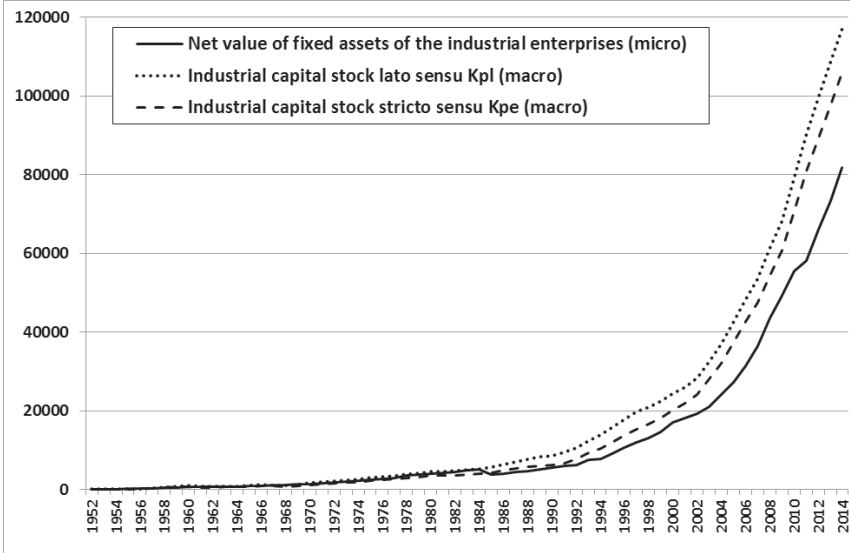
- i) the data used for “large companies”, relatively detailed, are complete and consistent, with clear conceptual criteria and stable statistical perimeters;
- ii) the thresholds for the definition of “large companies” (of “5 million yuans” [in 1988-2010]) or “20 million yuans” [in 2011-2014]) are relatively modest and can refer in reality to medium-sized production units at the China level, particularly in the industrial sectors;
- iii) the share of these large or medium-sized companies is around three-quarters of the total value of the fixed assets of Chinese industrial enterprises, sometimes even exceeding them since the 2000s (*Table 4*).

*Table 4* – Share of large and medium-sized enterprises in China from 2000 to 2014  
(in percentages of the total value of the fixed assets of industrial enterprises)

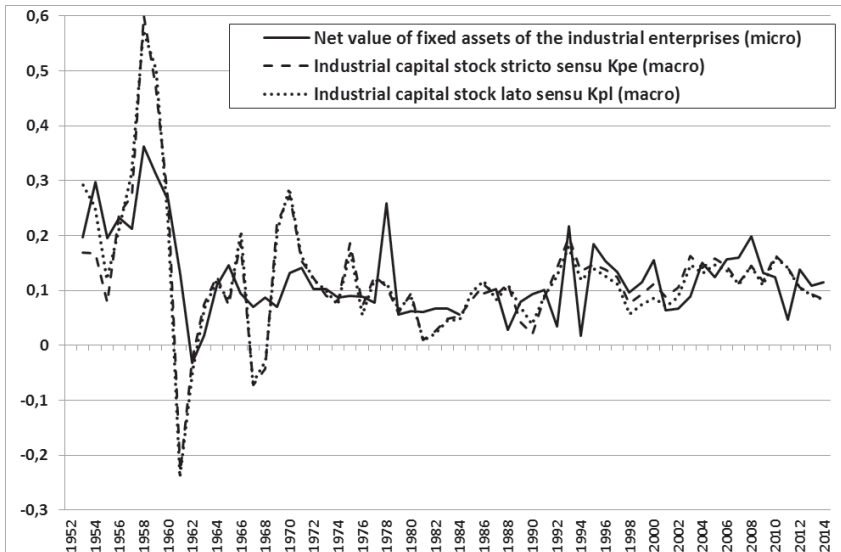
2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
72.95	75.38	74.72	76.62	74.55	75.08	74.92	74.51	71.61	72.52	72.92	74.69	73.67	72.59	70.76

Source: National Bureau of Statistics of China (various years).

Graph 1 – Levels of micro and macroeconomic industrial capital stocks:  
China, 1952-2014  
(in hundreds of millions of yuans, at constant prices [base 1952])



Graph 2 – Growth rates of the micro and macro industrial capital stocks:  
China, 1952-2014  
(in percentages [0.1 = 10 %], at constant prices [base 1952])



## CALCULATION OF INDUSTRIAL PROFIT RATES: MACROECONOMIC LEVEL

In a second step, we will calculate macroeconomic profit rates, again for the industrial sector, in order to compare them to the microeconomic results previously obtained. Such rates are ratios which compare a numerator representing the aggregate surplus of the industrial sector or “profit”, and a denominator corresponding to the capital stock of the same sector. Regarding this stock, we rely on new statistical series of physical capital, reconstructed by us for China over the extended period: 1952-2014. Rebuilt on the basis of official data, especially those of the NBS, our series use original (and complex) methods of elaboration – involving modern techniques of cointegration for the determination of capital stock price indices. It will not be possible here to present these methods at length; the detail is available to the reader in an article recently published in the *China Economic Review* (Long and Herrera [2016], pp. 33-53). Our database includes various time series of physical capital stocks that are called “productive” – that is, without residential buildings and the value of their land – stocks, conceived according to more or less broad definitions; in particular, there are: a *lato sensu* productive capital,  $K_{pl}$ , including the inventories, and a *stricto sensu* productive capital,  $K_{pe}$ , which does not include these.

We should mention that several arguments allow us to maintain that our series are of good quality compared to those currently available in the literature. First, our initial stocks of capital are calculated through an iterative process which converges towards a capital-output ratio that is less approximate (and lower)<sup>13</sup> than those generally advanced. In addition, our investment flows are consistent with the statistical scopes of these initial stocks (Table 5). Then, the depreciation rates are estimated by type of capital, under consistent assumptions on age-efficiency and retirement, in order to deduce the calculation of a total depreciation rate from the overall structure of the capital.

---

13. See, for example: Zhang (1991) and He, Chen and He (2003).

Table 5 – Calculated or actual proportions of the investment in state-owned enterprises’ fixed assets as compared to the national investment in fixed assets in a five-year average: China, 1953-1980

Period	Years	Calculated average proportion	Actual proportion
First Plan	1953-1957	83.95%	-
Second Plan	1958-1962	99.00%	-
<i>Period of recovery</i>	1963-1965	81.82%	-
Third Plan	1966-1970	79.57%	-
Fourth Plan	1971-1975	89.62%	-
Fifth Plan	1976-1980	87.09%	-
Sixth Plan	1981-1985	66.98%	66.70%
Seventh Plan	1986-1990	64.48%	64.80%
Eighth Plan	1991-1995	65.58%	59.00%

Source: Long and Herrera (2016).

Our efforts have focused on constructing price indices of investments strictly tailored on the content of these capital stocks. The unit root tests that we performed have shown that, contrary to what many authors think,<sup>14</sup> with very rare exceptions,<sup>15</sup> the price index of capital investment – an index that does not appear continuously and homogenously from 1952 to 2014 for the whole of China in the yearbooks of the NBS – cannot be replaced by another price index. This issue is indeed fundamental to the extent that price indices are the components that most decisively determine the level and the structure of the stocks of capital. Their careful construction is therefore crucial.

Thus, four industrial profit rates are calculated at the macroeconomical level, as follows:

$$\text{Macro} \left\{ \begin{array}{l}
 \text{profit rate of the } \textit{stricto sensu} \text{ productive industrial capital before taxes: } \tau_5 = \frac{Y_{(t)} - R_{(t)}}{K_{pe(t)}} \\
 \text{profit rate of the } \textit{stricto sensu} \text{ productive industrial capital after taxes: } \tau_6 = \frac{Y_{(t)} - R_{(t)} - T_{(t)}}{K_{pe(t)}} \\
 \text{profit rate of the } \textit{lato sensu} \text{ productive industrial capital before taxes: } \tau_7 = \frac{Y_{(t)} - R_{(t)}}{K_{pl(t)}} \\
 \text{profit rate of the } \textit{lato sensu} \text{ productive industrial capital after taxes: } \tau_8 = \frac{Y_{(t)} - R_{(t)} - T_{(t)}}{K_{pl(t)}}
 \end{array} \right.$$

14. Among others: Jefferson, Rawski and Zheng (1996), Wu (1999), Zhang and Zhang (2003), Shan (2008)...

15. We quote here: He (1992) and Chow (1993).

where  $Y_{(I)}$  represents the product of the industrial sector,  $R_{(I)}$  the income of workers in this sector,  $T_{(I)}$  the taxes on corresponding companies,  $K_{pe(I)}$  and  $K_{pl(I)}$  the industrial components of the respectively narrow or broad stocks of productive physical capital (*Graphs 1 and 2*).

In the same way that, at the microeconomic level, we have defined the industrial sector as all enterprises in the sections “B + C + D”, excluding construction (section “E”), taken as a whole, logically, it is a productive capital stock without residential buildings and the value of their land that we use in addressing the macro level. We assume here that the proportion of the industrial capital stock  $K_{(I)}$  in the total productive capital stock ( $K$ ) is equal to that of industrial production  $Y_{(I)}$  (*i.e.*, the sum of the industrial value added) in the gross domestic product (GDP), minus the value added of the construction sector, noted  $Y^*$ , that is to say:

$$K_{(I)t} = \frac{Y_{(I)t}}{Y_t^*} \cdot K_t = \alpha_t \cdot K_t$$

where  $K_t$  is the total stock of productive physical capital respectively conceived *stricto sensu*  $K_{pe}$ , or *lato sensu*  $K_{pl}$ .

Therefore, we associate with the trajectory of  $\alpha_t$  an assumption of constant returns to scale in production.<sup>16</sup> The calculation of this variable is allowed through the online series of the NBS after 1978 and, before 1978, thanks to the “Comprehensive Statistical Data and Materials on 50 Years of New China” (新中国50年五十年统计资料汇编).

China’s GDP comes from the calculations performed by the NBS according to the production approach, aggregating the value added of the three economic sectors, primary, secondary and tertiary. Total incomes (both direct and indirect, including premiums and specific allocations) received by the workers in all industrial sections,  $R_{(I)}$ , and expressed before taxation, are also extracted from the NBS’s databases. However, only data after 2003 are provided. So, for those prior to that date, we recalculate them by multiplying the remunerations of the urban (*i.e.*, non-rural) employees by the proportion  $\beta_t$  of the industrial value added  $Y_{(I)t}$  in those of the secondary  $Y_{(S)t}$  and tertiary  $Y_{(T)t}$  sectors, as follows:  $\beta_t = Y_{(I)t} / (Y_{(S)t} + Y_{(T)t})$ ; the sources being here identical to those of  $\alpha_t$ .

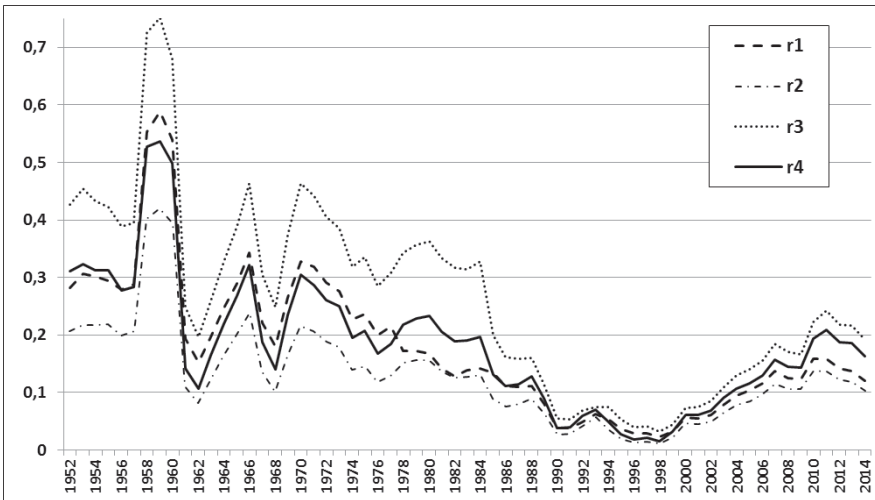
16. Although carried out under a very different methodology to that developed in this article, one of our previous studies on China’s economic growth has shown that such an assumption of constant returns to scale in production is defensible under certain conditions. On this point, see: Long and Herrera (2015).

The series related to these remunerations after 2000 come from the NBS's online database, and, before that date, from the "Comprehensive Statistical Data and Materials on 50 Years of New China". The comparison of actual and estimated income of the industrial workers over the period after 2003 shows a gap of around +35 % between the latter and the former; this leads to a downward correction in remunerations before 2003. The consumer price index is used to convert current income into constant income (base 1952).

Data on taxes of the industrial enterprises,  $T_{(i)}$ , were much more difficult to obtain, especially because the NBS disseminates little statistical information about them. Published by the State Administration of Taxation, the *Tax Yearbook of China* (中国税务年鉴) provides data on such taxation by economic sections only since 2001. Before the tax reform in 1993, the first fiscal yearbook (or *Tax Yearbook of China 1993*) gives data on the "industrial and commercial tax" of industrial sections for the period 1952-1993, while the *Tax Yearbook of China 2001* indicates income taxes on enterprises by sections only since 2000. Consequently, the series of  $T_{(i)}$  is incomplete between 1993 and 1999. Over those years, it is assumed that there is a proportional relationship between the taxation of industrial sections and the total product,  $y_t = Y_{(i)t} / Y_t$ . This assumption is acceptable for the taxes on sales (or VAT), but not for those on the enterprises' incomes, because of the existence of various tax incentives implemented by the Chinese authorities in favor of foreign firms.<sup>17</sup> It was therefore necessary to distinguish the years of application of this policy in order to take them into account, by using the table of "Taxes on corporate revenues by section and by nature of enterprises for the whole country" in the corresponding yearbooks (全国企业分项目分企业类型所得税情况).

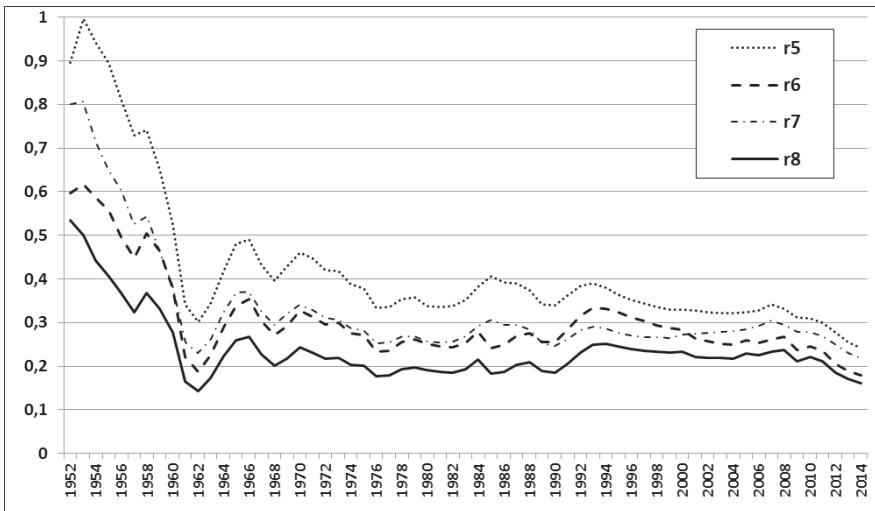
17. Cf. Article 8 of the 1991 Act on the tax revenues of companies with foreign investment and foreign enterprises (中华人民共和国外商投资企业和外国企业所得税法 1991).

Graph 3 – Changes in the profit rates of industrial enterprises at the microeconomic level: China, 1952-2014 (in percentages [0.1 = 10 %])



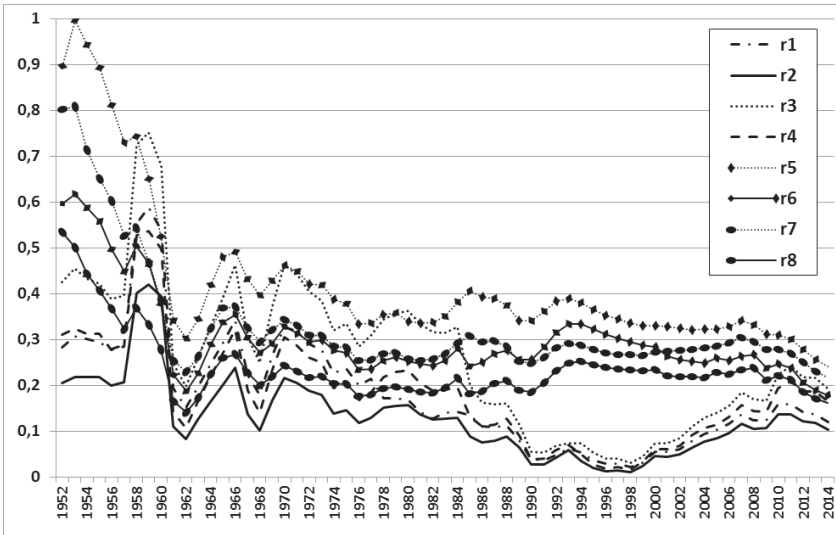
Notes:  $r_1$  = nominal profit rate before taxes;  $r_2$  = nominal profit rate after taxes;  $r_3$  = real profit rate before taxes;  $r_4$  = real profit rate after taxes of industrial enterprises at the micro level.

Graph 4 – Changes in the profit rates of the industrial sector at the macroeconomic level: China, 1952-2014 (in percentages [0.1 = 10 %])

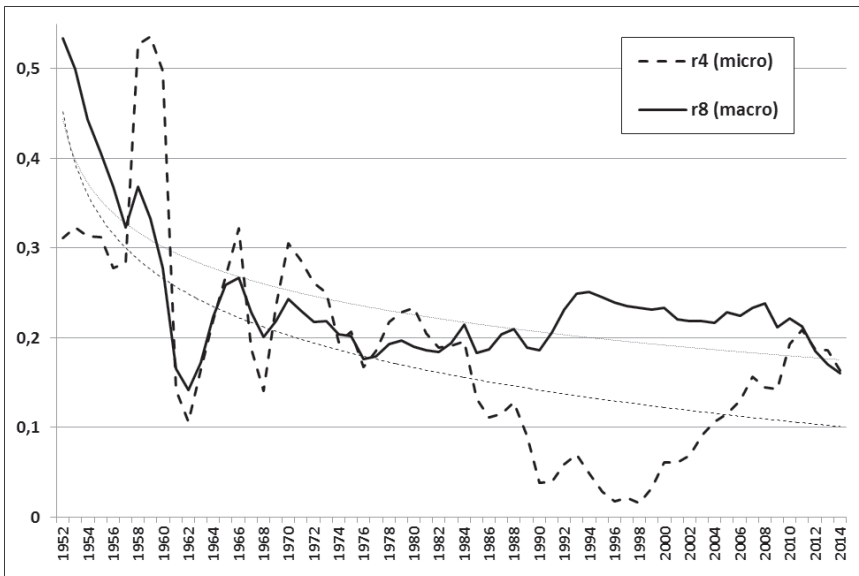


Notes:  $r_5$  = profit rate of narrowly-defined capital before taxes;  $r_6$  = profit rate of narrowly-defined capital after taxes;  $r_7$  = profit rate of broadly-defined capital before taxes;  $r_8$  = profit rate of broadly-defined capital after taxes for the industrial sector at the macro level.

Graph 5 – Comparison of the changes in profit rates at the micro and macroeconomic levels: China, 1952-2014 (in percentages [0.1 = 10 %])



Graph 6 – Comparison of the trends in profit rates at micro and macroeconomic levels: China, 1952-2014 (in percentages [0.1 = 10 %])



## CHANGES IN MICRO / MACROECONOMIC PROFIT RATES: A COMPARISON

The evolutions of industrial profit rates calculated at the micro and macroeconomic levels are presented in *Graphs 3* and *4*. The results obtained at the macro level are higher than those found microeconomically. Indeed, on average, the micro profit rates are respectively 17.9% for  $r_1$  (pre-tax nominal profit rate of industrial enterprises), 13.0% for  $r_2$  (nominal rate after taxes), 26.2% for  $r_3$  (real rate before taxes) and 18.2% for  $r_4$  (real rate after taxes) over the entire period from 1952 to 2014. The average macro profit rates are found at 42.2% for  $r_5$  (profit rate of the narrowly-conceived productive industrial capital before taxes), 30.4% for  $r_6$  (profit rate of the *stricto sensu* productive capital after taxes), 32.9% for  $r_7$  (profit rate of the *lato sensu* capital before taxes) and 23.7% for  $r_8$  (profit rate of the capital defined in a broad sense after taxes) during the same period 1952-2014. As we see it, the averages of the two profit rates which are the most representative of the effective activity of the Chinese industry, that is to say,  $r_4$  at the micro level (calculated by subtracting taxes and excluding the cumulated depreciations of fixed assets of industrial enterprises) and  $r_8$  at the macro level (calculated from the productive capital stock of the industrial sector including inventories, but not residential buildings and the value of their land), are of the same order of magnitude: 18.2% for the first profit rate, and 23.7% for the second one. Both profit rates still remain rather close to one another over the sub-period 1978-2014, that is, after the reforms: 12.0% and 21.2% respectively.

In general, the overall profiles of the micro and macroeconomic profit rates are quite similar; they are basically characterized by a downward tendency over the long term (*Graph 5*). Very marked fluctuations are observable for the two levels of analysis during a first stage, going from the founding of the People's Republic to the break with the Soviet Union (1952-1961). Following a downward trend, the oscillations in profit rates continue, albeit in a much less harsh way, until 1978, and even until the 1990s, but with these gradually diminishing. It was from there that things seem to have changed somewhat. Indeed, the trajectory of the macro profit rate appears to move upward, slightly, from the early 1990s, while that of the micro profit rate continues its descent, before rising more strongly at the end of the decade. The micro and macro curves meet again in the first years of the 2010s, and move together downward. These sequences are clearly visible in the case of the indicators  $r_4$  and  $r_8$ . (*Graph 6*). Beyond the "reassuring" or "safe" result – at least, for a Marxist economist – brought about by highlighting a falling profit rate trend over the long term (a trend which is measured in

logarithmic terms for  $r_4$  and  $r_8$  in *Graph 6*), however, the findings of a sharp rise in the trajectory of  $r_4$  from 1999 until 2007 (or rather until 2011), on the one hand, and, on the other hand, of a relative stability for that of  $r_8$ , extended over fifty years (from 1962 to 2011 approximately), require the introduction of some complexity in these over-intuitive interpretations.

Consequently, for further analysis, we perform a technical decomposition of the rates of profit in order to distinguish their long-term trends and their cyclical components, capturing short-term fluctuations. Such a breakdown can be obtained by writing these profit rates, as follows:

$$r_t = \Psi_t + \Theta_t + \varepsilon_t$$

where  $\Psi_t$  represents the trend – which is decreasing and can take a polynomial form –,  $\Theta_t$  the cyclical component – that is to say, a stationary process (of a sinusoidal type, for example) – and  $\varepsilon_t$  an error term – a random walk or white noise. A simple formulation of this breakdown is, among many other possibilities:

$$r_t = [a_1 t + \dots + a_n t^n] + [a_0 + A \sin(\omega t + \varphi)] + [b_1 r_{t-1} + \dots + b_p r_{t-p} + u_t]$$

with  $a_1 < 0$ , and where the three components (polynomial trend, sinusoidal functional form of the cycle, and error term) are shown in brackets.

Here, we present the application of the technical decomposition to the cases of macro rates of profit  $r_6$  and  $r_8$ . For this, the breakdown is performed by using the method of the Hodrick-Prescott filter (*Graph 7*); the setting of its own parameters being completed by those suggested by Ravn-Uhlig (*Graph 8*).<sup>18</sup> Other breakdowns into trend and cycles have also been tried in time series;<sup>19</sup> they give similar results and confirm the solidity of our findings.

*Graph 8* shows that the short-term cycles of the macro profit rates see the magnitude of their fluctuations diminish over time, from the early 1950s until the end of the 2000s – however, from the onwards they seem to widen again. Thus, these fluctuations fairly regularly alternate up and down periods. For the profit rates  $r_6$  and  $r_8$ , with two parameter settings for the filters (Hodrick-Prescott and Ravn-Uhlig parameters), the years of common recession, marked by the first differences of the cyclical components

18. See: Hodrick-Prescott (1981), then Ravn and Uhlig (2002).

19. Alternative techniques are those with – fixed length – symmetrical filters (Baxter and King [1995], Christiano and Fitzgerald [1999]) or – time-varying – asymmetric filters. The other methods that we used are those provided by Beveridge-Nelson (1981), Harvey (1985), Watson (1986), Clark (1987), Quah (1992), and Morley (2002).

recording a negative sign, are observed 24 times. Such a negative sign happens specifically in 1957, 1961-63, 1968, 1976-77, 1981-82, 1985-86, 1989-91, 1998-99, 2001-04, 2009 and 2012-14. This corresponds to more than a third of the 63 years of the total period from 1952 to 2014 – even if the GDP growth rate can sometimes simultaneously achieve quite a high rate.

Through these 11 sequences of recession, we readily recognize the successive slowdowns that have characterized China's economic history since the founding of the People's Republic. After the huge difficulties experienced in the early period (1949-1952), mainly due to the wars and convulsions through which the country has gone during the decades before the revolution, we find traces of the recessionary period that began in 1954 and whose low point was in 1957. The crisis of the early 1960s, the worst ever for China, has resulted from the combined effects – clearly visible in 1961-62 – of the interruption of the USSR's aid after the Sino-Soviet conflict, the failure of the "Great Leap Forward", and disasters that occurred on the Yellow River. Another low point, 1968, coincides with the hardening of the Cultural Revolution, launched two years earlier. The serious problems encountered in 1976-77 reveal those of the transition following the death of Chairman Mao Zedong. 1981-82 were years of implementation of the structural reforms of "openness" adopted after the XI Congress of the Communist Party, and 1985-86 those of application of the 1984 tax reform – one of the turning points towards China's market economy. Amid the collapse of the USSR, a brief "neoliberal" experiment was attempted and resulted in a sharp slowdown in the economy (1989-91) – accompanied by corruption. In a (quite paradoxical) context of the strong dynamism of China's GDP, the declines recorded from 1998 onwards are largely attributable to exogenous (or imported) shocks, linked to the spread of regional or global crises: the Asian crisis (1998-99), then the "new economy" and "post-September 11" crises (2001-04), and the so-called "financial" crisis of 2008 (whose global effects have been felt in China on two occasions: in 2009, and from 2012 to the present).

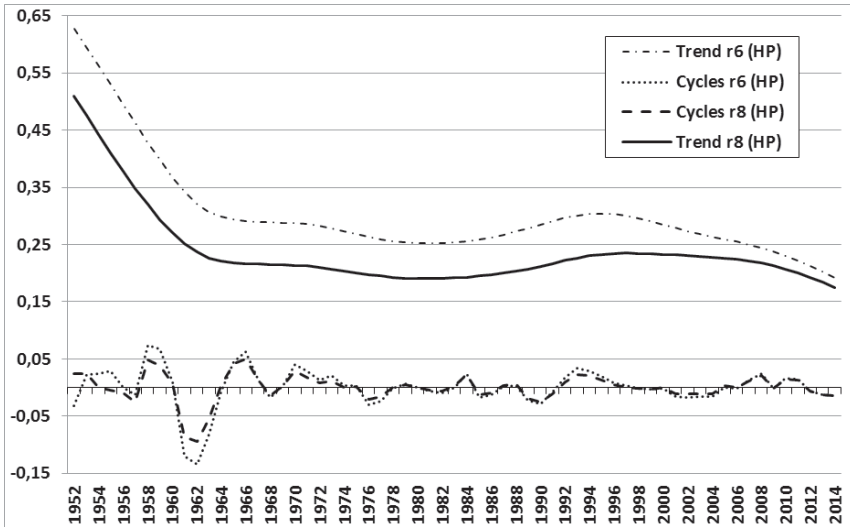
Finally, we proceed to an economic decomposition of the macro profit rate (here  $r_g$ ) in order to distinguish the respective changes in the organic composition of capital (*i.e.*, the inverse of  $R_{(t)}^* / K_{pl(t)}$ ), the productivity of the labor cost unit ( $Y_{(t)} / R_{(t)}^*$ ), and the share of profits ( $\Pi_{(t)} / Y_{(t)}$ ), using the following simple formula:

$$r = \Pi_{(t)} / Y_{(t)} \cdot Y_{(t)} / R_{(t)}^* \cdot R_{(t)}^* / K_{pl(t)}$$

where  $\Pi_{(t)}$  is profit, with  $\Pi_{(t)} = Y_{(t)} - R_{(t)} - T_{(t)}$ ; and  $R_{(t)}^*$  the cost of labor in the industrial sector (without taxes), approached by the product of the number of employees and average earnings. Theoretically, this formula is close to that suggested by Weisskopf (1979).

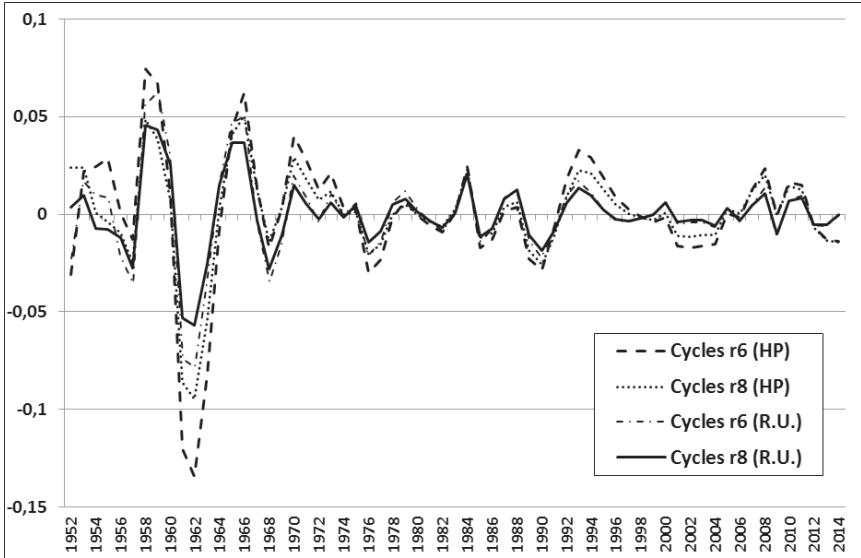
Graph 10 indicates that it is mostly the strong increase in the organic composition of capital that contributes to largely explaining the downward trend of the long-run profit rate. If the profit share remains relatively stable, the upward trend of the productivity of the labor cost unit is slightly more pronounced – but the latter begins to decline over the last decade.

Graph 7 – Technical decomposition of the macro profit rates  $r_6$  and  $r_8$  into trend and cycles: China, 1952-2014 (in percentages [0.1 = 10 %])



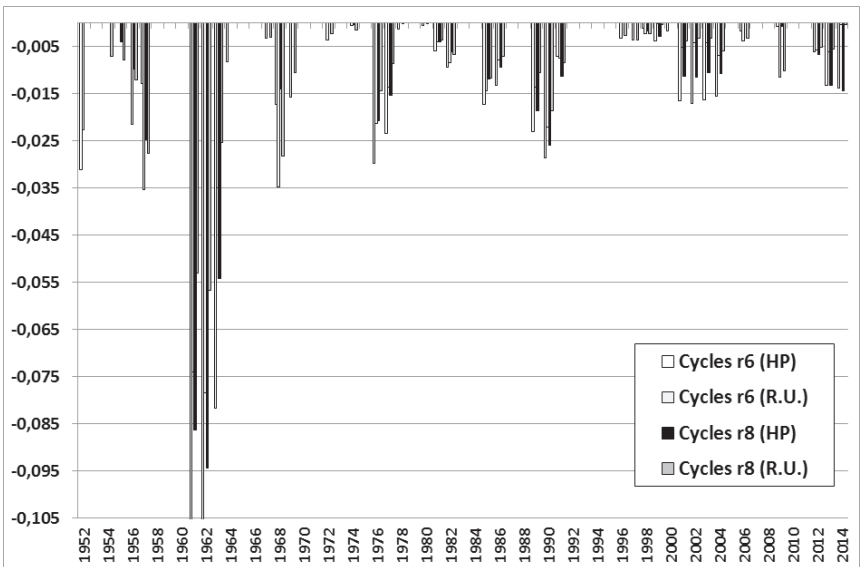
Note: The technical breakdown is performed using the method of the Hodrick-Prescott filter (HP filter).

Graph 8 – Changes in the cyclical components of the macro profit rates  $r_6$  and  $r_8$  according to several methods of technical decomposition: China, 1952-2014 (in percentages)

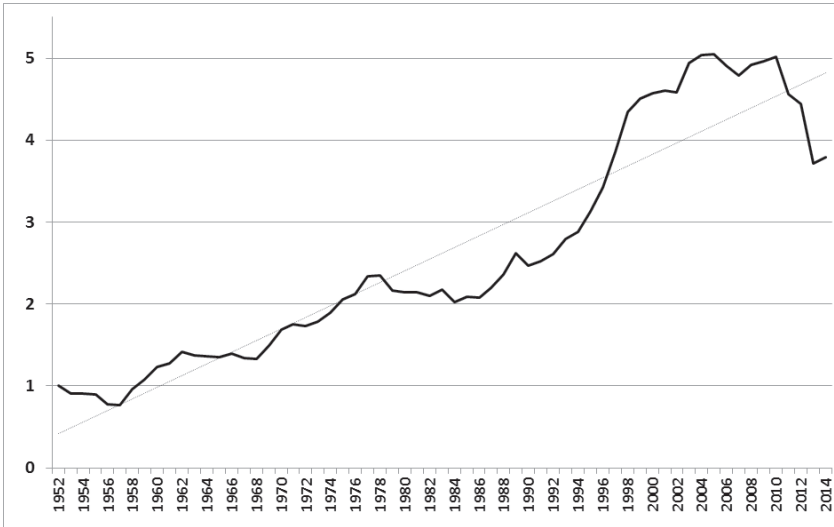


Note: The technical breakdown is performed by using the method of the Hodrick-Prescott filter with its own parameters (power = 2, lambda = 100) or those suggested by Ravn and Uhlig, R.U. (power = 4, lambda = 6.25).

Graph 9 – Negative values of the cyclical components of the macro profit rates  $r_6$  and  $r_8$ ; China, 1952-2014 (in percentages [1 = 1952])



Graph 10 – Organic composition of capital obtained by an economic decomposition of  $r_g$ : China, 1952-2014 (in indices [1 = 1952])



Note: Variable presented with its linear trend.

## CONCLUSION

Based on a definition – as rigorous as possible – of the scope of the industrial sector, and the construction of original stocks of fixed assets of enterprises and productive physical capital, we have calculated profit rate indicators for China at the micro and macro levels from 1952 to 2014. The results obtained using the two selected methods (micro-macro), are quite similar, and can be summarized as follows: *i*) a tendency of the rate of profit to fall is observed over a long period, for the two levels of analysis. *ii*) The short-term fluctuations in profit rates show a succession of cycles at the macro level – rarely completely achieved – whose range is decreasing with time. *iii*) More than a third of the total period (1952-2014) is concerned with recessive years of the profit rate cyclical components. The largest declines are recorded, in descending order, after the rupture between China and the Soviet Union (1961-63), during the Cultural Revolution (1968), in the course of the 1950s (especially in 1957), in the post-Mao transition (1976-77), when a neoliberal experiment was attempted (1989-91), and finally with the dissemination of the crises of capitalist globalization (which affected China in 1998, 2001 and 2009, then again after 2012). And *iv*) it is essentially – much more than the evolutions of the profit share in value added and of

the productivity of the labor cost unit – the increasing organic composition of capital that pushes the macro profit rate down tendentially.

However, a number of difficulties of interpretation persist at the end of this exercise. First, it is the analysis of this decline in the profit rate itself that raises a problem, to the extent that this long-term trend does indeed find part of its explanation in the extreme scarcity of physical capital that characterized China at the beginning of the revolution. In addition, over rather long periods of time, at the macro level, we can very distinctly observe intervals of relative stability in the industrial profit rates, or even phases of increases in these rates, as in the first half of the 1990s. The micro analysis also highlights a clear recovery in profit rates, but from the end of the 1990s – until the moment when the country suffered the effects of the 2008 “financial” crisis. Such an increase in the profit rate at the micro level since the end of the 1990s is not only due to state-owned enterprises’ reforms. One of the explanations is also, very probably, the recent acceleration of China’s integration into the global economy.<sup>20</sup> Indeed, its overproduction problem has been eased by the opening of new outlets in external markets. Nevertheless, at the same time, this integration also involved the exposure of the Chinese economy to exogenous fluctuations, and its relative vulnerability to imported cycles, or even crises, such as from 2007-2008 onwards. Thus, our conclusion of a long-term downward tendency in the profit rate must tolerate some nuances.

Secondly, and apart from the disturbances of the first period of the revolution, the most notable gap between the trajectories of the micro and macro profit rates can be observed after the adoption of the structural reforms (1978) – and of the taxation reform (1984). The deep causes of such a discrepancy, which lasted until the late 2000s (*i.e.*, until the outbreak of the most recent stage of the “systemic” crisis in 2008),<sup>21</sup> are to be found in differences in our angles of study – that is, also in the statistical sources –, in the perimeters and contents of the industrial sector (for example, the scope of the industrial enterprises is changing at the micro level, and it does not integrate small productive units, which generally have higher rentability rates than those of large state-owned enterprises which are registered), but also in the indicators related to taxation. Furthermore, even if the gap previously noted between the micro and macro levels seems to narrow when the effects of the systemic crisis affect the Chinese economy at the end of the 2000s, once again directing downwards both the micro and macro profit rates, the question remains of how to qualify recessive phenomena that negatively affect

20. The export of Chinese capital has considerably increased from the beginning of the 2000s. In addition, China joined the World Trade Organization in 2001.

21. For a theoretical and political interpretation of the current systemic crisis (which is not only “financial”), from a Marxist perspective, see: Herrera (2014).

the rate of profit in overall contexts where very high GDP growth rates are recorded, as is still the case in China at the present time – even in 2015. The answers to these questions, as well as to those, among others, related to the functional forms that are able to translate as pertinently as possible the long-term trends and short-term fluctuations, thus call for further research.

One of the main lessons to be drawn from this article concerning the future is that, beyond an impressive GDP growth rate of more than 10% over several decades, the Chinese economy is paradoxically not immunized against sudden short-term economic downturns or adverse cycles, and even, in relation to the transformations of its structures in the long term, against “crises” – as the severe disruptions in its stock markets during the summer of 2015 have shown.

## REFERENCES

- ANDREANI, T., HERRERA, R. (2013), Système financier et socialisme de marché “à la chinoise”, *La Pensée*, 373, 65-76 (published in Chinese in *Marxism and Reality* [Beijing], 2-2013, 22-28).
- ANDREANI, T., HERRERA, R. (2015), Which Economic Model for China?, *International Critical Thought – A Journal of the China's Academy of Social Sciences*, 21, 163-183.
- BAXTER, M., KING, R.G. (1995), *Measuring Business Cycles: Approximate Band-Pass Filters for Economic Time Series*, NBER Working Paper Series, 5022.
- BEVERIDGE, S., NELSON, C. R. (1981), A New Approach to Decomposition of Economic Time Series into Permanent and Transitory Components with Particular Attention to Measurement of the “Business Cycle”, *Journal of Monetary Economics*, 7(2), 151-174.
- CHOW, G. C. (1993), Capital Formation and Economic Growth in China, *Quarterly Journal of Economics*, 108(3), 809-842.
- CHOW, G. C., LI, K.-W. (2002), China's Economic Growth: 1952-2010, *Economic Development and Cultural Change*, 51(1), 247-256.
- CHRISTIANO, L. J., FITZGERALD, T. J. (1999), *The Band Pass Filter*, NBER Working Paper Series, 7257.
- CLARK, P. K. (1987), The Cyclical Component of U.S. Economic Activity, *Quarterly Journal of Economics*, 102(4), 797-814.
- DING, S., KNIGHT, J. (2009), Can the Augmented Solow Model Explain China's Remarkable Economic Growth? A Cross-Country Panel Data Analysis, *Journal of Comparative Economics*, 37(3), 432-452.
- HARVEY, A. C. (1989), *Forecasting, Structural Time Series Models and the Kalman Filter*, Cambridge U.K., Cambridge University Press.
- HE, F., CHEN, R., HE, L. (2003), The Estimation and Correlation Analysis on Our Country's Cumulative Amount of Capital, *Economist*, 5, 29-35 (in Chinese).
- HE, J. H. (1992), Estimation of Assets in China, *Journal of Quantitative and Technical Economics*, 8, 24-27 (in Chinese).

- HERRERA, R. (2011), A Critique of Mainstream Growth Theory: Ways out of the Neoclassical Science(-Fiction) and Towards Marxism, *Research in Political Economy*, 27(1), 3-64.
- HERRERA, R. (2014), A Marxist Interpretation of the Current Crisis, *World Review of Political Economy – Journal of the World Association for Political Economy*, 5(2), 128-148.
- HERRERA, R., LONG, Z. (2015), *Piketty in Beijing: The Laws of Capital in the Twenty-First Century Facing China*, mimeo, UMR 8174 CNRS – Centre d'Économie de la Sorbonne (CES), Paris, December.
- HERRERA, R., LONG, Z. (2016), *Some Considerations on China's Long-Run Economic Growth: 1952-2014: From the Analysis of Factor Contribution to that of the Profit Rate*, mimeo, UMR 8174 CNRS - CES, Paris, January.
- HODRICK, R., PRESCOTT, E. C. (1981), *Postwar U.S. Business Cycles: An Empirical Investigation*, Carnegie Mellon University Discussion Paper, 451 ([1997], *Journal of Money, Credit, and Banking*).
- JEFFERSON, G. H., RAWSKI, T. G., ZHENG, Y. (1996), Chinese Industrial Productivity: Trends, Measurement Issues, and Recent Developments, *Journal of Comparative Economics*, 23(2), 146-180.
- LONG, Z., HERRERA, R. (2015), *A Contribution to Explaining Economic Growth in China: New Time Series and Econometric Tests of Various Models*, mimeo, UMR 8174 CNRS - CES, Paris, November.
- LONG, Z., HERRERA, R. (2016), Building Original Series of Physical Capital Stocks for China's Economy: Methodological Problems, Proposals of Solutions and a New Database, *China Economic Review*, 40(9), 33-53.
- MADDISON, A. (1995), *Monitoring the World Economy: 1820-1992*, Paris, OECD Development Centre.
- MORLEY, J. (2002), A State-Space Approach to Calculating the Beveridge-Nelson Decomposition, *Economics Letters*, 75(1), 123-127.
- NATIONAL BUREAU OF STATISTICS OF CHINA (various years), *China Statistical Yearbook*, Beijing, NBS.
- QUAH, D. (1992), The Relative Importance of Permanent and Transitory Components: Identifications and Some Theoretical Bounds, *Econometrica*, 60(1), 107-118.
- RAVN, M. O., UHLIG, H. (2002), On Adjusting the Hodrick-Prescott Filter for the Frequency of Observations, *Review of Economics and Statistics*, 84(2), 371-376.
- SHAN, H. (2008), Re-estimating the Aggregate Capital Stock K of China: 1952-2006, *Journal of Quantitative and Technical Economics*, 10, 17-31 (in Chinese).
- WATSON, M. W. (1986), Univariate Detrending Methods and Stochastic Trends, *Journal of Monetary Economics*, 18(1), 49-75.
- WEISSKOPF, T. E. (1979), Marxian Crisis Theory and the Rate of Profit in the Postwar U.S. Economy, *Cambridge Journal of Economics*, 3(4), 341-378.
- WU, F. W. (1999), Estimates of China's Agricultural Capital Stock, *Journal of Agrotechnical*, 6, 34-38 (in Chinese).
- ZHANG, J., ZHANG, Y. (2003), Recalculating the Capital of China and a Review of Li and Tang's Article, *Economic Research Journal*, 7, 35-43 (in Chinese).
- ZHANG, J. (1991), Systemic Analysis of Economic Efficiency During the 5<sup>th</sup> Five Year Plan, *Journal of Economic Research*, 4, 8-17 (in Chinese).