Compétitivité-coûts et hors-coûts de la manufacture chinoise: comparaison internationale

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Résumé

Mots clés: coûts salariaux unitaires, taux de couverture, manufacture
Measuring Cost and Non-Cost Competitiveness of Chinese Manufacturing: International Comparison

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ABSTRACT

This paper joins the debate of why Chinese manufacturing has experienced a significant catch-up. We estimate the cost and non-cost competitiveness of China and other 12 countries’ manufacturing between 1970-2008 in three steps: firstly providing an overview of the method to analyzing competitiveness, secondly identifying factors that affect it, at last carrying out empirical studies. At outset, Chinese commercial performance was gradually enhanced with a sharp decline of labor cost. Lower labor remuneration, depreciated currency and improved productivity are main favorable factors. However, its labor compensations have increased since 1990s, thus China lost cost advantages, especially compared with Thailand and India. Its export has started to rely more on non-cost competitiveness. According to the econometric results, cost competitiveness had significant impacts on trade performance of developing countries and also developed ones. In non-cost terms, China and other emerging economies were still disadvantageous. Most industrialized countries, except for Japan and Germany, were handicapped too.

JEL Classification: F14, F16, J30, L60, O47

Keywords: unit labor cost, trade coverage rate (export import ratio), manufacturing

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1. Introduction

Chinese export growth is generally considered as one of great contributors to global imbalance, with a rise by 18% per year from 1979 to 2007. Even facing the subprime crisis in 2008, a brief stagnation, it recovered to 17.7% at the end of 2009 and has overtaken Germany to become the world's largest exporter of goods, while the USA and Europe recorded a slowdown during this period.

Given the increasing importance of Chinese export, many researchers have been attracted to study the underlying reasons of its success. Thorbecke and Zhang (2008) have done empirical studies to assess the impact of exchange rate on Chinese manufacturing export. They found econometric evidence that China has profited from currency undervaluation and an appreciation would substantially reduce its export of labor-intensive products. Besides, He and Zhang (2009) found a constructive role of Chinese government in commercial development. It implemented diverse favorable policies and strategies, for instance, diminishing SOE\(^2\) share, raising proportion of Foreign Invested Enterprises and establishing Special Economic Zones in order to improve productivity and cut the cost of production. Guo (2009) showed that the growth of Total Factor Productivity in China was faster than that of OECD counties.

Differently, Li cui (2007) thought the effects of exchange rate and production costs were limited; by contrast, it was the structural reform which conducted Chinese burgeoning trade surplus. Shifts from low value added products toward higher value chain and more sophisticated one allow Chinese exports to be more adaptable to international variety demands. Xing (2008) viewed China as a platform not only of traditional goods but also of High-Tech products. Thinks to the Foreign Direct Investment and externality, it made a remarkable progress in technology and nowadays has become the largest exporter of ICT\(^3\) products.

However, they devoted efforts to study of only one factor that affects exports or certain factors of only one country. There are very few studies shedding lights on overall comparison of basic statistics on Output, employment and cost levels across countries. This research has been the first one to put focus on this kind of comparison, providing twofold advantages: Firstly, every factor of competitiveness (according to macroeconomic fundamental calculation) has been taken into account. That permits to avoid the one-sided result or inaccurate statement, since each factor has impacts on country’s performance no matter whether it’s striking or not. Secondly, the international comparison in country level shows clearly China’s performance not only compared with developed countries but also relative to emerging economies. We can therefore understand their different source of growth and make decisions on market access and investment with a global perspective.

In this paper, we use classical methods to analyzing the cost competitiveness by Unit Labor Cost (ULC) and the non-cost competitiveness by trade coverage ratio (TCR). The next section presents the calculating formula for ULC. It decomposes cost competitiveness into two elements: labor compensation and labor productivity. Furthermore, as exchange rate affects real salary level, it’s evidently associated to the cost competitiveness. Then, we compare these

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\(^2\) State owned Enterprise. According to the industrial enterprise survey constructed and released by China’s National Economic Bureau, since 1999 till 2008, the share of SOEs has declined from 37% to less than 5% in terms of numbers, and from 68% to 44% in terms of assets for the industrial sector.

\(^3\) Information and Communication Technology, including computer, mobile phone, bio-tech product, aerospace equipment and so on, corresponding the code 75,76,77 of SITC rev.3 classification.
elements’ variation in manufacturing between 13 countries\(^4\) and provide our main findings. Section 3 analyzes their export performance in manufacturing by TCR and confers the evolution of non-cost competitiveness. Section 4 provides empirical studies to confirm the obtained inference. Finally, Section 5 gives the conclusions and future directions of research.

2. Direct Measurement of Cost Competitiveness

2.1 Methodology

Unit Total Cost (UTC), including cost of labor, capital and intermediate inputs, could be interpreted as follows:

\[
UTC_i = \frac{W_i}{N_i/P_i}Q + \frac{P_iK_i}{P_i}Q + P_iCI_i/P_iQ
\]  

(1)

Where \(P_i\) denotes the price of production at year \(t\), \(Q\) denotes volume of production over time. As \(t\) is always fixed in one year, for instance, this paper use \(t=\text{year of 1997}\) for manufacturing. \(W_iN_i/P_i\) denotes the real value of production, which eliminates inflation’s impact. \(W_iN_i\) is total labor remuneration including wage and non-wage labor cost. \(P_iK_i\) is the price of capital inputs multiplying its volume. \(P_iCI_i\) represents the cost of intermediate inputs.

Indeed, this paper only assesses the labor cost for three reasons: first is the availability of statistics. We can find out the data of capital and intermediate inputs for developed countries, whereas the data for developing countries (including China) are not available. Second is the measurement of indicator. Since there is no data that can be used directly, we must calculate the cost ourselves. The labor cost depends on labor compensation, which is easily measured. Other two costs are very hard to be estimated because they are relevant to several factors, such as variation in financial market, policies of import protection\(^5\)... Even though we succeed in doing this, they cannot correctly imply the competitiveness’ evolution. Thirdly, although labor cost accounts for only 30% of the cost of production, it has a glaring influence, especially for China. In this sense, ULC is still a good candidate for competitiveness study.

\[
ULC_i = \left(\frac{W_i}{N_i/e_i}\right)/(VA_i/\text{PPP}_{i97})
\]  

(2a)

\[
ULC_i = \left(\frac{W_i}{e_i}\right)/[(VA_i/N_i)/\text{PPP}_{i97}]
\]  

(2b)

Eq. (2a) presents the method of labour cost calculating. To begin with, each factor should be converted to a common currency. We utilize official exchange rate of country \(i\) (\(e_i\)) for converting its labor compensation in national currency to that in US dollars. \(VA_i\) is value added converted to US dollars by Purchasing Power Parity at year of 1997 (\(\text{PPP}_{i97}\)).

Eq. (2b) rewrites previous formula as a ratio of labor compensation per capita to productivity per capita (\(VA_i/N_i\)). We then compare their levels’ evolutions in Fig.1a and Fig.1b. Both of them generally increased for all the countries. Their division, the ULC, is relative term. It means whether a nation owns competitiveness depends on the level of its frame of reference. For example, Fig.1c illustrates Japan was more cost-advantageous than USA, but less than Korea in 1970s. Korea was more competitive than Japan but less than China over 1970-2008. If all countries are taken into account, the task tends to be complicated and burdensome.

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\(^4\) They are 8 developed countries, including USA, France, Germany, Italy, Spain, United Kingdom, Japan and South Korea; plus 5 emerging countries, including China, Thailand, Indonesia, India and Mexico. Because we have met a problem in the calculation for Brazil, this country is excluded in this paper.

\(^5\) Some capital goods can be transacted in financial market and their value’s variation cannot correctly imply changes of competitiveness. Likewise, the cost of imported intermediate inputs may decrease with favorable policies of supporting import, but it does not mean that the country becomes more competitive.
In order to simplify the comparison, we introduce an index of Relative Unit Labor Cost (RULC), expressed formally as:

\[ \alpha^i_k = \frac{(\text{EXP}_{k\rightarrow i} + \text{IMP}_{k\leftarrow i})}{\sum_{k=1}^{n} (\alpha^i_k \text{ULC}_k)} \] (3a)

\[ \text{RULC}_i = \frac{\text{ULC}_i}{1 - \sum_{k=1}^{n} (\alpha^i_k \text{ULC}_k)} \] (3b)

\[ \text{RW}_i = \frac{(W_i/e_i)}{1 - \sum_{k=1}^{n} (\alpha^i_k W_k/e_k)} \] (3c)

\[ \text{RP}_i = \frac{[VA_i/N_i/\text{PPP}_{97}]}{1 - \sum_{k=1}^{n} (\alpha^i_k VA_k/N_k/\text{PPP}_{97})} \] (3d)

Where \( \alpha^i_k \) is the trade weights of country \( k \) in country \( i \)’s commercial market, \( \text{EXP}_{k\rightarrow i} \) is \( k \)’s export to \( i \), \( \text{IMP}_{k\leftarrow i} \) is \( k \)’s import from \( i \), \( \sum_{k=1}^{n} (\alpha^i_k) = I^6 \) with \( i=1,2,3\ldots n; k=1,2,3\ldots n, n \) is the number of economies and in this paper, \( n=13 \). \( \text{RW}_i \) denotes the Relative Labor Compensation per capita in US dollars of country \( i \); \( \text{RP}_i \) is Relative Labor Productivity in US dollars of country \( i \).

Here a country’s level of cost competitiveness and interrelated factors are compared with nearly all its principal trade partners, rather than only with one economy. Problem is that we limit the whole world in 13 countries (\( n=13 \)), thus the calculated results maybe deviate from...
the truth. Fortunately, these 13 countries’ trade value (export plus import) makes up 60% of world’s total commercial value; the deviation is therefore not significant.

Now the final index RULC of country \(i\) is obtained in Eq. (3b) as a rate of ULC to the weighted sum of partners’ ULC, in other words, to the average level of other \(n-1\) economies. The RW and RP are estimated in the same way in Eqs. (3c-3d). It is important to note that even though ULC is a ratio of labor compensation to productivity, the RULC does not equal the Relative labor compensation divided by the Relative productivity, seeing Annex A.

\[
ULC_i = \frac{W_i}{VA_i/N_i}, \text{ but } RULC_i \neq \frac{RW_i}{RP_i}
\]

In summary, there are four elements that affect a country’s cost competitiveness: labor compensation, labor productivity, exchange rate and weights of trade, which are the main objects discussed in next parts.

2.2 Data

*Exchange rate and Trade weights*

Data of nominal exchange rate are derived from CEPII CHELEM-CIN. Fig. 2 illustrates the evolution of official exchange rate against US dollars of each economy. We choose 1999 as benchmark year, when the euro came into existence and European countries have the same nominal exchange rate. The increase of line signifies depreciation of national currency; decline means appreciation. During the decade of 1985-1995, currency of every developed country has appreciated, while that of China depreciated in reverse. From this period, China profited much from the price competitiveness and the international segment of production, improved its trade performance and is burgeoning till nowadays.

We also use CHELEM-CIN database to calculate trade weights in raison of its large statistic availability. For manufacturing industry, CHELEM has its own classification but we employ other classification named ISIC rev.3 in order to conform to other articles.
Labor compensation

We now turn to the labor compensation dataset. EU KLEMS\(^7\) database covering all the European countries is firstly employed. It is also used by OECD\(^8\) data. As the former does not yet publish statistics after 2006, we combine these two databases for the developed countries’ calculating.

It is always very hard to study the emerging countries’ level and there exists somewhat inconveniences for certain country. International Labour Organization (ILO) constructs Key Indicators of Labor Market (KILM\(^9\)). It contains all the developing countries’ data needed in this paper. However, these datasets concern the annual compensation of total labour force. For obtaining compensation per capita, we utilize index of ‘number of person engaged’ from the 10-sector Database released by Groningen Growth and Development Centre (GGDC\(^10\)).

Now we meet questions: are these databases compatible with each other? Why do we use so many sources of statistics? EU KLEMS calculates exactly labor inputs from 1970 to 2006, which is the most detailed among them. OECD and GGDC utilize directly EU KLEMS data but extend research to all over the world, hence there’s no problem of compatibility for the combination. Nevertheless, OECD’s data on compensation are available from 1993, so EU KLEMS is still needed. As for ILO KILM, it involves also the European countries but lacks some years. We compare data on developed countries from EU KLEMS with those from ILO, they are fortunately compatible. Generally speaking, we have to employ various sources of statistics and that does not lead to any serious problem.

With regard to particular country, the German data before 1991 pertain to the former West Germany, since then to the unified Germany\(^{11}\). Data for the United States after 1987 are in accordance with North American Industry Classification System (NAICS 97), whereas before this year they adapt to ISIC definition like other countries. Indeed, Bureau of Labor Statistics (BLS) launches an International Labor Comparison (ILC\(^{12}\)) program by evaluating American data also in this way. We do not use BLS database but we compare our results with it and confirm their robustness.

Annex B displays detailed items of total labor cost, adopted by the 11\(^{th}\) International Conference of Labour Statistics (ICLS) in October 1966 and used by ILO nowadays. Based on it born two measures:

1. Compensation of employee (COMP) is considered as a proxy for total labor cost, which refers only to employees
2. Labor Compensation (LAB) is another measure closely related to labor cost but not entirely correspond to ILO definition in Annex B. It does not include the items of employee training (VII), recruitment cost (IX), plant facilities and services, such as food payment (IV), medical care (VI-4) and welfare services (VIII). However, the costs not included account for around 1 to 2 per cent of total hourly labor cost, thus

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7 EU KLEMS data: [http://www.euklems.net/](http://www.euklems.net/)
10 Meanwhile, it’s complemented by ILO LABORSTA: [http://laborsta.ilo.org/](http://laborsta.ilo.org/)
11 In 1990 United Germany was born with the reunification of West Germany/FRG (Federal Republic Germany) and East Germany/GDR (German Democratic Republic).
LAB is still good enough to give a picture of overall labor cost competitiveness. Furthermore, it refers to persons engaged.

These two measures both contain wage and non-wage compensation costs, paid directly and indirectly. For well comparing them, we should firstly learn the relationship between employee and person engaged:

(1) Employee (EMPE) is the person working for others and earning salary in response. The number of employee is estimated according to the statistics of wage and salary.

(2) Person engaged (EMP) consists of all the workers, no matter whether they are paid or not. It equals the sum of employee and self-employed, who is always the worker in private household or the unpaid family worker.

In Fig.3a, the red line shows employee’s number and compensation of employee; the black line represents number of person engaged and labor compensation from 1970 to 2005 in developed countries’ manufacturing. Unfortunately, we cannot compare other developing economies’ performance in this regard. For nearly all the developed countries, labor compensation in manufacturing continued to increase, except for Japan, whose index have declined since 1997-1998 crisis. The gap between line of EMP and EMPE is the number of self-employed. The larger this gap is, the more self-employed a country has. The left side of Fig.3a reveals that in Japan, Italy and South Korea have absolutely more non-wage workers. The number decreased gradually in Japan, France, Germany and Spain; but rose in United State, United Kingdom, Italy and South Korea. In the right side, because Labor compensation concerns more workers than Compensation of employee, the former’s line is often higher than that of the later. Still, Japan, Italy and Korea have larger gap between two lines since they have more self-employed as discussed above.

There is another index namely “dependant employment ratio” (EMPE/EMP) described in Fig.3b. A smaller ratio stands for a larger share of self employment. In this figure, Korea had a largest share (nearly 20%) for manufacturing industry instead of Japan (less than 10%).

In Fig.4, LAB/EMP and COMP/EMPE in manufacturing are almost equivalent, except in Japan and Italy. It cannot be sure that which is bigger as they possessed reverse instances.

Gollin (2002) proposed three approaches of adjustment for income shares, in other words, for unit labor compensation. One of them is (other two approaches interpreted below):

\[
\frac{(\text{COMP/EMPE}) \times \text{EMP}}{\text{GDP}}
\]  

Eq. (5) is the stated form of Eq. (1). It supposes self-employed earn the same as employee, but if their wages are quite different, estimation tends to be bias. This paper prefers using only LAB/EMP rather than COMP/EMPE or both, because the next part computes labor productivity based on all persons engaged.

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13 838 thousand for Japan in 2008, 794 thousand for Italy and 575 thousand for Korea

14 Other two approaches take the amount of Operating Surplus of Private Unincorporated Enterprises (OSPUE) into account. First adjustment is (COMP+OSPUE)/(GDP-indirect taxes); Second is (COMP)/(GDP-indirect taxes-OSPUE). Bruno Jetin (2010) provided another method based on these two approaches, noting (adjustment1+adjustment2)/2. Compared with them, Eq. (5) compiles the fraction of self-employed people, instead of guessing how to divide up OSPUE between labor and capital.
Figure 3a: Comparison of EMP with EMPE; LAB with COMP at national currency.
Figure 3b: Dependant employment ratio for manufacturing

EMPE/EMP

Figure 4: Comparison of LAB/EMP with COMP/EMPE at national currency

Labor productivity

Labor productivity per capita over the period of 1970-2009 is compiled by GGDC under International Comparisons of Output and Productivity (ICOP) project. It assesses the real value added at 1997\textsuperscript{15} constant price and purchasing power parity (PPP) for manufacturing industry.

\textsuperscript{15} 1997 has been chosen due to the big availability of countries’ and goods’ information when calculating PPP in manufacturing.
We use PPP for productivity conversion rather than nominal exchange rate. There are mainly two PPP techniques called expenditure PPP approach and production PPP approach. The expenditure PPP\(^{16}\), often used by OECD and World Bank, is widely known through International Comparison Project (ICP) by United Nations. It applies the final expenditure information for calculating without any sectoral perspectives. On contrary, the production PPP (industry-specific PPP), provided by GGDC through ICOP project, is based on producer output data. It is more relevant to this study than the former.

In China, the prices in big cities are relatively high. In order to better reflect the impact of lower prices in rural areas, ICP made a downward adjustment on PPP; As for ICOP, it employs information from production census, input-output table and national accounts concerning overall areas in China, so that it obtained PPP much lower than that by ICP. For instance in Total Economy Database, the PPP in 1990 US dollars calculated by Maddison of ICOP/GGDC is pretty lower than that obtained by ICP/World Bank. As a result, Maddison’s GDP level in dollars is about 40% higher than that of World Bank. He therefore reduced GDP level by 22.6% and heightened PPP value. Unfortunately, ICP provides no PPP data for manufacturing and we cannot point out how much different between PPP ICP and PPP ICOP like what has done for total economy. We only know that Chinese PPP applied in this paper was undervalued and its productivity was correspondingly overvalued.

Still, German data before 1991 refer to the West Germany and then to the Unified country. For this sake, a rupture occurred at this year.

**2.3 Findings from international comparison**

**2.3.1 China won more cost advantage than major industrialized countries**

*China had lower level of labor compensation surprisingly unchanged*

According to Eq. (3c), relative compensation level depends on three elements: fixation of wage and salary in national currency, exchange rate and world average remuneration.

The model WS-PS provided by Layard-Nickell-Jackman (1991) views the fixation of salary as a result of co-ordinate between unions and firms. From this model derive two kinds of wage-setting institution: corporate wage-setting and company-based (or decentralized) wage setting. The

The corporate wage-setting system in France, Germany, Spain and Italy\(^{17}\) centralizes salary bargain in national union organizations and labour associations. These countries always have powerful labour unions, efficient collective bargaining and restrictive Employment Protection Legislations (EPL). So their salary evolutions kept relatively stable with similar slope when looking at labor compensation in national currency in Fig.4.

As for the company-based wage setting system, like United-State and United-Kingdom, they always have weaker regulation and labour protection\(^{18}\). The US enterprises own jobs and can

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\(^{16}\) In expenditure PPP approach, PPP relative to US dollars is defined as the number of currency units required in domestic market to buy the same goods and services that 1 dollar can buy in USA.

\(^{17}\) Indeed, Italy is categorized by OECD in 1980s as have company-based wage setting, but its wage was set through centralized Scala Mobile and it had high index of Institution. Therefore, we classed Italy as corporate wage-setting here even though its constructed employment protection index has markedly turned down from 4 to 2.4 over 1970-2005.

\(^{18}\) Richard B. Freeman (2008) compared labor institution across advanced countries. For Percentage of collective bargaining in 2000: France 90%, Italy and Spain 80%, Germany 68%, while UK 30%, US 14%, Japan 15%.
replace workers for any business or other (non discriminatory) reasons. UK’s employment protection level is much lower than that of other European countries (Blanchard and Wolfers). As a result, these two countries’ compensation level was relatively fluctuant in Fig.5 with shocks including exchange rate variation. The level of UK was upward during years of appreciation, 1985-1992 and 2001-2007.

Other three Asian countries have their own characteristics. It’s hard to say in which kind of wage-setting they belong. In Japan, as showed by Richard 2008, its collective bargain and protection systems were weaken in 2000s. Specifically, Japanese salary system was characterized by seniority-based payment and rigidity of nominal wages.

(1) Seniority-based payment, as showed in Fig.5, was on the one hand favorable for Japanese emergence but on the other hand, limited its growth. Between 1970s-1980s, firms were able to offer a low wage to young employees without any limits. That allowed Japan to maintain cost advantageous and accelerate capital accumulation. However, when the workers were getting older, their compensation was absolutely moving up. From 1987, Japanese relative compensation became superior to its rivals’ average level and Japan lost its cost-advantage.

(2) In terms of rigidity of nominal wages, as showed in Fig.4, it made labor compensation at national currency going up in a regular manner and affected chiefly by exchange rate. As yen’s exchange rate continued to appreciate (Fig.2), its relative compensation rose steeply from about 40% in 1970 to 180% in 2008. Although Japan suffered heavier and heavier labor costs, there is no leeway to diminish wages, especially for mid-to-senior age. In this context, Japanese compensation continued ascending gradually and arrived to peak in 1995 when the young workers in 1970s became to be mid senior. Raison for the reversal in 1995 is that rigidity was downward from 1990s. Face economic stagnation in that time, firms are likely to reduce total remuneration or offer lower wage to young workers by negotiation with union.

EPL in 2004 is: Spain 3.1, France 2.9, Germany 2.5 and Italy 2.4, while UK 1.1, US 0.7, Japan 1.8. Index of labor institution is higher in European countries.

19 As the value superior to 100% from 1987
Therefore, compensation in national currency slowed down its speed of increase and stagnated in 1995. When considering factor of exchange rate and looking at Fig.5, Japanese relative compensation level in 2007 has already returned to that in 1988.

In South Korea, affects of exchange rate were not as significant as in Japan. For instance, Korean currency “won” kept depreciating till 1986, but its compensation level continued rising instead of turning down. Korean government plays an important role in economy activities. Since 1970s, it carried out policies of depreciation and developed Export-Oriented Industries. Export and GDP expanded fleetly as awaited. In corresponding, wage level was put up in order to avoid negative impact of depreciation on workers’ earning and then on their employment effort. Hence, Korean income including remuneration per capita has accumulated over this period. At the same time, exactly in 1978, a new democracy was introduced in this country, which required more salary, better employment protection and more effective negotiation than before. That’s another raison for Korean outstanding growth in remuneration.

Yet Korea encountered an inflationary press as a result of rapid growth and accumulating investment. The economic policy was therefore shifted from “growth” to “stabilization”, that’s why exchange rate did not move so much as it performed 1986 ago. Since then, Korean currency has generally appreciated with relative compensation level increased, except the period of East-Asian crisis.

In China, it’s incredible that the relative compensation level remained extremely low and did not vary (from 7.6% in 1970 to 7.9% in 2008), no matter how evolved the exchange rate. Over the decade of appreciation 1970-1980, its remuneration reduced successively. When the currency began to depreciate, the compensation maintained initial value without any change. Why? At outset of 1970s, China has been a poor country dealing with the Cultural Revolution. That led a harmful recession and reductive compensation. In 1978, China began market reform then situation changed. Wage and salary were determined by authority central system in line with variety of different occupation, sector, industry and region. Over 1980s, Chinese authority launched a series of reforms incorporating salary fixation with change of Consumer Price Index (CPI). It means raising nominal salary face inflation or depreciation of “Yuan”, so that the compensation level remained stable and China kept its cost advantage over time. In 1998, the share of State-Owned Enterprises (SOE) was largely diminished. 8.8 million workers among 15.7 million employments were laid off under project of “XiaGang”. As a result, firms were able to pay more for the rest of persons engaged and the remuneration per capita rose a little from this year.

However, as a country with brilliant burgeon, Chinese unchangeable salary level will bring on various social problems, such as rich state poor people, inequality of income and wealth distribution, even polarisation, sensitive sense of belonging…These problems are imminent or already to impair Chinese durable development and need to be solved as quickly as possible. As this paper highlights Chinese Competitiveness, we do not shed lights on this issue, but make it to be direction for future research.

China had poorer labor productivity but continuously increased

Fig.1b refers to initial value of productivity per capita. US’s manufacturing was the most productive among countries. Wage-setting system is an important element. Workers there might to be fired at any time for any raison. The only way to avoid being replaced is working

21 A commonly known social movement that took place in 1966-1976
efficiently. This so called “survival of the fittest” system permits enterprises to choose more efficient workers, raise their productivity and cut down cost of production. On the other side, it allows workers to improve themselves and favorite overall productivity level. In this case, gap between American line and the rest became larger and larger.

UK was the second highest productivity country. Employees here are also less protected, thus are more productive. We could conclude that the stronger employment protection, the less productivity it has. Workers in Spain and Italy earn more assurance thus they work less efficiently.

Furthermore, R&D expenditure and industrial policies of innovation also affect productivity. Mazier (1999) documented that research efforts in UK, Germany and France were a little poorer than those did by US but much more than those in Italy and Spain. That’s why the latter two economies were less productive than other industrialized countries.

The three Asian countries were the least productive at beginning. In 2008, Korea and Japan became more productive than Italy and Spain. Wage-setting system is still an important element. As mentioned above, Korea introduced a new democracy in 1980s. It aggrandized remuneration and improved working conditions. Employees were then encouraged to wire in so productivity level went up as quickly as in US. Japanese salary system enhanced employees’ loyalty and team spirit. This circumstance inspired workers training themselves automatically and growing up with their firms together.

China suffered low productivity level all the times. In point of history, China missed the three Industrial Revolutions and its technological progress lagged behind other industrialized nations. It faced problems in popularization of education, especially in rural areas and its R&D expenditure was extremely tenuous. An increase happened at about 1998. Thanks to the “XiaGang” project, Chinese SOEs’ share began to decrease. Gao Xu (2010) found that the share of SOEs (in terms of number) in industrial sector declined from nearly 40% to 5% between 1999 and 2008. Most small SOEs have been privatized or filed bankruptcy, while larger ones have been subsidized and/or merged to hopefully create stronger firms. This allowed China to lessen the burden of inefficient operations and ameliorate its overall productivity level. In virtue of Foreign Direct Investment, foreign invested firms, whose productivity is much higher than local one, helped China to catch up in terms of labor efficiency.

It’s worthwhile to note that the integration also favors productivity. Ali et al. (2007) estimated PS model and confirmed that the European Integration would theoretically and empirically promote economies of scale and improve the productivity of members. China has profited from labor absorption of migrants from rural to urban areas since 1990s, especially in the construction and non-qualified manufacturing sectors.

Fig.6a demonstrates relative labor productivity level. Korea in this figure is classed the second rather than the fifth in Fig.1b. Japan becomes the third instead of the sixth. These differences are due to the trade weights $a_i$ from Eq. (3a). Fig.6b reveals that China occupied larger percentage in Korean and Japanese trade than in others. Given Chinese productivity was quite low, Korean and Japanese relative productivity level increased more than the rests. By contrast, UK’s relative level diminished when taking account of trade weights because US, whose productivity was very high, represented a larger share.

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22 Research efforts in UK, Germany and France were comparably among 2.2-2.4 as percentage of GDP from 1990s; while those in Italy and Spain were much lower, 1.2 and 0.9
Figure 6a Relative Labor Productivity per capita (in US $)
China and developed countries

Figure 6b trade weights of other 12 partners in each country’s exchange
Interaction between labor compensation and productivity

The relationship between these two indexes is reciprocal. On one side, compensation influences productivity. More salary could incite workers to exercise their talents. On another side, productivity has significant positive effects on compensation. Wills and Wroblewski (2007) found that the gain from productivity would be equally distributed between labor remuneration and capital one.

Nickell and Layard (1998) proved a positive correlation between EPL and Total Factor Productivity (TFP) through statistic regression analysis. Andrea Bassanini et al. (2009) developed this analysis by replacing TFP to labor productivity in the basic model. They pointed out that EPL also affected labor productivity, like what it did on TFP. In the long term, this affect is negative, i.e. EPL tends to weaken labor productivity. In the short term, the effects rely on employment rate, share of industries protected by EPL and the speed of labor productivity growth.

This paper tried an elementary study of relationship between relative productivity and remuneration by Pearson's correlation coefficient written as follows:

\[ P_{rw,rp} = \frac{\text{cov}(rw_i, rp_i)}{\sigma(rw_i) \sigma(rp_i)} \]

In Fig.6c, nearly all the counties have productivity closely related to salary. In Korea, Japan and France, these two sets of indicators have large positive effects on each other with coefficients correspondingly equaling 0.97, 0.77 and 0.72. By contrast, effects become negative and the only negative in Spain. The productivity growth here cannot swell payment for workers. Even if they are more paid, they still loaf more or less on the job which is apt to lead a stagnation of productivity. Therefore, labour cost, including rise of salary and better protection, will aggravate burdens. Spain cannot rapidly reallocate labor and financial resources face technological and other changes. In Germany and China, correlation coefficients are 0.23 and 0.25. We could conclude that there’s little relationship between salary and productivity so we cannot improve efficiency of production by rising labour compensation.

![Figure6c correlation coefficient](X is relative productivity; Y relative labor compensation)
China had much lower RULC than major industrialized economies

We suppose the average level of these economies equal 1. The value inferior to 1 means the country pays less labor cost than its rivals; hence it is advantageous in terms of cost. By contrast, when RULC surpasses 1, the country is considered to be disadvantageous.

**Fig.7** describes Relative Unit Labor Cost levels across countries. Chinese value was less than 1 and was the least among these countries’, i.e. it won most from cost competitiveness with shield of tiny compensation and increasing productivity. Other two Asian countries, Japan and Korea, lost their cost competitiveness nowadays. At outset of 1970, both of them possessed more cost advantages than China. Korea maintained advantageous until 2005, while Japan has begun to lose its advantages quickly since 1974.

Indeed, Japan mushroomed during this period. If it was rapidly handicapped in cost, it could not emerge as a major industrialized country. Therefore, we took into account of only seven advanced economies and recalculated RULC among them.

**Fig.8** illustrates new results. Japan became disadvantageous in 1986\(^{23}\) instead of 1974. In addition, its losses of cost competitiveness have diminished since 1995 and it reappeared competitive in 2007 even though the subprime crisis stopped this comeback. As discussed in part of productivity, China took up a larger percentage of Japanese trade than in others. Given Chinese ULC was quite low, Japanese relative level raised more than other advanced countries, so that Japan suffered more loss of competitiveness when China is taken into account.

The same difference occurs in US, for which China also occupied a large commercial share. In **Fig.8**, US kept competitive from 1986 till present; in **Fig.7** comparison including China, US became handicapped during 1997-2006.

Other advanced economies seem to be not very different between **Figs.7-8**. France and Germany were characterized by cost handicap. France remained close to average level while Germany was tending to be more and more unpropitious. UK, Italy and Spain owned minor RULC over most time. But when looking at their initial value in **Fig.1c**, ULC of Spain and Italy were the highest because of their lowest labor productivity. Particularly in Spain, towering labor protection and poorest productivity deteriorated its cost competitiveness at a great range.

\(^{23}\) There excludes 1978, the exceptional year.
2.3.2 China also won more cost advantage than most emerging countries, except for Thailand (more productive than China) and India (less compensation).

We have already discussed the elements of cost competitiveness and the relationship between them in previous parts for advanced countries. For now, we put eyes on emerging economies and study their performance country by country. Generally speaking, all the emerging countries are less paid, less productive and more competitive in cost than developed countries, according to Fig.11b, 12b and 13b.
Figure 11a Labor Compensation per capita for manufacturing
(in US $)
China and emerging countries

Figure 11b Relative Labor Compensation per capita for manufacturing
(in US $)
China and emerging countries
Figure 12a Labor Productivity per capita for manufacturing (in US $)
China and emerging countries

Figure 12b Relative Labor Productivity per capita for manufacturing (in US $)
China and emerging countries
Thailand was a relatively stable economy among Asian countries. Even went through the 1997 financial crisis, its trade surplus in overall manufacturing did not go down. Fig.12b signifies Thailand productivity was much higher than other emerging countries and followed a steady evolution. Its RULC level was therefore lowest, i.e. Thailand was the most competitive in manufacturing export. 1983-1986 and 1995-1997 were its two sparkling periods. First is due to the favorable exchange rate (Fig.10). “Baht” depreciated in 1985 (Plaza Agreement) and 1997-1998 (East Asian Crisis). Its remuneration in dollars was accordingly diminished. Second is relevant to the FDI. Foreign firms set up their production line in Thailand owing to its delighted productivity and slender labor cost (equivalent or
inferior to Chinese one). From this point of view, Thailand is a ferocious competitor for China.

![Figure 10: Exchange rate evolutions for emerging countries](image)

Indonesia has transformed from an agricultural economy to an industrial one, namely “industrialization” between 1970 and 1990. Thanks to that, its labor productivity continued to be strengthened over times, although it was the poorest among emerging countries at the beginning. However, this improvement stagnated in 1998. During the East-Asian financial crisis, Indonesian currency depreciated roughly and its labor compensation went down over 1997-2000. The workers were depressed and the outputs were reduced. As a result, ULC rose and it lost a little cost competitiveness.

India was the only country who kept decreasing ULC constantly from 1980. Despite of less advantage before 1984, its ULC began to diminish quickly from this year. Till 2002, India became the most competitive in cost. Fig.10 reveals that Indian exchange rate depreciated from 1984 and its remuneration started lessening to the lowest level among these countries. It is concluded that exchange rate has a significant effect on Indian cost competitiveness. As for the productivity, Figs.12a-12b illustrate that India did not make any notable progress. This is abhorrent to common deduction. From 1991, the impressing commercial liberalization and the integration drove a rapid and suitable development in India. Dynamic innovation, especially in Informatics’ field, promoted Indian labor productivity for total economy (Fig.14a). Its RULC was then reduced and India was more and more competitive (Fig.14b). Nevertheless, different from China, Indian development was driven by service industry rather than manufacturing. Hence, Indian productivity in total economy improved, while that in manufacture remained unchangeable. For the same purpose, Indian remuneration stayed in the lowest level.
Mexican growth relied on oil revenues instead of manufacturing profits, so it seems to be fragile face external shocks. When the currency depreciated, its remuneration persisted in cutting down. Innovation is the traditional weakness in Latin America, for instance, less R&D expenditure, unsound system and infrastructure of higher education, deficient university-enterprise cooperation… All of them hindered the development of productive forces and made Mexican labor productivity downward successively from 1980s, even though it has been the highest at initial.

China profited from the rise of productivity compared with other emerging countries. In 2006, it earned a stronger productivity force than most developing economies, except for Thailand. In regard to labor compensation, Chinese was superior to Indian. As a result, China was more competitive in cost than most rivals but less cost-advantageous than Thailand or India.
We calculated Pearson’s correlation coefficient for these emerging countries and found there’s no relationship between relative labor remuneration and relative labor productivity\(^{24}\).

Indeed, one country’s commercial performance relies on cost advantages (CA) as well as non-cost advantages (NCA). After discussing the cost competitiveness, we now turn into analysis of non-cost competitiveness.

**3. Indirect measurement of Non-Cost Competitiveness**

**3.1 Methodology**

Commercial performance could be expressed by the index of Trade Coverage Rate (TCR) as ratio of export value to import value. In Eq. (7a), \(P_{xi}\) is price of export from country \(i\); \(EXP_i\) is export volume, \(P_{xi}EXP_i\) represents export value in US dollars and \(P_{mi}IMP_i\) stands for the import value. \(TCR_i\), superior to 1 means a trade surplus of country \(i\) because its exports are more than imports.

\[
TCR_i = \left(\frac{P_{xi}EXP_i}{P_{mi}IMP_i}\right)
\]  
(7a)

\[
RTCR_i = \left[\frac{(P_{xi}EXP_i)/(P_{mi}IMP_i)}{\sum_{k=1}^{n-1}(P_{sk}EXP_k)/(\sum_{k=1}^{n-1}(P_{mk}IMP_k))}\right]
\]  
(7b)

In order to facilitate the comparison, we introduce Relative Trade Coverage Rate (RTCR) in Eq. (7b). When RTCR\(_i\) is superior to 1, the country wins more trade surplus than its commercial partners. It must be mentioned that in this paper \(n=13\); hence the RTCR\(_i\) level is relative to 12 economies rather than the rest of whole world. This may cause little bias against reality but is compatible with the previous study on cost competitiveness.

Given commercial performance relies on cost advantages (CA) and non-cost advantages (NCA), its measuring index RTCR can be written as follows (Mathis et al. 1988):

\[
RTCR = \alpha CA + \beta NCA
\]  
(8a)

\(CA\) has been analyzed by Relative Unit Labor Costs (RULC); \(NCA\) depends on number of patents, R&D investment, innovation expenditure…which are not possible to be measured directly and exactly. However, \(NCA\) could be estimated indirectly by RTCR if variable \(CA\) was given.

Tab.1 displays four cases:

1. When a country’s \(RULC<1\), it profits from cost competitiveness but the performance is bad. It must suffer a significant impact of non-cost handicap that worsen the performance. (case A)

2. \(RULC<1\), country is advantageous in cost and has usually a good commercial performance. (case B)

3. When a country’s \(RULC>1\), it loses from cost handicap and the performance often deteriorates. In this case, we cannot examine whether the country is non-cost handicapped or not. (case C)

4. \(RULC>1\), country is handicapped in cost but it possesses non-cost advantages that offsets loss of cost handicap. Its RTCR is thus superior to 1. (case D)

---

\(^{24}\) Correlation coefficient of Thailand is -0.31, Indonesia 0.5, India 0.06, Mexican 0.47
| Table 1 |
|---------------------------------|---------------------------------|
| RTCR < 1 (bad performance)      | RTCR > 1 (good performance)    |
| RULC < 1 A/ non-cost handicap > cost advantage | B/ cost advantage |
| RULC > 1 C/ cost handicap       | D/ non-cost advantage > cost handicap |

3.2 Findings

Data in this section derive from CHELEM-CIN under ISIC rev.3 classification system.

In Fig. 15a, developed countries’ commercial performance appeared stable and generally varied in range of ±0.5 around 1 (except Japan). In Fig. 15b, developing countries followed an upward tendency until 1998 and evolved in scope of ±0.8 around 1. China is an outstanding economy keeping prosperity and now it is known as the largest exporter in the world. Fig. 16 puts Cost Advantage (measured by RULC) and Non-Cost Advantage (measured by RTCR) together so that we can conclude each country’s competitiveness clearly.
Tab. 2 shows the conclusion from Fig. 16 in detail. China is advantageous in cost over all the time. Before 1990s its RTCR has been inferior to 1 and it belonged to type A/. The non-cost handicap damaged commercial performance. Since 1994 China has moved into type B/ cost advantage. RULC continued increasing but RTCR kept rising. China lost more and more cost advantages but export expanded largely and successively. It is to say that Chinese export progression nowadays is subserved mainly by non-cost competitiveness instead of cost advantages.

Most emerging countries (Thailand, Indonesia, India and Mexico) have similar evolution to China. They pertained to case A/ at outset and then fell into case B/. What’s different from China is they returned to A/ after East Asian financial crisis, except for Thailand which is considered as a relatively stable economy among Asian countries. In summary, they are advantageous in cost and handicapped in non-cost over most periods.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>RTCR&lt;1 (bad performance)</th>
<th>RTCR&gt;1 (good performance)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A/ non-cost handicap &gt;cost advantage</td>
<td>B/ cost advantage</td>
</tr>
<tr>
<td></td>
<td>- China before 1994</td>
<td>- China after 1994</td>
</tr>
<tr>
<td></td>
<td>- emerging countries at outset</td>
<td>- emerging Countries afterward</td>
</tr>
<tr>
<td></td>
<td>- Korea before 1977</td>
<td>- Korea between 1976-2005</td>
</tr>
<tr>
<td></td>
<td>- US between 1987-1997</td>
<td>- Italy between 1975-2003</td>
</tr>
<tr>
<td></td>
<td>- UK after 1980</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Spain before 1996</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C/ cost handicap</td>
<td>D/ non-cost advantage &gt;cost handicap</td>
</tr>
<tr>
<td></td>
<td>- USA before 1987 and after 1997</td>
<td>- Japan</td>
</tr>
<tr>
<td></td>
<td>- UK 1970-1980</td>
<td>- Germany</td>
</tr>
<tr>
<td></td>
<td>- France</td>
<td>- Italy after 2003</td>
</tr>
<tr>
<td></td>
<td>- Spain after 1996</td>
<td>- Korea since 2005</td>
</tr>
</tbody>
</table>

USA and France were cost handicapped (case C) but their evolutions were not the same. According to Fig. 16, French cost handicap and performance index were both around 1. Its non-cost competitiveness was very likely to locate around average level. Differently, USA was much more handicapped in non-cost during 1986-1996. Over this decade, its commercial development was hampered by non-cost disadvantage although it’s competitive in cost.

UK was handicapped in cost at beginning (case C). After 1980s it became advantageous in cost but disadvantageous in non-cost aspect (case A). On contrary, Spain belonged to type A/ at outset. In 1996 it fell into case C/ with cost handicap devastating external performance.

Since 1970s, Germany and Japan have maintained non-cost advantage (case D). Also from 1970s, Italy and Korea kept cost advantage (case B). Both of them went to situation D/ by

\[ \text{RTCR} = \alpha \text{CA} + \beta \text{NCA} \]

so RTCR is determined by CA and NCA. When the variable RTCR and CA both are around average level, NCA are very likely to be also around average level. Otherwise, its performance will be away from 1. There are still other possibilities. According to the derived equation: \( \text{NCA} = \lambda \text{RTCR} - \theta \text{CA} \). The level of NCA depends on the coefficient \( \lambda \) and \( \theta \). We just adduce the general conclusion. Whether it’s true or not needs a further estimation.

25 Germany since 1972, Japan since 1974
26 Italy from 1975, Korea from 1976. Before this year they were handicapped in non-cost (type A)
the end of 2000s. These four developed countries lost their cost advantages but ameliorated the non-cost one that enhanced their commercial performance. However, at present they possess trade coverage rate level lower than China. This level tends to decrease while China holds its level upward. For this raison, the cost advantage still occupies an essential role in trade activities. With both cost and non-cost competitiveness, China became the only country maintaining a successive rapid progress of manufacturing industry.

For now, we obtained the preliminary conclusion but there exists problems. We cannot examine whether a country is non-cost advantageous or not in case B/ and C/. We supposed French competitiveness around average level but not yet prove it. They all need other way of interpretation; therefore we will provide in next section econometric estimations of RTCR model (Eq.8a) for clarifying our preliminary inference.

Figure 16 Cost Advantage (RULC) and Non-Cost Advantage (RTCR)

4. Empirical study of cost and non-cost competitiveness

4.1 Methodology

We first divided panel data over 1970-2008 into three groups: All country, developed country and emerging country.

Tab. 3 reports the results from ADF Fisher unit root tests. The series of RULC and RTCR have not unit root and are stationary for “all country” group and “developed country” group. For “emerging country” group, the series of RULC are stationary but RTCR are not. We use “first difference rate” for their estimation in follows.

28 Italy from 2003, Korea from 2005
29 We also use IPS unit root test and results, available on request, are similar to those reported below.
The HAUSMAN test was used to select a preferable model between FE effects and RE effects. Tab. 4 presents results by comparing FE model with RE model. Since HAUSMAN test statistic under RE model is significant in one out of six cases, the FE model was selected. 

\[ RTCR_{it} = \alpha RULC_{it} + \mu_t + \gamma_i + \varepsilon_{it} \]  

(8b)

We rewrite Eq. (8a) to Eq. (8b) where \( RTCR_{it} \) represents relative trade coverage rate of country \( i \) at year \( t \), \( RULC_{it} \) represents relative unit labor cost of country \( i \) at year \( t \), \( \mu_t \) is unobserved common time-effect, \( \gamma_i \) is unobserved country-effect, and \( \varepsilon_{it} \) is the error term.

4.2 Results

Tab. 5 reports the estimated results of Eq. (8b). We used two types of fixed effects for each group’s estimation. One is time fixed effects \( (\mu_t) \) showed in column (1) (3) (5) (7). Another is time plus individual fixed effects \( (\mu_t + \gamma_i) \) showed in column (2) (4) (6) (8). Since the series of RTCR for “emerging country” group is not stationary, we added first difference in its estimation showed in column (7) and (8). The results here are completely consistent with the inference in last section (tab. 2). All the estimated coefficients have expected signs and are statically significant at the level of 1%. This indicates the robustness of previous inference. Generally speaking, relative costs have negative impacts on trade performance. A 10% cost augment leads an reduction of 3.3% (or 4.4%) in manufacturing exports relative to imports. Non-cost factors evaluated by constant have positive effects. A 10% increase of non-cost advantage leads to 13% (or 13.9%) growth in exports relative to imports.

Table 3

Panel unit root test (ADF-statistic and prob.)

<table>
<thead>
<tr>
<th></th>
<th>all country</th>
<th>developed country</th>
<th>emerging country</th>
</tr>
</thead>
<tbody>
<tr>
<td>( RULC )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>level</td>
<td>53,49***</td>
<td>29,45**</td>
<td>24,04***</td>
</tr>
<tr>
<td>Diff.</td>
<td>204***</td>
<td>115,91***</td>
<td>88,09***</td>
</tr>
<tr>
<td>prob.</td>
<td>(0,00)</td>
<td>(0,02)</td>
<td>(0,008)</td>
</tr>
<tr>
<td>( RTCR )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>level</td>
<td>47,4***</td>
<td>35,56***</td>
<td>11,84</td>
</tr>
<tr>
<td>Diff.</td>
<td>195,59***</td>
<td>121,77***</td>
<td>73,82***</td>
</tr>
<tr>
<td>prob.</td>
<td>(0,006)</td>
<td>(0,003)</td>
<td>(0,30)</td>
</tr>
</tbody>
</table>

*Note: Null hypothesis: unit root and non-stationary

*** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level

Table 4

HAUSMAN test results

<table>
<thead>
<tr>
<th></th>
<th>all country</th>
<th>developed country</th>
<th>emerging country</th>
</tr>
</thead>
<tbody>
<tr>
<td>( RULC ) (level)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed</td>
<td>-0.327</td>
<td>-0.323</td>
<td>-0.342</td>
</tr>
<tr>
<td>Random</td>
<td>-0.282*</td>
<td>-0.316</td>
<td>-0.296</td>
</tr>
<tr>
<td>Prob.</td>
<td>0,009</td>
<td>0,135</td>
<td>0,641</td>
</tr>
<tr>
<td>( RULC ) (difference)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed</td>
<td>-0.114</td>
<td>-0.096</td>
<td>-0.125</td>
</tr>
<tr>
<td>Random</td>
<td>-0.111</td>
<td>-0.086</td>
<td>-0.113</td>
</tr>
<tr>
<td>Prob.</td>
<td>0,612</td>
<td>0,344</td>
<td>0,344</td>
</tr>
</tbody>
</table>

* Note: prob. values concern random effects estimation

* Significant at 10% level
Table 5

estimation results for Relative Trade Coverage Ratio (TCR) equation

<table>
<thead>
<tr>
<th></th>
<th>all country</th>
<th>developed country</th>
<th>emerging country</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TCR (level)</td>
<td>TCR (level)</td>
<td>TCR (level)</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
</tr>
<tr>
<td>TCR (first difference)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEi</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FEit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relative Cost (level)</td>
<td>-0.33***</td>
<td>-0.44***</td>
<td>-0.32***</td>
</tr>
<tr>
<td></td>
<td>(-4.55)</td>
<td>(-6.07)</td>
<td>(-5.09)</td>
</tr>
<tr>
<td>Relative Cost (difference)</td>
<td>-0.12</td>
<td>-0.25*</td>
<td>-0.18</td>
</tr>
<tr>
<td>Constant</td>
<td>1.30***</td>
<td>1.39***</td>
<td>1.48***</td>
</tr>
<tr>
<td></td>
<td>(22.3)</td>
<td>(23.77)</td>
<td>(21.60)</td>
</tr>
<tr>
<td>C_CN</td>
<td>-0.16</td>
<td>-0.20</td>
<td>0.15</td>
</tr>
<tr>
<td>C_esp</td>
<td>-0.19</td>
<td>-0.20</td>
<td>-0.38</td>
</tr>
<tr>
<td>C_fr</td>
<td>-0.01</td>
<td>0.04</td>
<td>-0.20</td>
</tr>
<tr>
<td>C_ger</td>
<td>0.41</td>
<td>0.48</td>
<td>0.23</td>
</tr>
<tr>
<td>C_idn</td>
<td>-0.36</td>
<td>-0.39</td>
<td>-0.05</td>
</tr>
<tr>
<td>C_ind</td>
<td>-0.32</td>
<td>-0.34</td>
<td>-0.01</td>
</tr>
<tr>
<td>C_ita</td>
<td>0.13</td>
<td>0.17</td>
<td>-0.05</td>
</tr>
<tr>
<td>C_jpn</td>
<td>1.41</td>
<td>1.50</td>
<td>1.22</td>
</tr>
<tr>
<td>C_kor</td>
<td>0.16</td>
<td>0.17</td>
<td>-0.03</td>
</tr>
<tr>
<td>C_mex</td>
<td>-0.26</td>
<td>-0.31</td>
<td>-0.05</td>
</tr>
<tr>
<td>C_thai</td>
<td>-0.43</td>
<td>-0.49</td>
<td>-0.13</td>
</tr>
<tr>
<td>C_uk</td>
<td>-0.23</td>
<td>-0.21</td>
<td>-0.42</td>
</tr>
<tr>
<td>C_us</td>
<td>-0.29</td>
<td>-0.22</td>
<td>-0.48</td>
</tr>
<tr>
<td>Observations</td>
<td>484</td>
<td>484</td>
<td>301</td>
</tr>
<tr>
<td>R²</td>
<td>0.67</td>
<td>0.73</td>
<td>0.82</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *** Significant at 1% level; ** Significant at 5% level; * Significant at 10% level

For “all country” group, individual-fixed and time-fixed effects conduct similar results, except for France. When we introduce dummy variables of each country, we found that all the emerging countries were disadvantageous in non-cost side because estimated coefficients are negative. Germany, Japan, Italy and Korea are competitive in non-cost but US, UK, France and Spain are not. The coefficient of France (-0.01) is negative and near zero, i.e. France is handicapped but still around average level. When time-fixed effects are considered, its variable becomes positive (0.04).

---

30 0.00002
31 0.004
We then distinguished industrialized countries from emerging countries. Dummy variables of the former diminished (column 3-4 have variables inferior to column 1-2) and those of the later rose (column 5-6 variables superior to column 1-2). It is logically correct. Industrialized countries are absolutely more competitive in non-cost when compared with emerging economies; emerging countries are less competitive in front of developed ones.

When considering only developed countries, Germany and Japan are always competitive in non-cost. Italy and Korea become disadvantageous. As Tab.2 showed, Italy was non-cost advantageous after 2003 so its variable becomes negative (-0.05 and -0.03) over the period of 1970-2008. The estimated coefficient of Korea is negative (-0.03) under cross-country effect but positive (0.01) when time-fixed effects are taken into account. This suggests that Korea was disadvantageous in non-cost but not so much handicapped as Italy.

When considering only emerging countries, estimation is not satisfied with determinant coefficient ($R^2$) only 0.08, 0.02 and 0.29. When time and individual effects are taken into account, estimation is more or less valuable with $R^2$ equaling 0.82 (column 6). Here China and India becomes advantageous in non-cost. However, dependent variable RTCR is not stationary so the results of “all country” group are preferable.

5. Conclusion

Both cost and non-cost competitiveness have significant impacts on trade performance. Emerging countries’ manufacturing have always benefited from cost advantages but lost from non-cost handicap. Developed economies were disadvantageous in cost but also handicapped in non-cost aspect, except USA and Spain. Italy and Korea improved non-cost competitiveness in recent years; however the overall industrialized countries are still anxious.

Labor compensation, labor productivity, exchange rate and trade in previous period are four elements determining cost competitiveness. Salary system, R&D expenditure and integration are also relevant. Meanwhile, labour compensation and productivity affect each other in process of production. The relationship becomes little in Germany and emerging countries, including China.

China is characterized by striking cost competitiveness. Its relative level of labor compensation was much lower than others, except than India; China improved its productivity with political support and its production became more efficient than the rest of emerging countries, excluding Thailand. Hence, Chinese unit labor costs were lower than developed countries and most developing countries, aside from India and Thailand. In this sense, these two nations are China’s largest rivals.

Since 1990s, China could not maintain its low cost level with rise of labor remuneration. Its manufacturing exports relied more on non-cost competitiveness. The empirical study suggests that if certain emerging countries could be advantageous in non-cost, in must be China and India. Therefore, we will work over the way of enhancing non-cost competitiveness in future research.
Annex A: explication of Equation (4)

According to Eq. (2b), $ULC_i$ is a ratio of labor compensation to labor productivity. However, it is important to note that $RULC_i$ does not equal the Relative labor compensation divided by Relative productivity, as showed in Eq. (4).

$$ULC_i = \frac{W_i}{VA_i/N_i}$$  \hspace{1cm} (2b)

$$RULC_i \neq \frac{RW_i}{RP_i}$$  \hspace{1cm} (4)

$$RULC_i = \frac{W_i}{VA_i/N_i} \left( \frac{a_1W_1 + a_2W_2 + \ldots + a_{n,t}W_{n,t}}{VA_{i,t}/N_{i,t}} \right)$$  \hspace{1cm} (3b)

$$\frac{RW_i}{RP_i} = \frac{W_i}{VA_i/N_i} \left( \frac{a_1W_1 + a_2W_2 + \ldots + a_{n,t}W_{n,t}}{a_1VA_{i,t}/N_{i,t} + a_2VA_{2,t}/N_{2,t} + \ldots + a_{n,t}VA_{n,t}/N_{n,t}} \right)$$  \hspace{1cm} (3c)+(3d)

Combining Eq. (3c) and Eq. (3d) then comparing it with Eq. (3b), we find that the numerator is the same but the denominators are not equal, which proves Eq. (4).
Annex B: Definition of labor cost

The 11th ICLS (Geneva, 1966) adopted a resolution concerning statistics on labor cost, recommending the following International Standard Classification of Labour Cost:

I. Direct wages and salaries
   1. Straight-time pay of time-related workers
   2. Incentive pay of time-rated workers
   3. Earnings of piece-workers (excluding overtime premiums)
   4. Premium pay for overtime, late shift and holiday work

II. Remuneration for time not worked
   1. Annual vacation, other paid leave, including long-service leave
   2. Public holidays and other recognized holidays
   3. Other time off granted with pay (e.g. birth or death of family members, marriage of employees, functions of titular office, union activities)
   4. Severance and termination pay where not regarded as social security expenditure

III. Bonuses and gratuities
   1. Year-end and seasonal bonuses
   2. Profit-sharing bonuses
   3. Additional payments in respect of vacation, supplementary to normal vacation pay and other bonuses and gratuities

IV. Food, drink, fuel and other payments in kind

V. Cost of workers’ housing borne by employers
   1. Cost for establishment-owned dwellings
   2. Cost for dwellings not establishment-owned (allowances, grants, etc.)
   3. Other housing costs

VI. Employers’ social security expenditure
   1. Statutory social security contributions (for schemes covering old age, invalidity and survivors, sickness, maternity, employment injury, unemployment, and family allowances)
   2. Collectively agreed, contractual and non-obligatory contributions to private social security schemes and insurances (for schemes covering old age, invalidity and survivors, sickness, maternity, employment injury, unemployment and family allowances)
   3a. direct payments to employees in respect of absence from work due to sickness, maternity or employment injury, to compensate for loss of earnings
   3b. other direct payments to employees regarded as social security benefits
   4. Cost of medical care and health services
   5. Severance and termination pay where regarded as social security expenditure

VII. Cost of vocational training, including fees and other payments for services of outside instructors, training institutions, teaching material, reimbursements of school fees to workers, etc.

VIII. Cost of welfare services
   1. Cost of canteens and other food services
   2. Cost of education, cultural, recreational and related facilities and services
   3. Grants to credit unions and cost of related services for employees

IX. Labour cost not elsewhere classified, such as costs of transport of workers to and from work undertaken by employer (including reimbursement of fares, etc.), cost of work clothes, cost of recruitment and other labor costs

X. Taxes regarded as labor cost, such as taxes on employment or payrolls, included on a net basis, i.e. after deduction of allowances or rebates made by the State.
References

Andrea Bassanini, Luca Nunziata, Danielle Venn [2009], « Job protection and productivity», Economic policy, n°58, avri


Ali M. Kutan, Taner M. Yigit [2007], « European integration, productivity growth and real convergence », European economic review, volume 51, no°6, août

Bart Van Ark and al. [2008], « The Cost Competitiveness of Manufacturing in China and India: An Industry and Regional Perspective», Working Paper No.228

Bertola [1994], « flexibility, investment and growth », Journal of monetary economics

Blanchard O., Wolfers J. [2000], « The role of shocks and institutions in the rise of European unemployment: the aggregate evidence », NBER working paper series, Cambridge

Bronmyn H. Hall, Francesca Lotti, J. Mairesse [2008], « employment, innovation and productivity: evidence from Italian microdata », industrial and corporate change, août


Couharde C., Mazier J. [1999], « Les fondements macroéconomiques de la compétitivité», Economie internationale, No.79, 3e trimestre


Guo K, N’Daye P [2009], « Is China export oriented growth sustainable», IMF working paper 09/172


He D, Zhang W [2008], « How dependent is the Chinese economy on exports and in what sense has its growth been export led? », Hong Kong Monetary Authority working paper 14

Jonathan L. Wills, Julie Wroblewski [2007], « What happened to the gains from strong productivity growth? », economic review, volume 91, no°1, 1er trimestre


Li cui, Murtaza H. syed [2007], « Is China changing its stripes? The shifting structure of china’s external trade and its implications», discussion paper of IMF, juin

Mathis J., Mazier J. et Rivaud-Danset D. [1988], La compétitivité industrielle, Dunod, Paris
M. Aglietta, F. Lemoine [2011], « La nouvelle frontière de la croissance chinoise », *l’économie mondiale 2011*

M. Aglietta, F. Lemoine [2010], « Chine : Fin du modèle de croissance extravertie », *lettre CEPII* No.298, le 21 avril 2010

Nickell S., Layard R. [1998], « labor market institutions and economic performance », *Handbook of labor economic* de Ashenfelter O., Card D

Nickell S., Layard R. [1998], « labor market institutions and economic performance », *Handbook of labor economic* de Ashenfelter O., Card D

Richard B. Freeman [2008], « Labor Market Institutions around the World », *CEP Discussion Paper No.844*


William Thorbecke, H. Zhang [2008], « effect of exchange rate changes on china’s labor-intensive manufacturing exports », *RIETI discussion paper 08-E-038*, septembre