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Cost Competitiveness of Chinese Manufacturing Industries from the Finnish Perspective

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FOREWORD

Globalisation has, in recent years, been a topic of intense discussions in most developed countries, including Finland. Some years ago, global competition from low-cost emerging economies was primarily considered a threat to jobs and even the social models of developed western countries. More recently a more balanced view has emerged. The gains produced by increased global exchange of goods and services have been better recognised, most likely as a result of the good growth and employment performance of many developed economies.

Nevertheless, the cost competitiveness of emerging economies, China in particular, appears to remain strong, which implies great challenges to many existing businesses and jobs in developed countries. As meeting these challenges involves costly adjustments, it is important to understand as precisely as possible the degree and evolution of the cost advantage the merging economies have.

In this concise study, the cost competitiveness of the manufacturing sectors of China and a small European emerging economy, Estonia, is examined with regard to Finland, and the two leading developed manufacturing countries, the United States and Germany. The study uses the most recent national accounts data to calculate relative unit labour costs in manufacturing and also looks at the various components of these measures and their development over time.

The study, commissioned by the Secretariat of the Economic Council, was conducted by Paavo Suni from ETLA, the Research Institute of the Finnish Economy, and Harri Ahveninen from Creapo Oy. Heli Honkaharju was responsible for transforming the manuscript and diagrams into the final publication. On behalf of the Secretariat, I extend my thanks to all of them.

Vesa Vihriälä
Secretary General of the Economic Council of Finland

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Paavo Suni, ETLA
Harri Ahveninen, Creapo (Chapter 4.1)

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1 INTRODUCTION

Emerging economies led by China have grown into major players in the global economy thanks to trade and capital market liberalisation, declining communication costs and the introduction of market mechanism into their economies. These factors have allowed the emerging economies to use their comparative advantage of low labour costs to create internationally extremely competitive and dynamic manufacturing industries.

The study looks at the cost competitiveness of the Chinese and Estonian manufacturing sectors relative to Finland and the US and Germany, two big developed manufacturing economies. We focus mostly on the manufacturing sector as an aggregate. Given the important structural challenges currently facing the Finnish forest industry, the development and competitiveness of the paper and pulp sector in China is given special attention.

In this study we consider competitiveness as relative profitability. A certain level of profitability as such is necessary for sustainable survival of a firm or industry. Differences in this respect play a critical role in the future development of economic structures. Profitability is simply a difference between revenues and costs. Costs consist of intermediate costs, labour costs, technically calculated capital costs (depreciation) and net taxes (taxes minus subsidies) in the national accounts. We describe these items on a general level and focus on the labour compensation differences.

In section 2 of this report, the globalisation and its effects on national economic structures are dealt with on a general level. In section 3, the level and development of labour cost competitiveness are analysed. Section 4 describes the Chinese pulp and paper industry to reveal problems and difficulties in the comparisons. Finally, we present our conclusions from this study and indicate fruitful topics for further research.

2 ECONOMIC GROWTH AND THE SIZE OF EMERGING ECONOMIES

Economic globalization can be seen as the IMF does as “a historical process, the result of human innovation and technological progress. It refers to the increasing integration of economies around the world, particularly through trade and financial flows.” (IMF 2002)

On a national level, globalisation is not a zero-sum game as Krugman (1994) notes. The benefits and costs, however, are not divided evenly between the nations and inside the nations. Some lose and these losses are often very visible and they are painful for the firms and societies which face them. On the one hand, benefits are seen in good profits in successful industries or firms. On the other hand, benefits to the consumers also become widely diffused as a result of lower prices. As an average both China and industrialised countries have greatly benefitted from this process on average and disadvantages have been more visible than the benefits. (See e.g. Euroframe 2005).

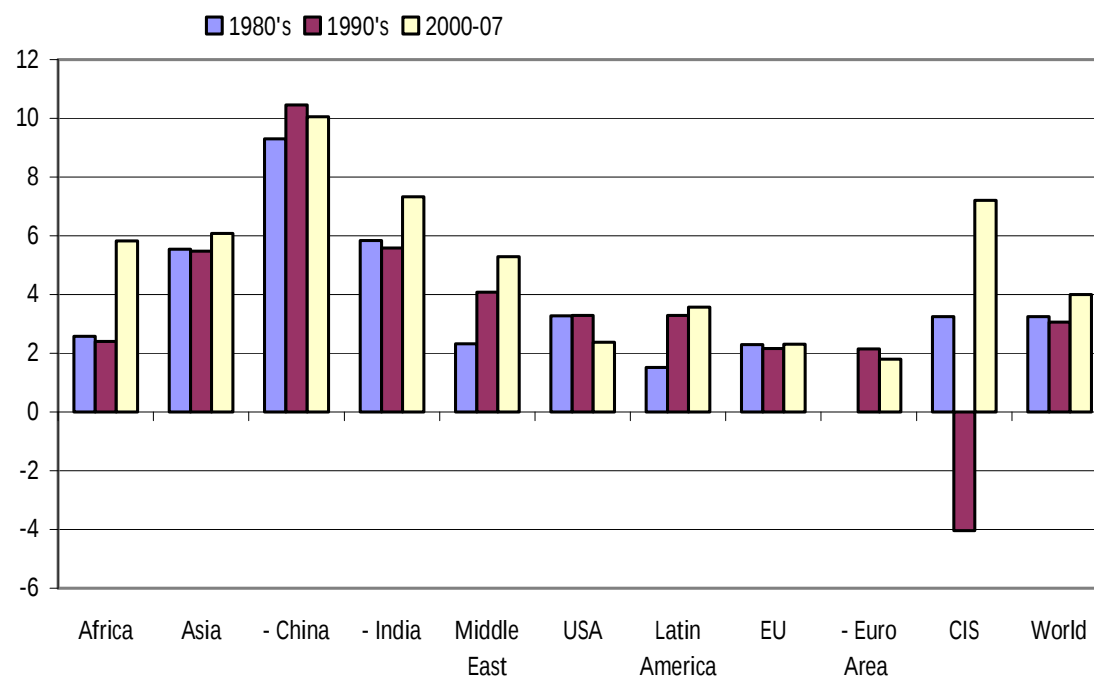
Globalisation hinges on the opening up of national borders due to trade negotiations like GATT rounds and the obligations made in the WTO as well as the freer movement of capital. This process has strongly changed the economic circumstances under which firms operate. These changes have opened up new opportunities for firms to benefit from combining low unit costs with technology in new potential production localizations, as well as from new very rapidly growing markets. In fact, industrial firms are even obliged to do this and at least think globally if they wish to survive in light of intensifying competition in the domestic and foreign markets. Otherwise they would lose their competitiveness vis-à-vis the firms that utilise these opportunities, which could be very detrimental to their future.

Globalisation includes the rise of China to one of the most influential economies in terms of activity as well as its size. The growth of GDP in China started to affect pronouncedly the global economic development in the 2000s, which can be seen e.g. in skyrocketing prices of energy and other raw materials.

The Chinese economy has grown with an average rate of nearly 10 per cent since the end of the 1970s, when the government decided to shift the economy towards a more market-orientated direction. The Chinese economy has been catching up to the industrial world quickly, spurred by rapid increases in domestic and foreign investments. In the 1990s, the inflow of foreign direct investments (FDI) amounted to 11.3 per cent of domestic gross fixed investments. In the mid-2000s the share fluctuated between 8-9 per cent.

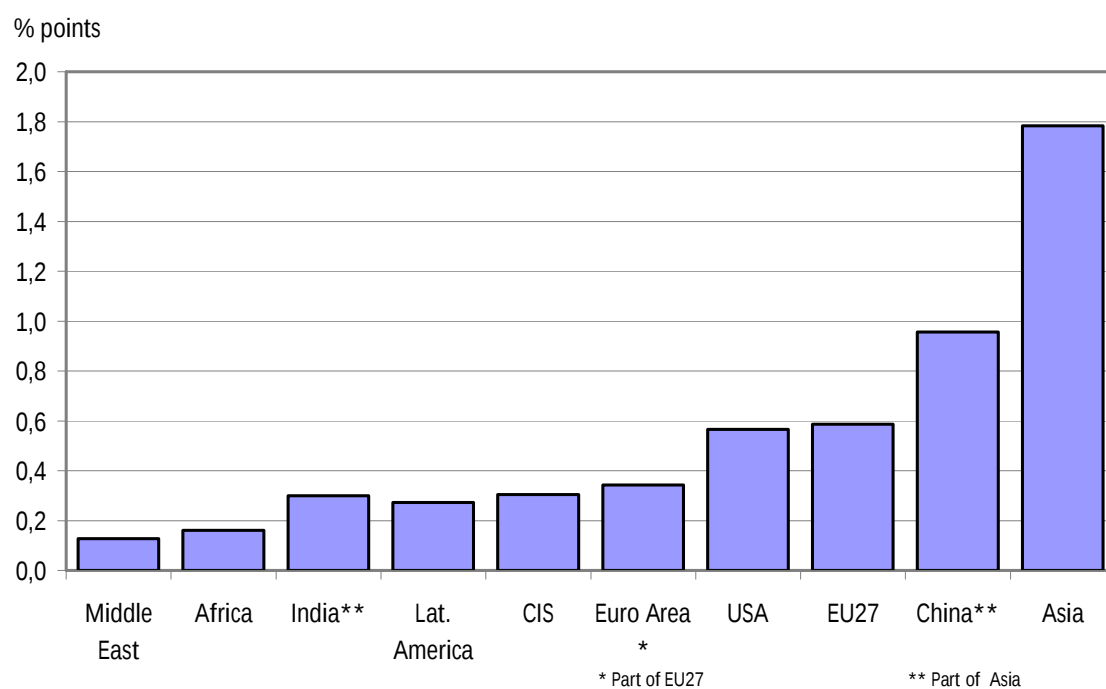
On the other hand, the inflow of foreign direct investments to China consisted of 5.3 per cent of world FDIs in 2006 after nearly a 9 per cent average share in 2002-2005. Foreign investments are larger than one could infer from these shares as such as gross fixed investments had an abnormally high 43 per cent share of GDP in 2006. (CSY2007, UNCTAD 2007)

Figure 1 World economic growth by areas.



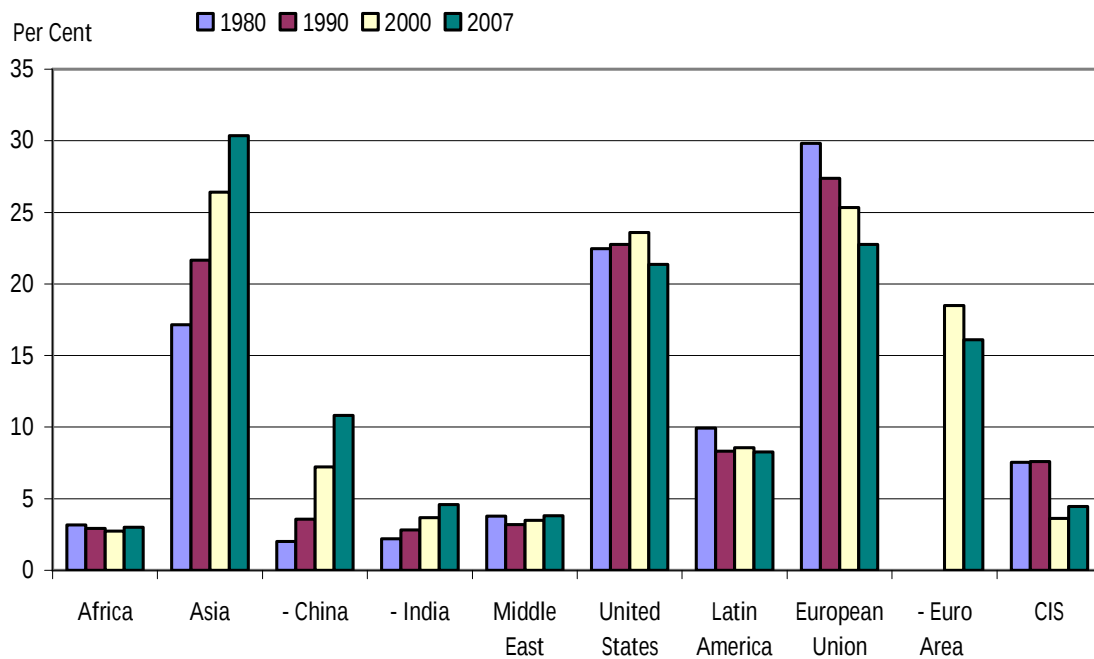
Source: IMF, World Bank, ETLA

Figure 2 Contribution of selected areas or countries to world GDP growth in 2000–2007.



Source: IMF, World Bank, ETLA

Figure 3 World GDP shares.



Source: IMF, World Bank, ETLA

China has risen to be the second largest economy in the world GDP ranking if the low purchasing power of the citizens is taken into account. In 1980 China's share in world GDP was only 2 per cent. The share rose to 7.2 per cent by 2000 and up to 10.9 per cent in 2007 according to the latest estimation by the IMF and the World Bank¹. The share is growing rapidly if the difference in the growth stays large. (ICP 2007, IMF 2007) In fact, if the growth of China continues even well below the current rates at 8 per cent a year and the US growth averaged 3 per cent in a longer run, China would surpass the US as the world's largest nation in terms of GDP by 2021 (Sun 2008). The core of the world activity is concentrating rapidly on Asia, where other countries such as India will grow swiftly if the world economy does not face a serious crisis. In 2000-2007, the contribution of China alone to the world GDP growth of 4 per cent was one percentage point. Asia including Japan contributed close to 2 percentage points. In comparison the contributions of the US and EU27 were both only close to half a percentage point.

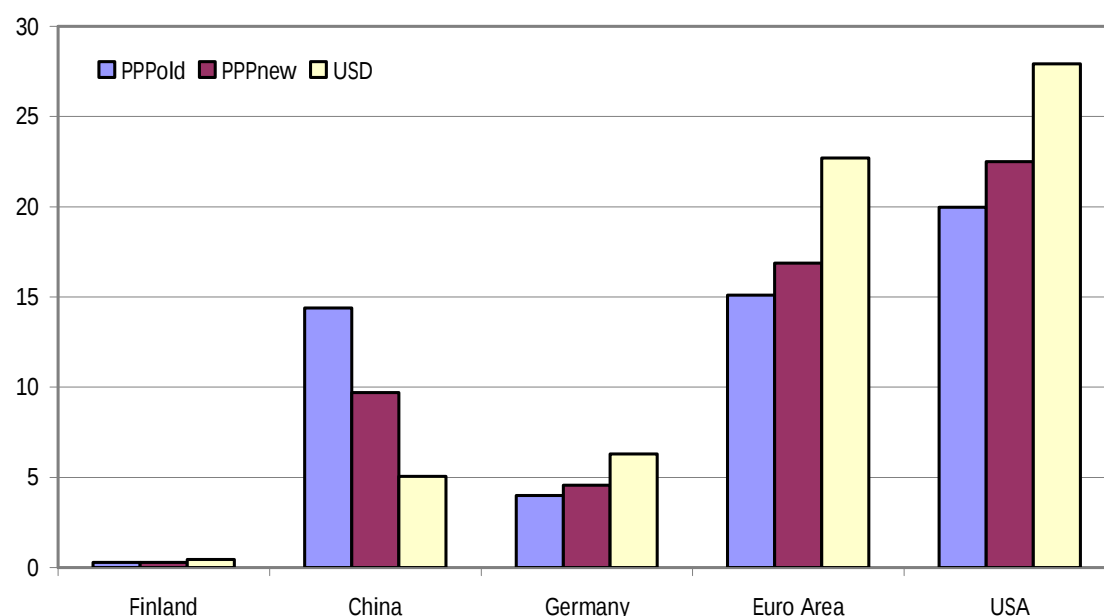
The rapid rise in Chinese production is due to interrelated structural changes in both the Chinese and global economies. The rise in China reflects the changing international division of labour, which pulls domestic and foreign investments to build new capacities especially on the manufacturing sector.

A large shift in the geographical structure of the manufacturing industry has taken place even more rapidly than changes in GDP. The manufacturing sector e.g. in China has been growing

¹ In fact, the World Bank published the new estimates of the purchasing power parities (PPP) of countries in the end of 2007. China took part for the first time in the study, where its share of the world GDP was strongly revised downwards. The revision was about a third from the previous estimate of 14.4 per cent to 9.6 per cent in 2005, which is the year of the survey. PPP's for the other years are calculated using GDP deflators. In comparison, the share calculated with current exchange rates was 5.1 per cent in 2005. The large revision did not change the rank of China as a second largest economy in the world with PPP terms.

very quickly in recent years. For example, in 2000–2006, the Chinese growth of the manufacturing production was nearly 25 per cent per year, while the US average growth was below one per cent, the German growth was 2.3 per cent and the growth in Finland was close to seven per cent. In 2007, the growth of the manufacturing production in China was 18.5 per cent compared to the 2.1 and 5.9 per cent in the USA and in Finland, respectively.

Figure 4 Size of the economy depends on definition: World GDP shares in 2005.



Source: World Bank, ETLA

The Chinese “industrial revolution” is not based only on the division of labour between countries. There is a growing division of labour between the firms in different locations as well as a growing division of labour inside the multinational firms between its parts in different locations. This implies more and more competition even between the tasks in different locations. (Baldwin 2006)

International comparison of the size is not without problems as can be seen in the adjacent graph comparing the sizes of GDP's in different countries with different measures. GDPs measured with PPPs tend to be larger than exchange rates based GDPs in developing countries and vice versa in industrialised countries. The reason for this is that price levels are usually much higher in industrial countries than in developing countries.

Several decades ago, it was a common practise to use exchange rates also in converting the volumes into comparable units. However, exchange rate-based volume estimates are normally biased. If the exchange rate were determined by the strict purchasing power theory, the prices in different countries would be the same. In this case there would be no problem in calculations. However, the difficulty arises from the fact that purchasing power parity (PPP) between any pair of currencies seldom exists. This is also the case within the Euro Area, although the countries have the common currency.

Box . A simplified example of a measuring problem with volumes

The following example clarifies the problem. Assume that two nations produce bicycles with similar technical properties. Let us assume further that the respective prices of bicycles in the countries are 3000 yuans and 300 euros. The corresponding unit price ratio (UVR) would be 3000 yuans divided by 300 euros, i.e. 10. In both countries, the values reflect also volumes as they are the multiples of the price. If the PPP holds, the UVR would equal the exchange rate.

However, if the actual exchange rate is, e.g., 20, the bicycle costing 3000 yuans would cost only 150 in euros. The euro price of the bicycle in the yuan country would be only half of the price of the bicycle produced in the euro country. If volumes were made comparable by dividing the base year value of yuan country by exchange rate, we would under estimate the level of yuan country volume by 50 per cent.

Note that in calculation of production volumes so-called basic prices should be used instead of retail prices. Otherwise differences in subsidies or taxes would skew the estimate. If we were interested in expenditures, the retail prices would be suitable.

In the cases of bicycles or single commodities, the values and volumes are normally easily available in the statistics. The complexities arise on a branch level or on the level of the whole nations, when the notion of the volume is not anymore visible. Volume has become an abstract concept achieved by using index theory.

Comparable values of volumes are usually achieved by using purchasing power parities (PPPs) in case of expenditure volumes and unit value ratios (UVRs) are often used with respect to production volumes. The purchasing power parities and unit value ratios for higher aggregates are normally calculated from the basic data of hundreds of commodities. In fact UVRs measure PPP on the production side, while "PPPs" measure the purchasing power parity on the expenditure side of the production accounts in the national accounts. The measurement of the UVRs is dealt with in the appendix.

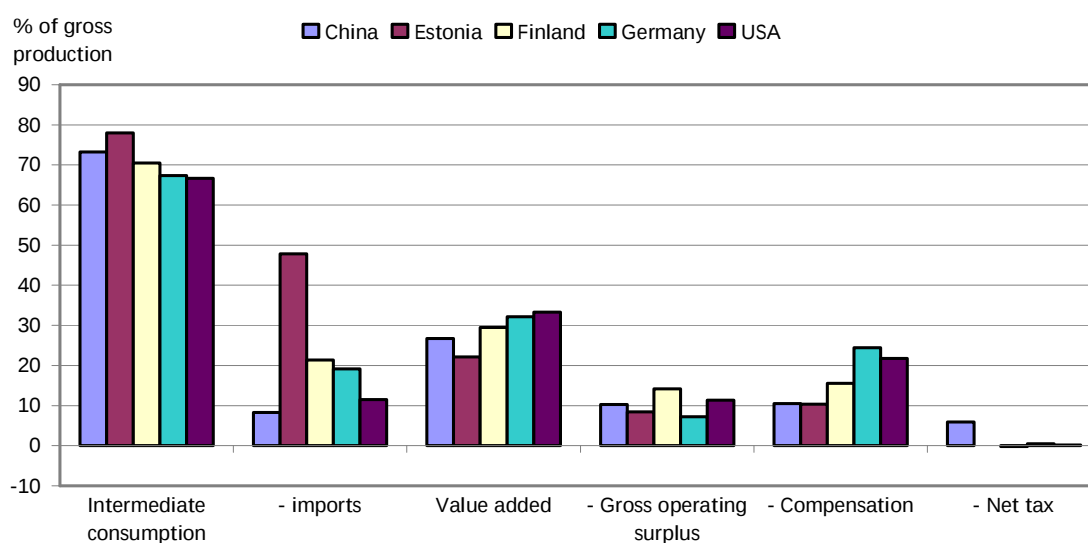
It is important to notice that PPPs or UVRs change the GDPs only into the common prices. The time series produced with PPPs are, in fact, value series in a common currency. Volume and value, however, coincides as already noted in every single year (with a prices of that year), but the comparison in time is a comparison of a value by definition. The comparable time series of volumes can be produced by selecting comparable value on a certain base year and producing the other years with volume indices in the respective countries.

3 MANUFACTURING OUTPUT AND ITS COST COMPONENTS

In this section the manufacturing sector is described in each country by using national accounts data. Gross output is decomposed into intermediate goods production, and into components of value added: gross operating surplus, wages and net taxes. The data are from input output tables in 2000 except for China, where the table is from 2002.

China and Estonia use more intermediate goods in the gross production than the three other countries and consequently their share of value added is smaller. Low wage costs of China and Estonia are seen in smaller shares of labour compensation. In China, the government acquires more revenues from production than the other countries.

Figure 5 Composition of manufacturing gross production in 2000 (China in 2002).

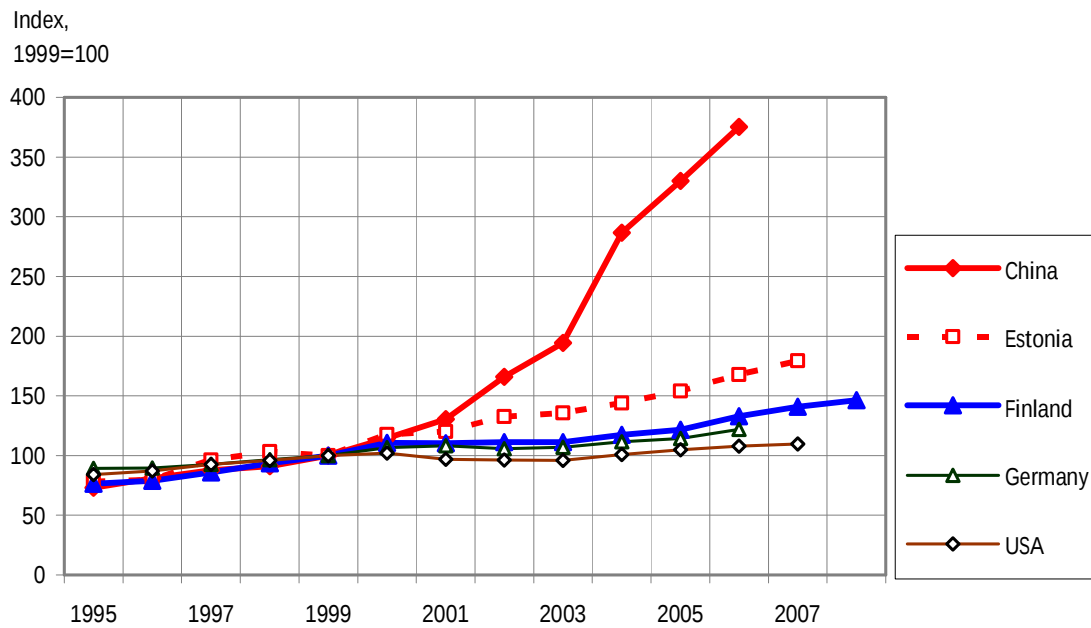


Source: National Input-output tables, ETLA

The volume of Chinese gross production has risen very rapidly as a shift in the global manufacturing production has taken place. The growth of manufacturing in China and also in Estonia is benefitting from catching up. Chinese growth is, however, exceptionally strong. It surpassed Germany already in 1999 in terms of the size of the gross output in fixed prices. Chinese gross output will probably surpass that of the US rather soon in fixed prices and comparable prices. In terms of value added, the gap between the US and China is larger due to large intermediate input contents of the Chinese output.

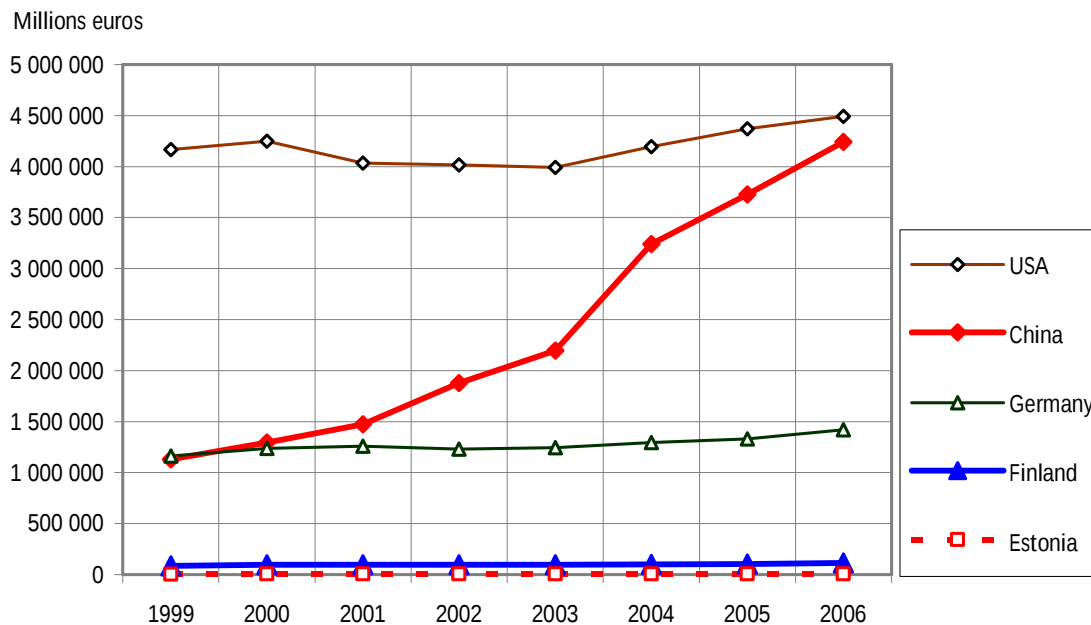
German manufacturers suffered from the very stagnant European growth in the first few years of this decade and the low cost competitiveness. In 2004–2006, the growth gained more momentum fuelled by strong international demand and improved cost competitiveness. The US economy suffered from a recession in 2001 and manufacturing was very stagnant in 2001–2003, but it has gained some momentum afterwards. Finland has greatly benefitted from its strong and rapidly expanding electrical engineering sector. The development in the other industries was less favourable in the first few years of this decade. However in recent years, also other technology industries have gained momentum. The forest industry has, on the other hand, not been able to take part in the very strong global economic growth in 2003–2007.

Figure 6 Volume of gross output in manufacturing in selected counties.



Source: Klems, National Statistics, ETLA

Figure 7 Gross output in manufacturing, millions of 1999 euros using UVRs.



Source: Klems, National Statistics, ETLA

The US economy has dominated global manufacturing in terms of size, but it is the Chinese manufacturing that has dominated the growth in recent years. Manufacturing in the mature industrial economies the US, Germany and Finland is growing rather moderately due to their technologically advanced nature.

3.1 Profitability

The average profitability (gross operating surplus per gross output) of Chinese manufacturing “above designed size industrial enterprises” (a Chinese definition) is lower than the total Chinese profitability indicated by input-output tables. Surprisingly this is also the case with private enterprises.

Generally the Chinese profitability is low compared to the other nations. This reflects partly the low Chinese price level compared to the other industrialised countries in 1999–2000 and partly the large share of intermediate inputs in Chinese gross output. In 2001 and 2002, the appreciation of the renminbi vis-à-vis the euro raised the relative Chinese price level close to par with Germany and Finland. After 2002, the price difference widened again quickly due to e.g. the depreciation of the renminbi vis-à-vis the euro.

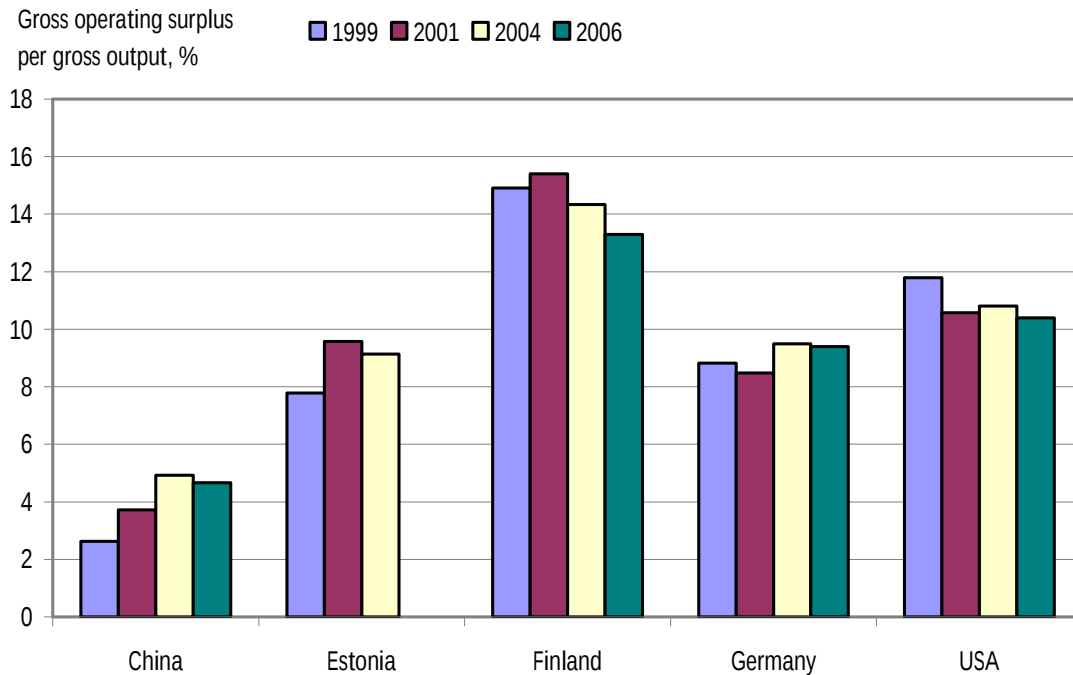
A large share of intermediate good as in the case of Estonia (see chapter 3.3) compared to the industrial countries decreases the relative output by definition if it is measured per gross output. The other measure of profitability (gross operating surplus per value added) would make the comparison more favourable for China and Estonia in this respect. The relatively low profitability of average and even private enterprises thus reflects at least partly the low prices and the high use of intermediates inputs. Multinational enterprises profit from these operations by reducing their costs of foreign inputs due to low prices. One example is so-called contract manufacturing. In addition, low prices may also reflect transfer pricing, although it is difficult to get information about that.

Firms may invest in China also due to expected large profits due to large markets with strong momentum. Chinese profits have, however, risen in contrast to fairly stable or decreasing profits in the other countries. This is a bit surprising as the Chinese manufacturing is very commodity-intensive and commodity prices have risen very rapidly. Kim and Kuijs (2007) explain the rise by technical improvements in the usage of intermediate inputs and labour productivity.

In Finland, the large share of profits is partly explained by the success of the electronics industry. The profitability of manufacturing excluding the electronics industry was 12.5 per cent in 2004 compared to 14.3 per cent in total manufacturing according to the KLEMS project.

The relatively low profitability of Chinese manufacturing, if measured with gross operating surplus divided by gross output, implies that all the cost components are important and worth monitoring. The role of intermediate goods including raw materials and wages are of great importance due their large share in gross production.

Figure 8 Profitability of manufacturing industries in selected countries, %.



Source: Klems, National Statistics, ETLA

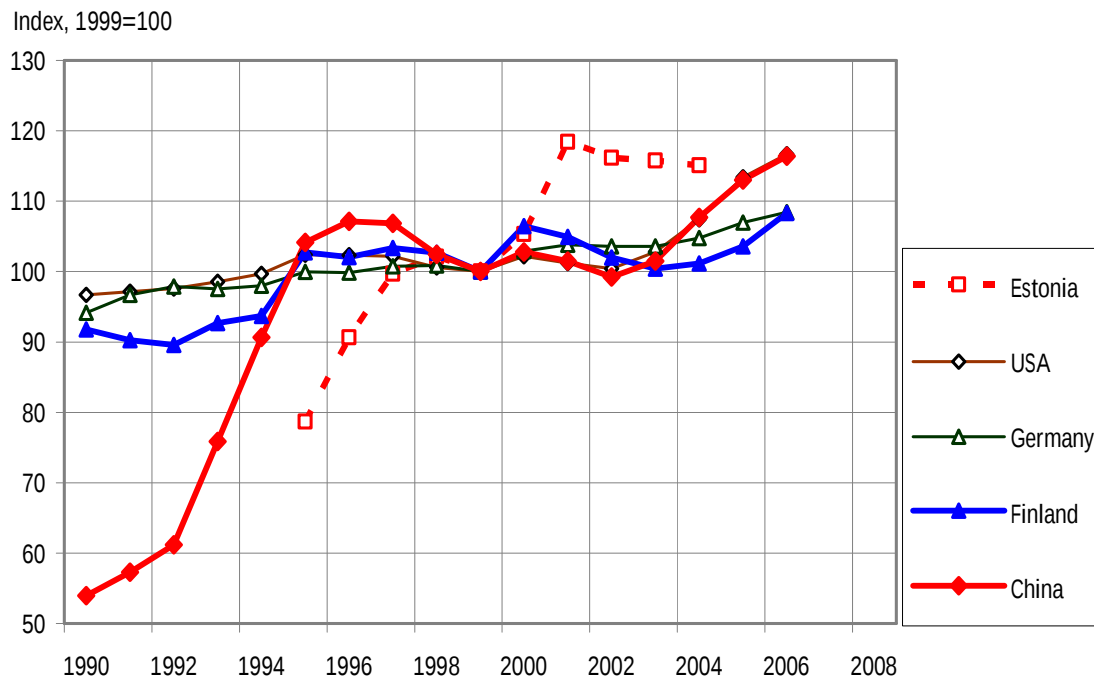
3.2 Prices of gross output

Prices of gross output in domestic currencies have risen at different rates in the group of countries. In Estonia the very rapid price development in the beginning of the 2000s stagnated after 2002. In the US as well as in Germany prices have risen rapidly since 2003. In Finland, prices have fluctuated on a low level, but risen in recent years. The development has been strongly affected by the decline in the prices of the electronics industry.

China is a special case. Prices have from time to time declined pronouncedly as markets have become oversupplied. In 2005 and 2006 prices started to rise, probably gaining more momentum in 2007. In early 2008, inflation was running at an over 8 per cent rate, which will probably lead to wage pressure in manufacturing firms. High inflation is spurred by developments in energy prices and food prices as in most other countries. However, in China food prices, which are very important for the people due to the still very low level of income, have risen at an alarming rate. In February the food prices were 23.3 per cent higher than in February 2007.

Basically raising prices increases the profitability of the firms, if all other factors stay unchanged or do not deteriorate. This is obviously the case in a favourable market situation. However, if the firms, for example, cannot cover the raising costs and possible dwindling of market shares, this spawns a deterioration of profits.

Figure 9 Prices of gross output in selected countries.



Source: Klems, National Statistics, ETLA

Depending on the market situation and the invoicing currency, exchange rates may have a substantial effect on comparative price levels (as well as comparative costs) between the nations. The appreciation of the renminbi vis-à-vis the euro in recent years has decreased the Chinese price level in comparison to Euro Area countries. At the same time the price level has risen compared to the US.

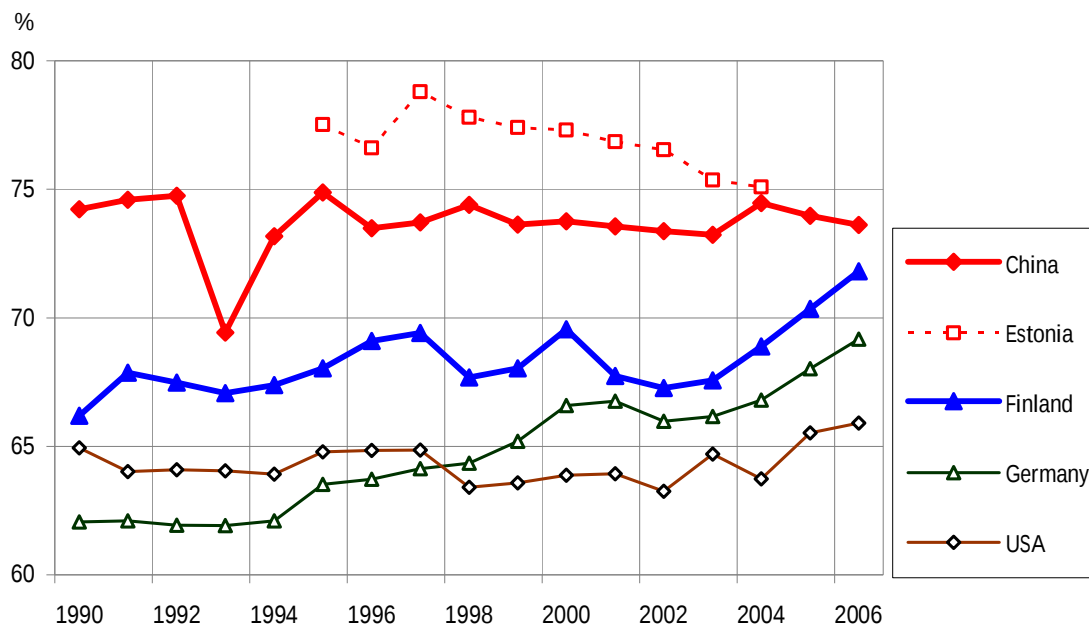
3.3 Intermediate costs

Intermediate goods are used intensively in Chinese and Estonian production. However, the use has intensified also in Finland and Germany in recent years. This obviously reflects the globalisation and the changing economic structures. The US share is surprisingly well below the other countries, although the share has also risen in recent years. Perhaps, outsourcing of the production of final products is more common in the US than in these other countries.

The use of intermediate goods is fluctuating in relation to gross output. However, use of intermediate goods is trending downwards in Estonia, being stable in China, and it has been trending upwards in the US, Finland and Germany in recent years.

It would be very interesting to decompose the intermediate goods into energy, other raw materials and other intermediate goods to see, e.g. the effect of three digit rises of many raw material prices since 2003. This is nevertheless beyond the scope of this study.

Figure 10 Intermediate production per gross production in selected countries, %.



Source: Klems, National Statistics, ETLA

3.4 Labour costs per person and per unit of production

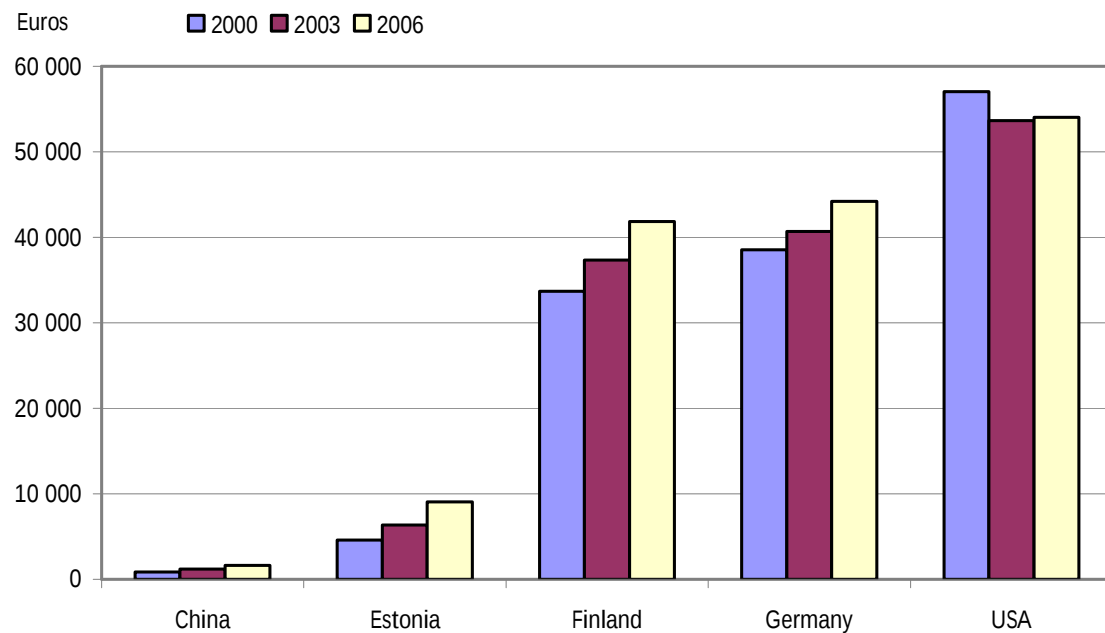
Labour cost is an important cost component in gross output and value added of the manufacturing sector. The share of labour compensation (wages and other labour costs) within value added varies between 39 per cent in China to 76 per cent in Germany according to input-output tables in 2000 (2002 in case of China). Thus labour costs play an important, although variable, role in the profitability.

Differences in labour compensation are huge between the developing countries and industrial countries in particular. The Chinese labour costs were around 2 per cent of those in Germany in 1999 calculated in euros. In 2006 the cost ratio had risen to below 4 per cent. In Estonia the ratios were 11 and nearly 20 per cent, respectively. In Finland the ratios were 87 and 95 per cent in 1999 and 2006. The US labour is the most expensive, being over 20 per cent above that in Germany in 2006.

The magnitude of labour compensation is important for the profitability of the firm, though the importance varies by the nature of the firm. It is naturally important for the well-being of the workers as well. Huge compensation differences per person² between China and industrialised countries have raised strong fears of superior production circumstances compared to other nations and a related transfer of production to China. This issue is dealt with in section 4.

² Compensation per hour would be a better measure, but data is difficult to obtain and it is highly unreliable especially in the case of China. See Bannister (2005)

Figure 11 Annual labour compensation per person.



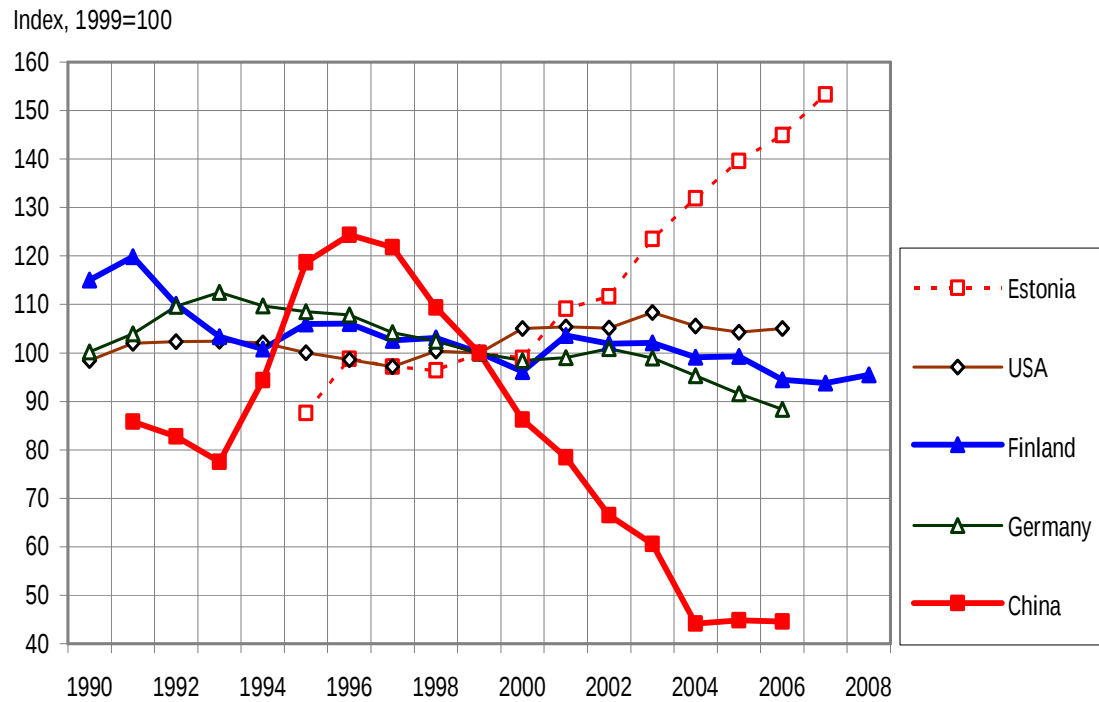
Source: Klems, National Statistics, ETLA

Labour is an important and necessary factor of production in producing goods. The magnitude of the compensation as such is not important for the profitability. The key for the profitability and for sustainable continuation of a firm is how the size of the wage in relation to productivity or the size of the labour compensation relative to the size of production develops. This is measured with unit labour costs, i.e. labour compensation per real production or wages per productivity.

Finally, it is the output achieved with this and other costs which matters, i.e. productivity. In the adjacent charts, costs and unit labour costs (labour compensation costs per volume of gross production) are shown in the case of the manufacturing sector. Rapidly rising Chinese labour costs in 2000–2006 have up to 2004 been well compensated by the huge rise of productivity due to the strong rise in manufacturing production. In 2004–2006, wages rose more or less in line with production, which stabilised the development of unit labour costs. In 2007 and 2008, Chinese unit labour costs will probably start rising due to high inflation. Estonian unit labour costs have risen strongly as the rise in productivity has not compensated for labour cost increases in its catching up process. This is a normal development as the economy matures. The danger is, however, how well costs can be kept in check after catching up potential has been utilised.

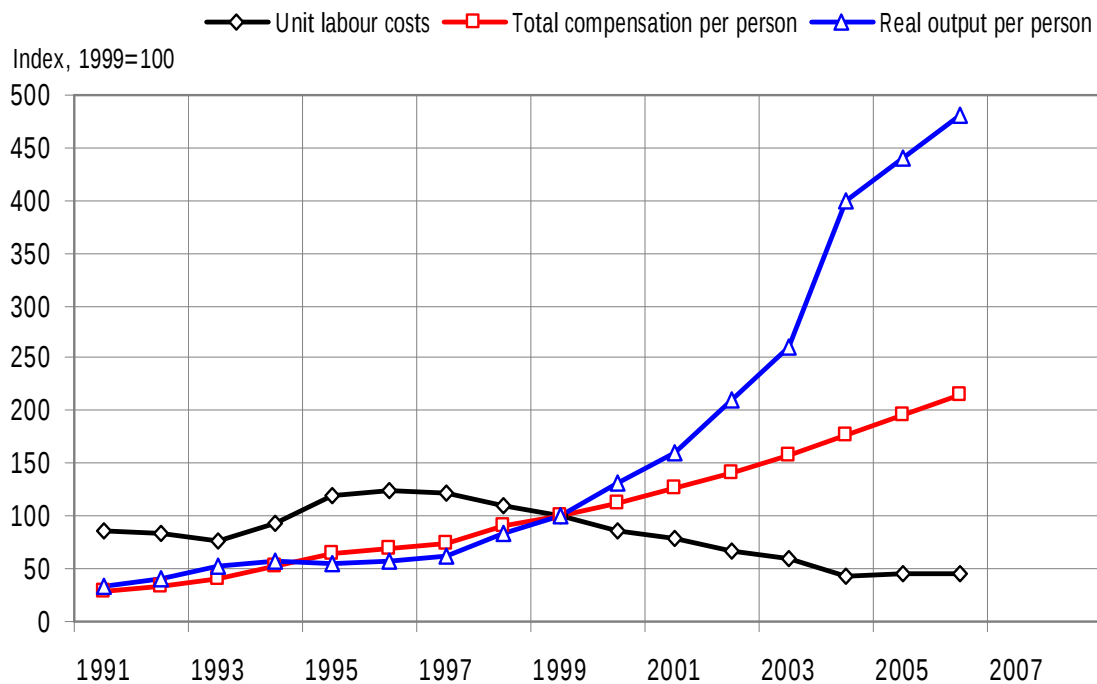
In the US unit labour costs have risen moderately. In Germany and in Finland the unit labour costs have even declined. The reason for Germany is wage moderation due to the stagnation in the early 2000s and related labour market reforms to improve German competitiveness. In Finland, the electronic industry dominates this measure as well as most other measures by its strong productivity rise.

Figure 12 Unit labour costs in domestic currencies.



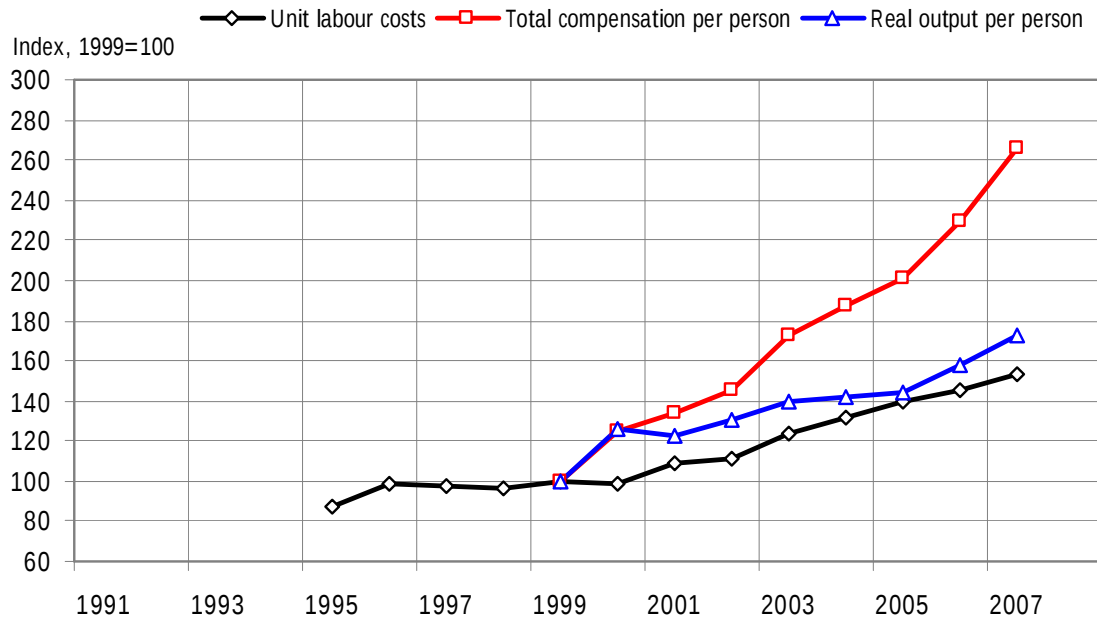
Source: Klems, National Statistics, ETLA

Figure 13 Chinese wages, productivity and unit labour costs.



Source: Klems, National Statistics, ETLA

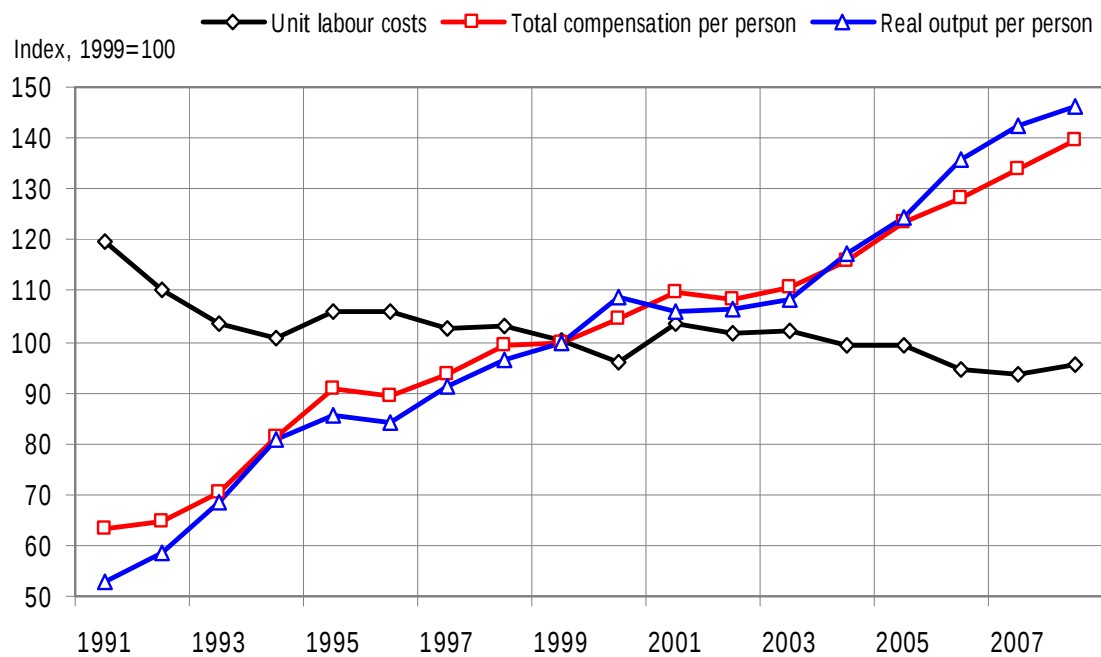
Figure 14 Estonian wages, productivity and unit labour costs.



Source: Klems, National Statistics, ETLA

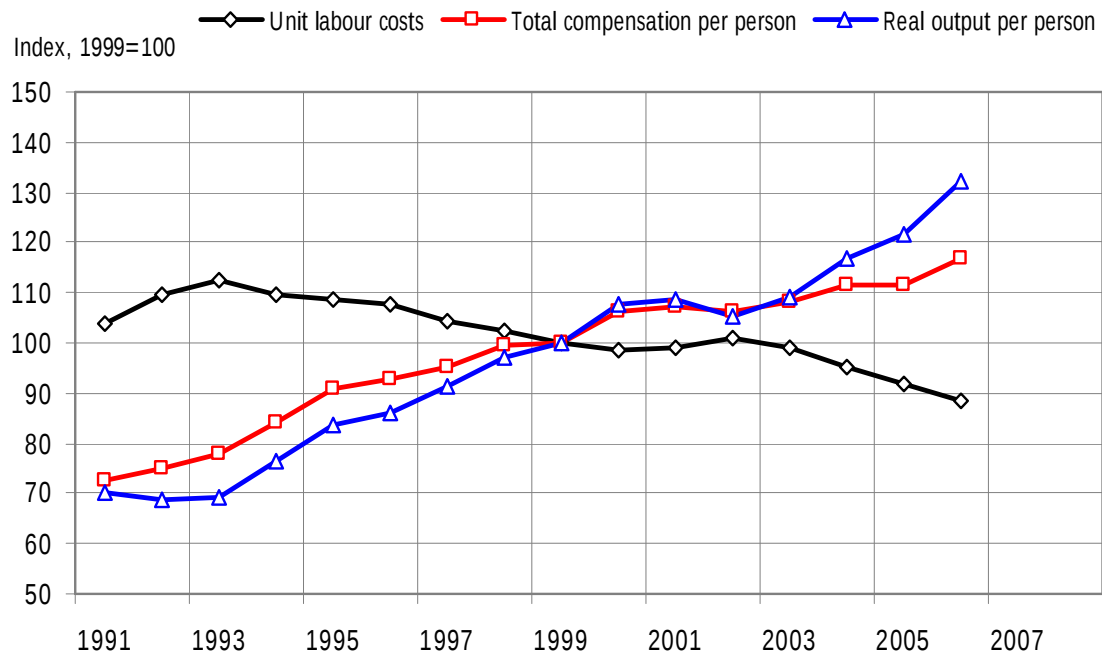
These charts reveal the domestic developments in the selected countries and give signals on unsustainable trends like in the case of Estonia. However, comparing levels or changes in unit labour costs between nations calls for a new measure: relative unit labour comparisons in a common currency. This is done in the next section.

Figure 15 Finnish wages, productivity and unit labour costs.



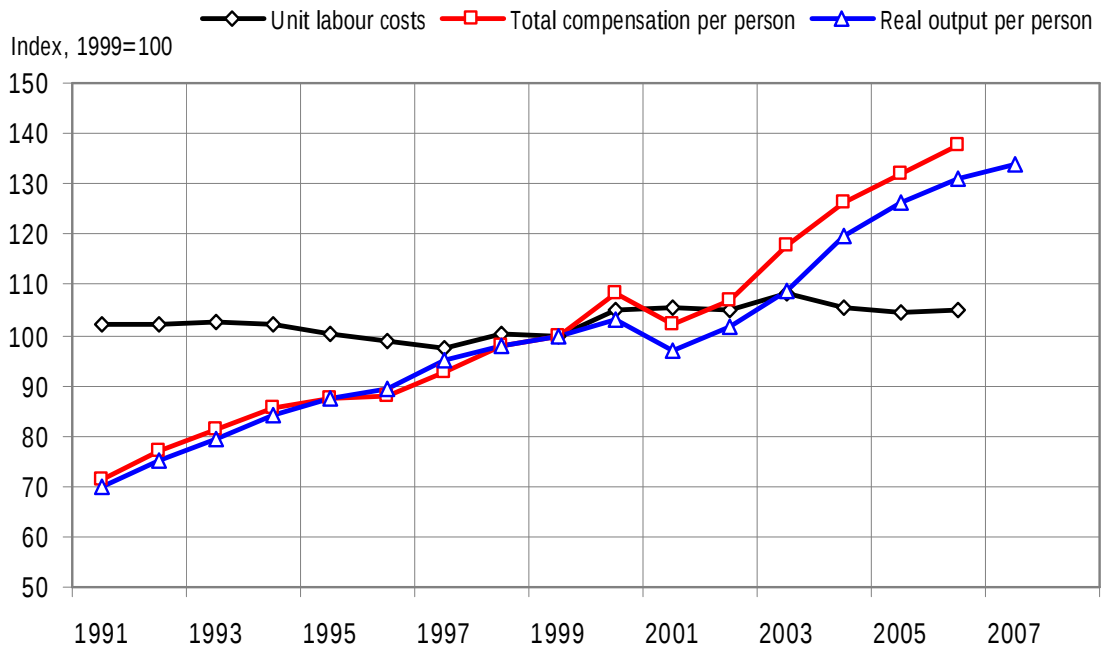
Source: Klems, National Statistics, ETLA

Figure 16 German wages, productivity and unit labour costs.



Source: Klems, National Statistics, ETLA

Figure 17 The US wages, productivity and unit labour costs.



Source: Klems, National Statistics, ETLA

4 RELATIVE UNIT LABOUR COSTS IN A COMMON CURRENCY

Competitiveness is a rather vague concept and, for example, Paul Krugman has strongly criticised its use in analysing national developments. Competitiveness is clearly connected to the development of a single firm. A certain amount of profits is necessary for survival. Large profits attract more competition, which reduces excessive profits later.

In this study, we selected relative profits as the final measure of competitiveness as it provides us with a framework for putting the labour cost measures into a wider perspective. Labour costs, although very important, are not the only factors determining the success of a firm. The use of intermediate goods and all other costs are also important factors.

We focus on two component of the relative profitability, namely relative labour costs and exchange rates, as they are one of the basic determinants of the profitability of the industries and of the welfare of the employees. Our approach is to describe the development, while the explanations of the reasons for the development call for deeper analysis on the labour markets and the behaviour of the firms (See e.g. Rantala 2007).

Relative unit labour cost is a widely used competitiveness indicator utilised by e.g. international organisations and central banks. Basically, it is a comparison of labour compensations and productivities in different countries. Wages are easy to compare, but the calculation of the relative productivity of the labour requires coefficients, which make national production volumes comparable. Exchange rates can be utilised in cases of values, but they do not suit when comparing volumes. Comparable volumes are achieved by using unit value ratios, UVRs in converting volume production into comparable units.³

Below you will find bilateral comparisons in the group of countries having one important developing country (China), one country in transition (Estonia) and three different industrialised countries (Finland, Germany and the US).

4.1 Exchange rates

Exchange rates often have a significant effect on competitiveness. If they are “too strong”, firms suffer from poor price competitiveness. On the other hand, if they are “too low”, a country can be accused of “beggar thy neighbour” policies. Anti-dumping accusations may easily follow. Low exchange rates may easily also lead to high inflation, which is often seen as detrimental to economic growth (See Mishkin 2007). Depending on exchange rate regimes, central banks can or cannot (or do not want) to change the rates to a more justified level. In the following we deal briefly with exchange rate systems in the selected countries and the developments of the rates.

³ Often this problem is solved by using only indices of unit values. In this case, information of the changes of competitiveness is provided.

US exchange rate system has multiple targets

It is generally accepted that the environment of low inflation is favourable for growth as it provides a stable framework for investment calculations and also reveals the changing relative prices, which should help the economy to utilise its resources well. (See e.g. Mishkin 2007) The current exchange rate regimes in the group of selected countries differ from the free float in the US to the basket-based system in China and the free float of the euro as a common currency for 15 countries in the Euro Area.

The key target for the Federal Reserve, the central bank of the USA, is “in the economy in pursuit of maximum employment, stable prices, and moderate long-term interest rates”. Thus there is no target for the exchange rates, and they affect the monetary policy only if they are considered as a threat to these main goals. As a result, the US nominal as well as real exchange rates have fluctuated strongly in recent decades.

Euro system leans on inflation target

In the Euro Area the euro was adopted as a single currency in 1998, initially for 12 countries and currently for 15 countries. The Euro Area monetary policy is guided by the inflation target according to which inflation should stay “below but near 2 per cent” in the medium term. Thus exchange rate has no target and it affects the monetary policy decisions only if it affects the inflation in the medium term.

The European Central bank, on the other hand, sticks to its inflation target. The expectations of the interest rate declines were significantly lower in April 2008, which is related to the substantial strengthening of euro vis-à-vis the USD. The euro has strengthened also vis-à-vis the renminbi. While the recent strengthening of the euro even in effective terms is alarming and certainly dampens the inflation pressure in the medium term, the central bank is worried about inflation running well above its target. As a result it is careful about lowering interest rates, which may induce large swings in the exchange rate especially vis-à-vis the USD.

The euro has fluctuated strongly during its short life especially vis-à-vis the US dollar. In January 1999 one euro cost 1.16 dollars, in June 2001 only 85 US cents and by March 2008, the price has climbed above 1.5 dollars.

Estonia pegs its currency to euro

In Estonia, the primary goal of the central bank, Eesti Bank, is “to ensure price stability by means of a stable exchange rate”. The central bank has used a currency board system since June 1992 to peg the kroon to the Deutsche mark at 8 kroons per one DM and since 1999 to the euro at 15.65 kroons per one euro. In the currency board system central bank liabilities are fully guaranteed by gold or foreign exchange rate reserves.

The stable euro exchange rate is one of the Maastricht criteria that must be fulfilled before becoming a member of the Euro Area. Estonia joined the so-called Exchange Rate Mechanism (ERM II), already on 28 June 2004 planning to become a member of the Euro Area starting in the beginning of 2007. The plans failed as one of the targets, inflation, was too rapid. Now, the country aims to join as soon as it is possible.

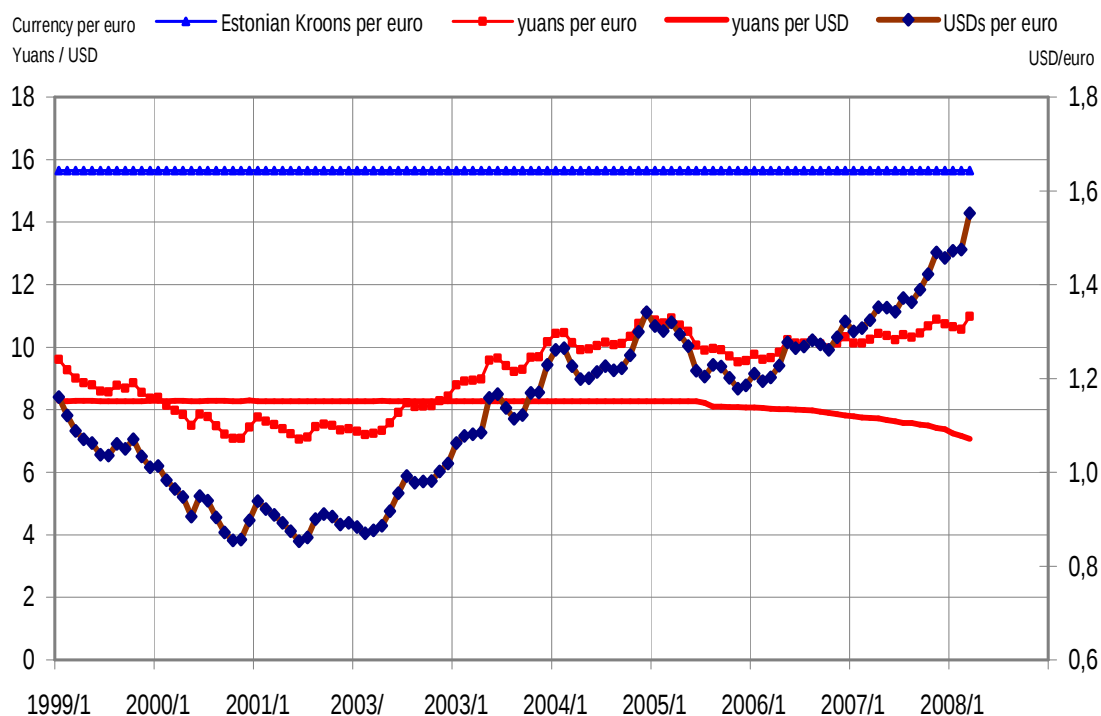
Chinese system has adopted managed float of renminbi

In China, the renminbi (people's currency) exchange rate regime has undergone large changes since 1979. The system has changed from a single official rate to a single market rate. Since the Asian crisis in 1997 the renminbi was pegged to the US dollar at the rate of 8.28 yuan to one dollar until the mid 2005. The peg was abandoned on July 21, 2005, when China reformed "the exchange rate regime by moving into a managed floating exchange rate regime based on market supply and demand with reference to a basket of currencies." (PoC 2005) The objective of the monetary policy is to maintain the stability of the value of the currency and thereby promote economic growth.

The renminbi has strengthened gradually since the start of a new currency regime in mid-2005. In March 2008 one USD cost around 7.1 yuan, i.e., the USD was nearly 15 per cent cheaper than during the currency peg. During the same period, the euro had strengthened by nearly a quarter in US dollars. As a result, the euro become about 8.5 per cent more expensive in terms of yuan in the same period.

The renminbi is obviously substantially undervalued (see Cline R. Williamsson J. 2007 for a good review). A general view seems to be an undervaluation of around 20 per cent. With respect to the USD, the undervaluation is seen to be much larger. The Chinese agree, though no estimates have been given. It is, however, seen in gradual strengthening of the renminbi vis-à-vis a basket of currencies and the USD in particular. The latter reflects the weakening US economy and related expectations of lower interest rates to support employment.

Figure 18 Selected bilateral exchange rates.



Source: ECB, Federal Reserve, ETLA

Effective exchange rates provide information on average situation

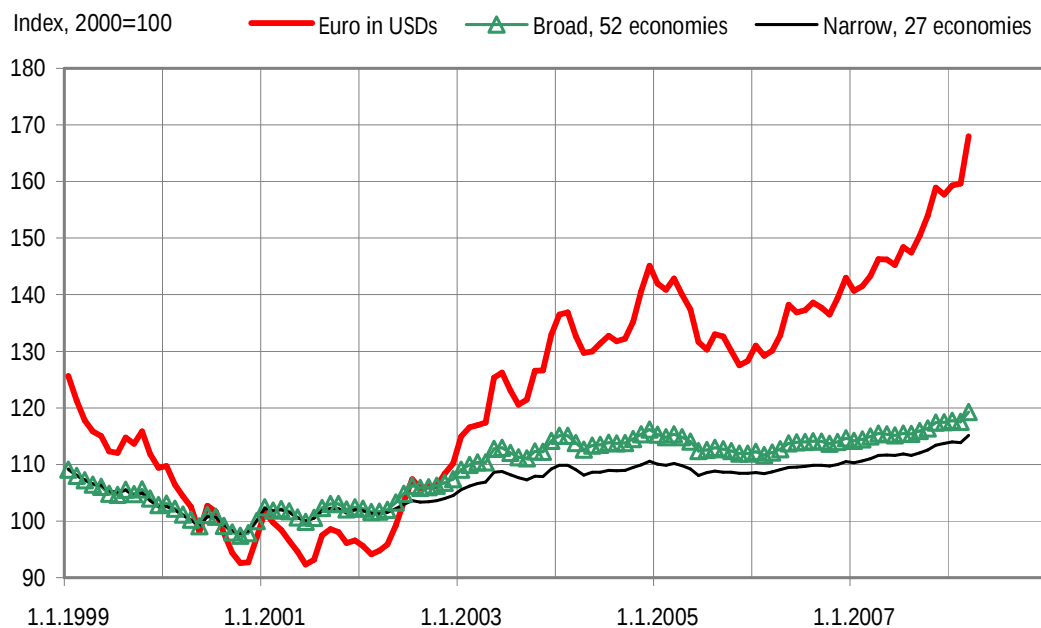
Bilateral exchange rates fluctuate with respect to each other depending on many relative factors like expected economic developments or/and expected monetary policy changes, unexpected events and so forth, which affect the relative attractiveness of a currency.

The price or cost competitiveness of a single country is quickly and sometimes strongly affected, by changes in bilateral rates in addition to relative price or cost changes. In principle, all the rates may change in different phases and some changes may strengthen and some weaken the competitiveness of a certain country at the same time as can be seen from the adjacent chart.

Effective exchange rates help in this problem by producing a weighted average of bilateral exchange rates. Selecting the weight is not straightforward. Often simple export weights are used, but these weights can be improved by taking into account the competition in the third markets. In the case of Finland, this would mean, e.g. checking the competitive situation in the Euro Area by using the shares of Euro Area (excluding Finland) imports to domestic demand. This may be done in multi-commodity markets. This sophistication will increase the weights of those countries which compete much with Finnish products in the third markets compared to single export weights.

In the case of 15 current Euro Area countries, the effects of the bilateral exchange rate on average rates are smoothed pronouncedly by the fact that 14 export countries belong to the Euro Area with the common currency. In addition, the export weights for these countries are also large. That is why the substantial depreciation of the USD vis-à-vis the euro is eroding the competitiveness of the Euro Area by just a fraction of the change in the USD. In a similar way, the Chinese renminbi has appreciated both in terms of the euro and also in effective terms since the beginning of 2005, although it has appreciated vis-à-vis the USD.

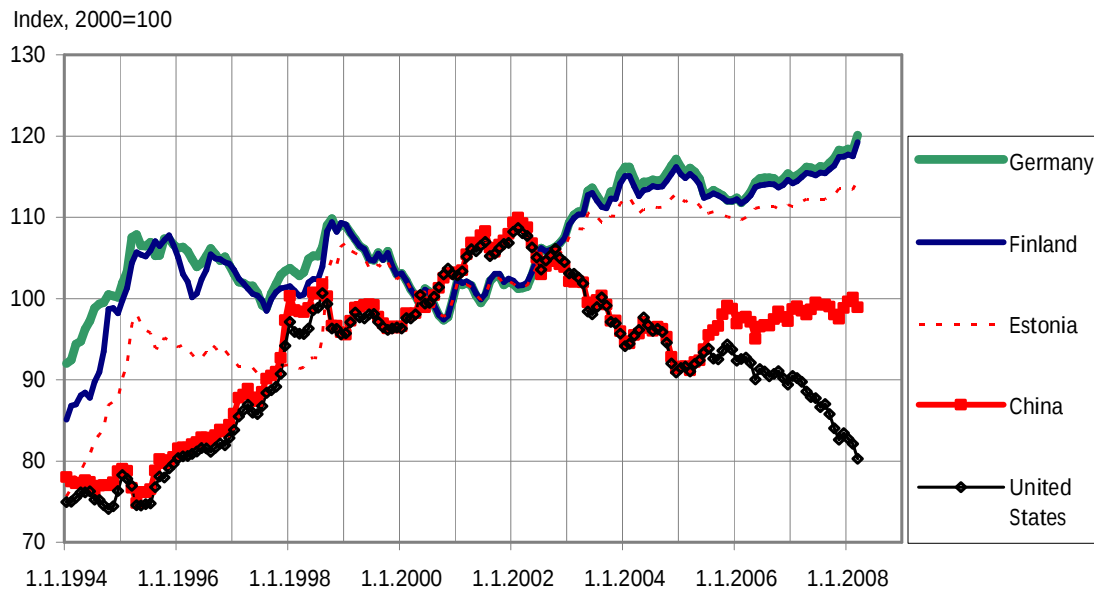
Figure 19 Nominal effective exchange rate indices, Finland.



Source: ECB, Federal Reserve, ETLA

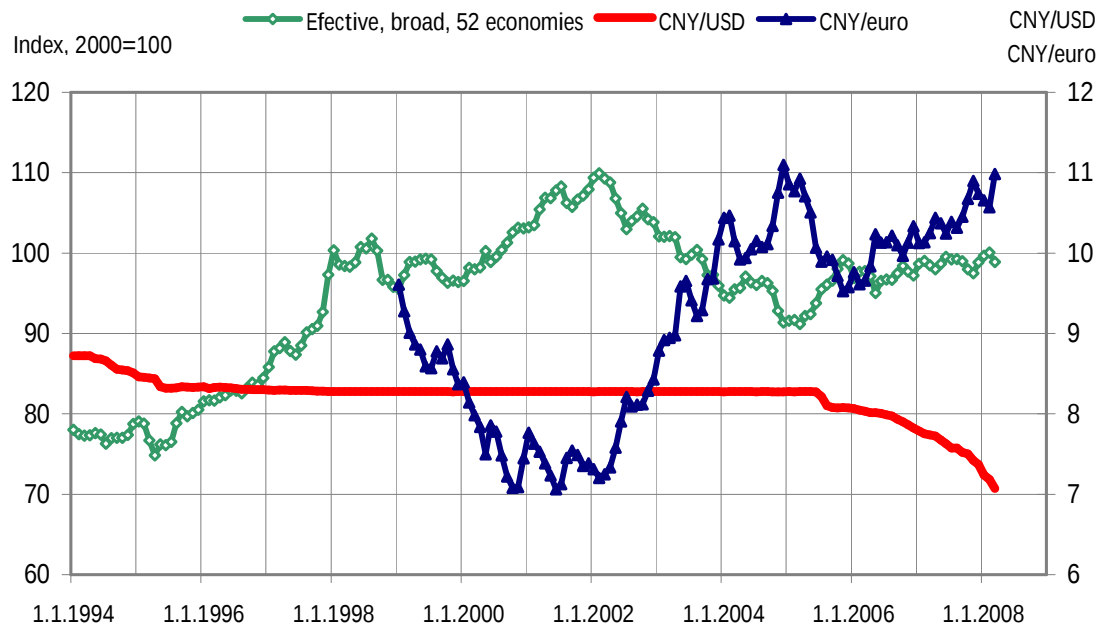
The US exports and import-competing industries greatly benefit from the weakening of the dollar not only vis-à-vis the euro, but also on average since the end of 2001. This is obviously one of the key changes which would help in balancing the deep global current account imbalances by supporting the US internal demand at the same time. This trend will probably turn when the US upturn is confirmed.

Figure 20 Nominal effective exchange rates (broad BIS index, 52 countries) of selected countries.



Source: BIS, ETLA

Figure 21 Nominal effective exchange rate index and US dollar and Euro exchange rates, China.



Source: BIS, ECB, FED, ETLA

4.2 Relative unit labour costs

The measurement of competitiveness utilises a comparison of the prices or costs between the nations. It is interesting and useful to make bilateral comparisons between the manufacturing sectors in two nations, but the average picture is obtained by calculating average measures taking into account both the competitors as well as competition in various goods markets.

In this study, we aim to make bilateral competitiveness calculations in order to gain insight into the forces shaping the future development of global structural change in manufacturing. Our focus is on Chinese and Finnish competitiveness. We acknowledge the large differences between these nations and their different setting in the global economy. That is why we have selected some other counties for comparative purposes. Estonia is a small open economy, which is still catching up to industrial countries in development. Germany and the US are, on the other hand, mature large industrial economies. Comparing the relative unit labour costs in a common currency, RULC and its decompositions in these countries, we get information on the competitive pressures in different circumstances.

RULC is one factor behind the profitability and sustainability of firms and industrial sectors as we saw in section 2. Our formulation of RULC differs from most other formulations as it deals with comparative levels of production as we have made the production volumes comparable using unit value ratios UVRs. The graphs show the absolute differences in e.g. unit labour costs. The comparisons are made vis-à-vis Germany as the UVRs were available vis-à-vis Germany. One of the deficiencies of the UVRs is that they are not transitive, i.e. if we would make comparisons against Finland or China, the potential size of error would be large. (See e.g. Rao-Timmer 2000)

We measure relative unit labour costs (RULC) as follows

$$(1) \text{ RULC} = E \times \text{ULC}^* / \text{ULC}$$

RULC = Relative labour costs in a home country

ULC = Relative labour costs in a foreign country

E = Exchange rate in terms of domestic currency per foreign currency

x is a multiplication operator

RULC can be decomposed into the exchange rate, relative labour costs and outputs as follows:

$$(2) \text{ RULC} = E \times (\text{LC}^* / \text{Q}^*) / (\text{LC} / \text{Q}) = E^* \times (\text{LC}^* / \text{LC}) / (\text{Q}^* / \text{Q})$$

LC = Total labour costs

Q = Volume of gross output

Q* = Volume of gross output converted into euros by multiplying by the unit value ratio, UVR

Another interesting and popular decomposition is obtained by adding labour productivity into the measure as follows:

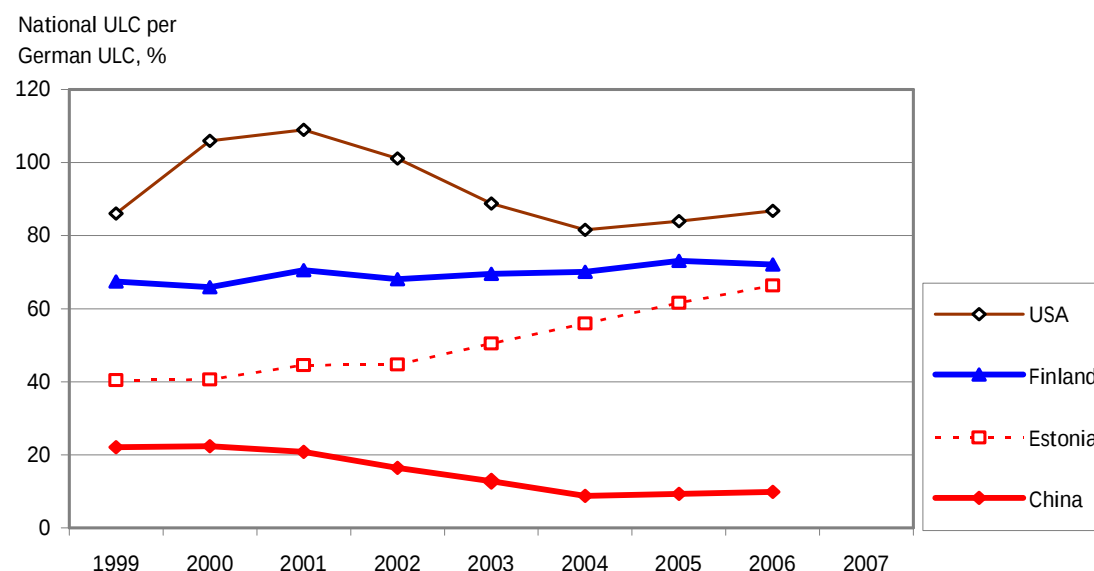
$$(3) \text{ RULC} = E \times (\text{LC}^* / \text{LC}) / (\text{Q}^* / \text{Q}) = E \times (\text{W}^* / \text{W}) / (\text{P}^* / \text{P})$$

$W = LC / L$, compensation per person. L = number of persons engaged,
 $P = Q / L$, productivity, * denotes the foreign variables

Relative unit labour costs in the common currency decomposed into the exchange rate, labour compensation per person and output per person show that the Chinese RULC is only a small fraction of the RULC in the other selected countries. Chinese RULC was around 20 per cent of Germany's. It decreased to less than 10 per cent of that in Germany in 2006. This relation had even declined in 2001–2004 and stabilised after that as the German ULC has declined.

The Estonian RULC had risen strongly in 2002–2006 reflecting a rather strong rise in wage costs and relatively slow rise in productivity. The Estonia kroon has been pegged to the euro so the development of the Estonian RULC has been determined by the relative rises in labour compensation and productivity. In Germany, the labour costs have risen in recent years, but labour productivity has kept German ULCs in a decline.

Figure 22 Relative unit labour costs in common currency vs. Germany, %.
 Costs in euros, volumes converted comparable with UVRs.

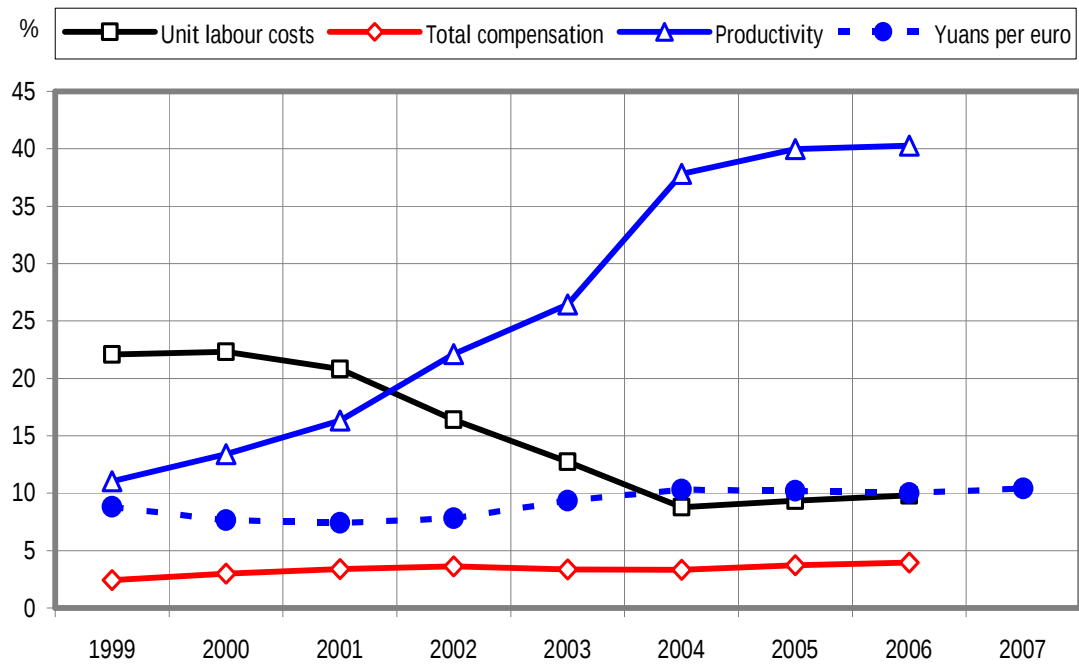


Source: Klems, National Statistics, ETLA

In the US, the unit labour costs were well above those in Germany in 2000–2001, when the dollar was very strong. However, after that especially the depreciation of the US dollar lowered the US RULC relative to Germany in 2002–2004. In 2005–2006 the RULC has been relative stable.

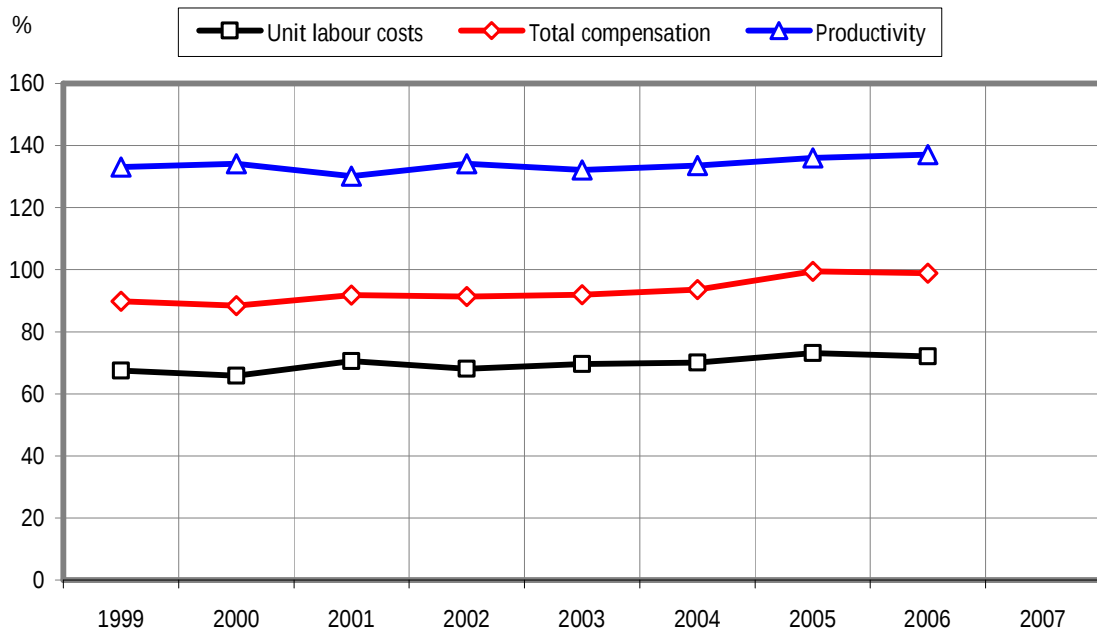
The room for continuation of globalisation still appears to be great from the perspective of labour costs. Chinese total labour costs per person were still below 4 per cent of those in Germany in 2006. If the differences in productivity are taken into account, the Chinese unit labour costs (labour compensation by real production) are substantially higher due to the lower level of Chinese productivity, but still they were less than 10 per cent of those in Germany. In 2007–8 the differences will shrink due to steep labour cost increases in China, the appreciation of the renminbi and due to slowing (albeit very rapid) growth of output.

Figure 23 Relative unit labour costs, productivity and labour costs: China / Germany.
Costs in euros, volumes converted comparable with UVRs.



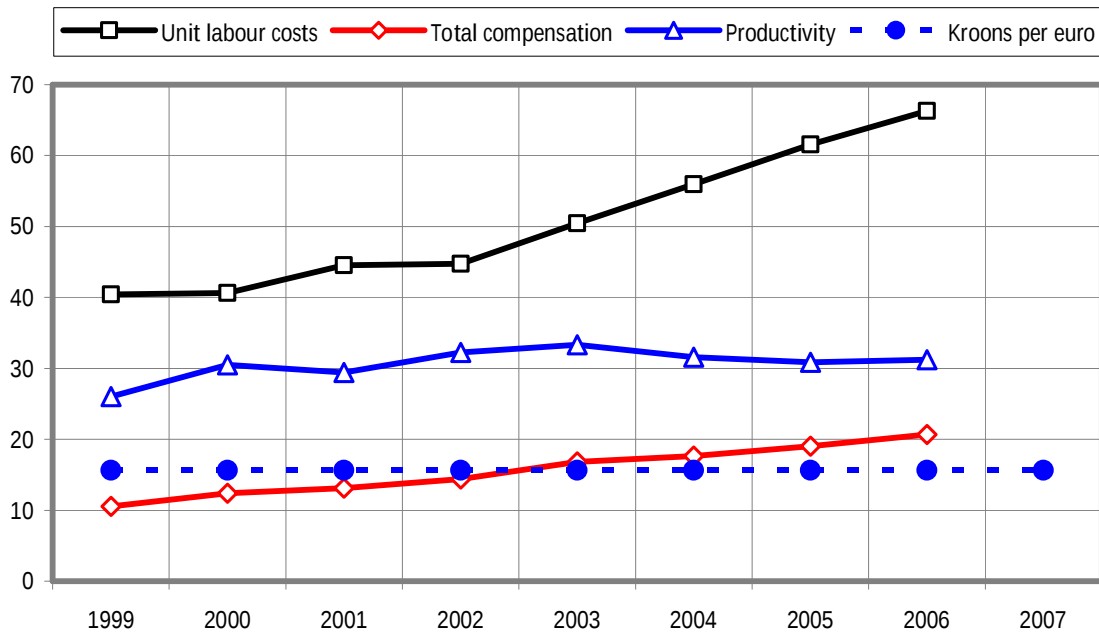
Source: Klems, National Statistics, ETLA

Figure 24 Relative unit labour costs, productivity and labour costs: Finland / Germany.
Costs in euros, volumes converted comparable with UVRs.



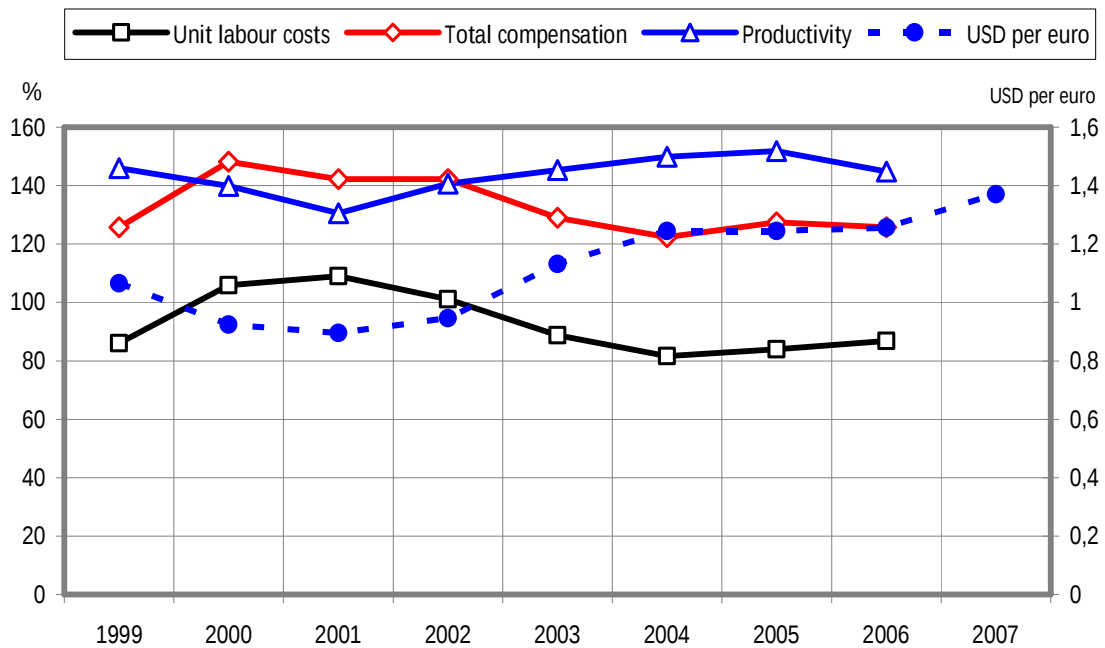
Source: Klems, National Statistics, ETLA

Figure 25 Relative unit labour costs, productivity and labour costs: Estonia / Germany.
Costs in euros, volumes converted comparable with UVRs.



Source: Klems, National Statistics, ETLA

Figure 26 Relative unit labour costs, productivity and labour costs: USA / Germany.
Costs in euros, volumes converted comparable with UVRs.



Source: Klems, National Statistics, ETLA

5 COMPETITIVENESS CHALLENGE OF CHINESE PAPER AND PULP INDUSTRY

The adopted framework is not without its shortcomings. One key problem is the data itself. The Chinese data is rather unreliable as the gigantic country is in a rapid development phase. One particular problem in this respect is the data on working hours, which would be a better measure for productivity than the number of employees.

There are also problems related to the heterogeneity of China and other countries with respect to production and geographical areas. China is a huge country with very different provinces and even the same statistical sectors may strongly differ from each other in different provinces. In the following, we have an initial look at this problem in case of the paper industry.

The Chinese pulp & paper industry has a structure which significantly affects its position in the global pulp & paper market. The Chinese non-wood pulp industry has consisted of a large number of relatively small mills, resulting from the past industrial development policy and equipment supply capabilities of the Chinese machinery building industry. A process to concentrate the capacity into larger mill capacity classes started a few years ago when the government duly ordered the pulp industry to reduce its environmental pollution load. The capacity concentration process is expected to continue, resulting in a significant consolidation of the industry in the next 10 years. The current structure of the industry is summarized as follows:

- A large number of relatively small & old mills exist.
- Non-wood fibers form an important component of the fiber furnish of the Chinese pulp paper industry.
- Some new modern mills have been constructed.
- Government policy favours new projects based on modern technology and integrated with industrial forest plantations.

Increasing demand for paper and paperboard, fuelled by the economic growth, has forced the paper industry to expand its fiber supply basis. Due to the so far limited availability of pulpwood in China, the paper industry has increased the imports of wood pulp and recycled paper. The fiber furnish structure of the Chinese paper industry is as follows (year 2004, million tons):

- Non-wood pulp 12.210
- Chinese wood pulp 2.482
- Imported wood pulp 7.204
- Recycled fiber: 28.127

The Chinese non-wood fibers include straw (mostly wheat, and limited amounts of rice straw), reed, bagasse and bamboo. While straw has the largest volume, the other non-wood fibers are extensively utilized in the provinces where straw is not readily available. The relative volumes of non-wood fiber pulps are as follows (million tons/a, year 2004):

- Straw pulp 8.867
- Bagasse pulp 0.800
- Bamboo pulp 0.800
- Reed pulp 1.180

Spatial distribution of existing pulp & paper industry in China.

Given the great size of the territory, all industries are dispersed throughout China as long as the availability of raw materials has enabled the establishment of mills. For similar reasons, pulp production is integrated at the same mill site and under the same company as paper production. The provinces with the largest paper & paperboard productions are Shandong, Zhejiang, Guangdong, Jiangsu, Henan and Hebei.

The table below illustrates the spatial and fiber furnishes structure of the Chinese pulp paper industry. The largest production of non-wood pulp takes place in the provinces of Henan, Shandong, Hebei, Jiangsu, Guangxi, Sichuan and Liaoning. A number of existing pulp paper companies produce limited amounts of wood pulp. The companies also use imported wood pulp and recycled paper. Paper production is based on the mixing of non-wood pulp, Chinese and imported wood pulp and imported recycled fiber so as to produce paper and paperboard at a competitive quality and cost.

During the previous era, the non-wood pulp paper industry accounted for the bulk of the paper & board supply, and its development was driven by the policy of the government. Currently the government provides the regulatory framework within which the industrial sectors and enterprises operate under market economy conditions. Given the current policy to develop China as an energy efficient and environmentally friendly country, the government policy intervention has the relatively most direct impact on the pulp & paper industry in the fields of energy and water, which are essential production factors of the pulp & paper industry.

Non-wood pulp paper mills are dispersed throughout China but a significant share of the production takes place in the provinces (Henan, Shandong, Hebei, Jiangsu, Guangxi, Sichuan and Liaoning) which all have strong agricultural production, creating supplies of non-wood fibers. The seven provinces with relatively large non-wood pulp paper production accounts for 80 % of the total non-wood pulp volume, whereas 24 other provinces (including autonomous regions) cover 20 % of the volume. The average production volume outside the seven leading provinces is 100 000 tons per annum and province.

Imported wood pulp and recycled paper forms a major part of the fiber furnishes used in the paper & paperboard industry. Paper and paperboard mills using imported fiber are typically located in regions that have a relatively short transport connection by road to sea ports.

In each province, there are concentrations of pulp & paper mills, and hence the production is spread out unevenly. The formation of the pulp & paper production concentrations has

resulted from several factors, including the location of agriculture, former policy to create industrial activities and employment, initiatives to organize the collection of non-wood fibers, availability of water, availability of transport routes, etc. The spatial structure of the pulp & paper industry means that it is a significant economic factor in the cities of large pulp & paper production, whereas its impact on the development on a whole provincial scale is much smaller.

Table 1 Location and fiber furnish of Chinese paper & paperboard industry (2004, 1000 tons).

Province	Non-wood pulp	Wood pulp	Recycled paper	Import pulp	Paper and paperboard production
Shandong	2 820	560	4 920	900	9 200
Zhejiang	10	5	6 765	700	7 470
Guangdong	230	275	5 300	1 350	7 155
Jiangsu	650	-	2 680	1 760	5 090
Shanghai	-	-	280	100	380
Beijing	-	-	130	30	160
Henan	3 200	35	970	755	4 960
Hebei	1 640	30	1 120	350	3 140
Fujian	40	365	1 610	250	2 265
Other 22 provinces	3 620	1 210	3 865	805	9 510
Grand Total	12 210	2 480	27 640	7 000	49 330

Cost competitiveness of fiber furnish components

The straw, bagasse, bamboo and reed pulps have their own typical production line capacities and hence production costs (excluding capital costs). The variation of production costs is caused by fiber, chemical and personnel costs. The indicative typical production costs (excluding capital costs) are as follows (Rmb/ton, year 2006):

- Straw pulp 2.270
- Bagasse pulp 2.480
- Bamboo pulp 3.345
- Reed pulp 2.465

The production costs are lower than the cost of imported wood pulp, delivered to the paper mill, and higher than the cost of recycled paper delivered to the paper mill.

Demand and supply of paper & board in China

Paper and board production in China is largely based on the domestic production (table below). This is due to the industrial development policy and production conditions outlined above. China is a net exporter of coated printing paper, household paper, newsprint and uncoated printing paper, and a new importer of especially packing materials.

Table 2 Production, consumption and supply balance of paper & board in China (2006), million tons.

Paper & board grade	Production	Consumption	Supply balance
Newsprint	3.750	3.440	+0.310
Uncoated printing paper	12.200	12.110	+0.090
Coated paper	4.600	4.000	+0.600
Household paper	4.700	4.360	+0.340
Packing paper	5.200	5.280	-0.080
White board	9.400	9.720	-0.320
Container board	11.500	12.500	-1.000
Corrugating medium	11.300	11.930	-0.630
Special paper & board	1.100	1.310	-0.210
Other	1.250	1.350	-0.100
TOTAL	65.000	66.000	-1.000

Chinese foreign trade of pulp and paper

So far China is a very important player in the global trade of waste paper and secondly of wood pulp. These trade flows take place in order to provide the Chinese mills with fiber furnish. While trade flows of paper and board take place as well, such volumes are much less important than the trade flows of waste paper and wood pulp in the global context. Waste paper is largely imported from North America as return cargo of ships transporting goods to North America, and wood pulp from North America, Asia as well as South America.

Table 3 Export and import of paper & board making fibre and paper & board in China, million tons.

Grade	Export	Import	Trade balance
Pulp	0.075	7.960	-7.885
Waste paper	0.010	19.620	-19.610
Paper & board	3.410	4.410	-1.000
Newsprint	0.320	0.010	+0.310
Uncoated paper	0.540	0.450	+0.090
Coated paper	1.210	0.610	+0.600
Household paper	..	..	+0.340
Packing paper	..	..	-0.080
White board	0.410	0.730	-0.320
Container board	..	..	-1.000
Corrugating medium	0.080	0.710	-0.630
Special paper & board	0.230	0.440	-0.210
Other	0.070	0.170	-0.100

Outlook for pulp & paper industry development in China

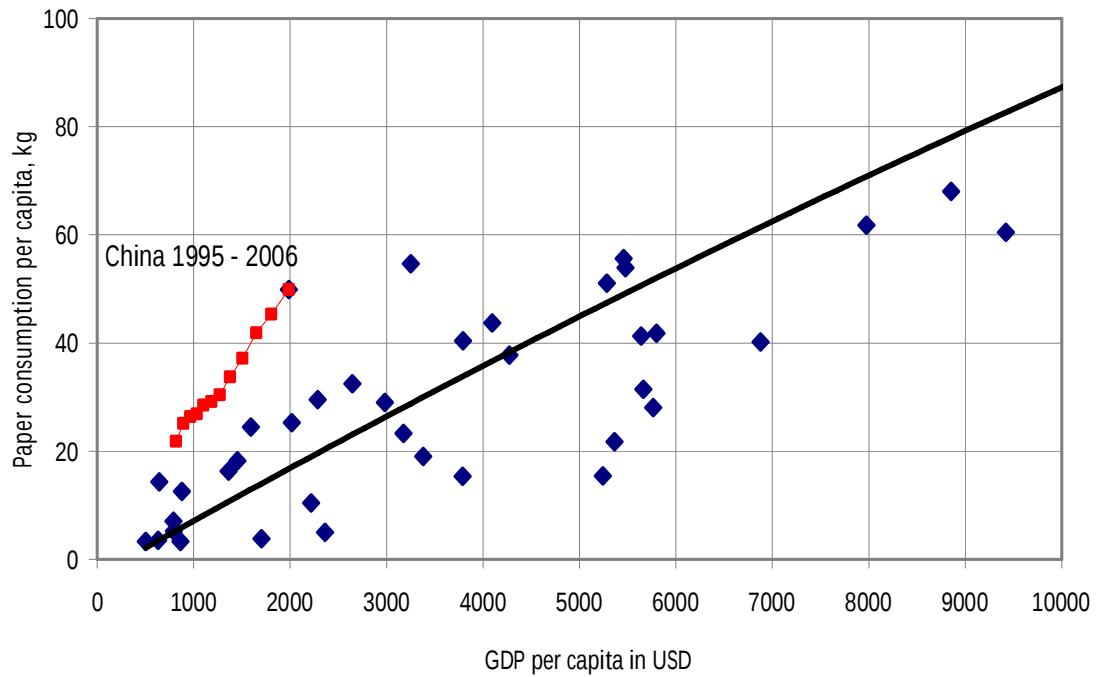
The demand for paper & board is forecast to rise very much in China, as the demand has high demand elasticity for the economic growth (figure below). This is due to the fact that the economic growth as its distribution over the population enables more people to start using paper & board and industrialization spawns the birth of more companies using printing and packaging materials.

The Chinese pulp & paper industry is an important player in the global waste paper and pulp market, but a less important player in paper and board markets. The future impact of the Chinese paper & board industry on the global business shall depend on:

- Availability and cost of waste paper in North America
- Return freight cost for waste paper and pulp from North America to China
- Exchange rate of the Chinese currency for USD
- Wood fiber production in China through the industrial forest plantation schemes
- Supply and cost of wood pulp from South America to China

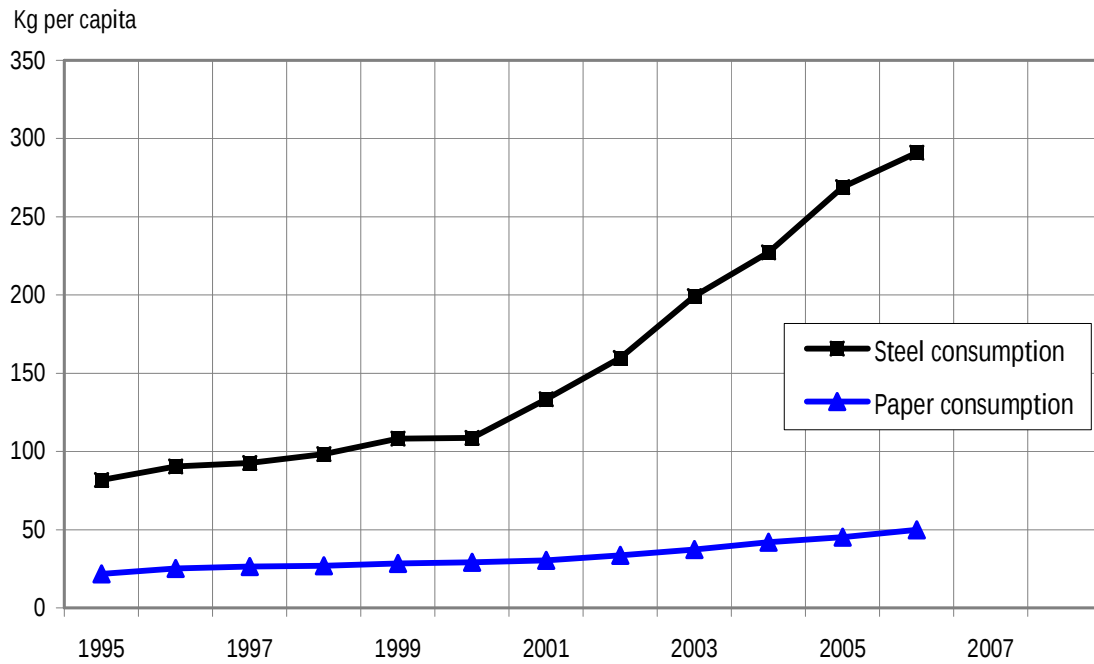
It is expected that gradually the Chinese pulp & paper market will have an increasing impact on the global market, hence boosting also the price development of paper & board globally. The magnitude of the Chinese paper & board market implies that such an impact can be significant in the long term. The globalization impact of China in the pulp & paper sector may hence materialize later than has been the case in some other sectors.

Figure 27 World paper consumption vs world GDP per capita in 2006.



Source: National statistical offices, Creapo, ETLA

Figure 28 Paper and steel consumption per capita in China 1995–2006.



Source: National statistical offices, IISI, Creapo, Pöyry, ETLA

6 CONCLUSIONS

World economic structures are changing rapidly. Developing countries and China in particular have been growing rapidly in recent decades. China is still a developing country, but has become a leading global manufacturer. China has surpassed Germany already in 1999 and will pass the US in a few years at the latest in terms of the size of manufacturing gross production in fixed prices on a comparable basis if the current trends continue.

The rapid rise of the Chinese GDP growth has been driven by heavy investments and net exports. Both domestic and foreign investments have been strong raising the Chinese investment ratio (gross fixed investments per GDP) to an unexceptionally high level, to 43 per cent of the GDP in 2007. Foreign investments have been attracted by the strong rise of the markets and a huge difference in the labour costs, which has spurred foreign investments. Foreign firms foresaw very profitable opportunities in combining cheap labour and advanced technology.

Chinese total labour compensation per employee was around 2 per cent of that in Germany in 1999. It has risen strongly after that, but the ratio was less than 4 per cent of the German labour compensation per head in 2006. If compared to Finland, the ratios would be slightly higher.

The level of productivity is still much lower in China than in industrial countries. As a result, relative unit labour costs in the common currency, RULC, show that the Chinese RULC is only a small fraction of the RULC in the other selected countries. It was around 20 per cent of that in Germany in 1999. It decreased during 2001–2004 to less than 10 per cent of that in Germany in 2004 as the Chinese productivity rose rapidly. In 2004–2006, the ratio has slightly risen even though the renminbi depreciated vis-à-vis the euro. The main reason for this was a decline in German ULC and slowing of Chinese labour productivity.

Estonia as a small country is the “normal” case in the process of globalisation. Its exchange rate has been fixed vis-à-vis the euro, which has closed this adjustment channel. The initial large unit labour cost gap in common currency vis-à-vis industrialised countries has quickly narrowed mainly by rapidly rising labour costs. Labour productivity has risen faster than in industrialised countries, but more slowly than labour costs. In fact, Estonian unit labour costs in euros rose close to Finnish costs, being two thirds of that in Germany in 2006.

Germany passed the US in terms of unit labour costs in a common currency in 2004, although the US dollar started to depreciate vis-à-vis the euro. In 2004–2006 the US costs rose compared to German costs, although the domestic unit labour costs and the USD/euro rates were fairly stable. The reason was the strong rise in German productivity and relatively modest rise in labour costs.

According to this study the level of labour productivity of the Finnish manufacturing sector has been more than 30 per cent above the German productivity since 1999. High productivity has pushed the unit labour costs in a common currency about a quarter below the German costs. This reflects to a large extent a strong role of the electronics industry in Finland.

The recent strong depreciation of the US dollar and the related depreciation of the renminbi vis-à-vis the euro is having a detrimental impact on German, Finnish and Estonian manufacturing vis-à-vis countries which aim to keep their exchange rates stable against the US dollar. The effect on the Euro Area is dampened, however, by its large traded share between the member countries.

The wide gap in labour costs between China and the industrial countries may still continue to prevail for a long time if the renminbi does not appreciate strongly. However, also other costs like energy and raw material costs as well as costs related to pollution will also easily erode Chinese competitiveness. On the other hand, there is still much room to improve the Chinese competitiveness by raising the labour productivity if the growth continues to be rapid as widely expected.

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APPENDIX:

Competitiveness, purchasing power parity and unit value ratios in manufacturing

Competitiveness, i.e. an ability to provide profitable competitive products or services, of firms and nations, depends on many different factors. It is measured in many ways using relative price or cost information. For example, indicators based on consumer prices, export prices or labour costs are provided (see e.g. Durand et al. 1997)

In this study, we compare labour costs in China and some developing countries in a wider framework of costs. In fact, profits can be regarded as an ultimate prerequisite for the competitiveness. Labour costs changes affect profitability if the change in these costs is not compensated by the change in labour productivity⁴. Changes in other costs like raw material costs or costs of intermediate goods, will also affect profitability as well, if not compensated with the opposite change in productivity of their use.

We describe the general development of manufacturing sectors in the supply-use framework of the national accounts (see Mankinen 2008 and Suni 2004). More specifically, we may use the identity (1) between the use and supply tables in the national accounts to reveal the factors affecting profitability. This identity shows that the development of the profitability (GOS) can be described as an interaction between gross production (Y), intermediate consumption (I), labour compensation (W) and net taxes (taxes minus subsidies, NT). This can be seen as analogous to the income statement of the firm, where profitability is obtained by deducting the costs (and adding possible subsidies) from the total sales.

$$(1) Y = I + GOS + W + NT$$

$$(2) GOS = Y - I - W - NT$$

Y = Gross output

I = Intermediate goods consumption

GOS = Gross operation surplus (includes depreciation)

W = Total labour compensation

NT = Net taxes on production

Gross production is a multiple of the price and quantity. By dividing (2) by the value of gross output, we get the identity (3).

$$(3) GOS/Y = 1 - (1/P) \times (I/Q - W/Q + NT/Q) = 1 - (1/P) \times (I/Q + W/Q + NT/Q)$$

P = Price of output, Q = volume of output, $Y = P \times Q$

x is a multiplication operator

We see that the profits per unit of production depend on the inverse of a price of production times the terms in the brackets, which are expressed in units by the quantity of production.

⁴ Labour productivity is a joint product of labour and capital. A pure labour effect can be calculated using multifactor productivity approach. This is not done in this study.

Measuring cost competitiveness of manufacturing can be defined as a comparison of costs between nations. Basically this can be done by calculating the variables in (3) in a home country and in a competitor country and comparing the costs.

We can calculate (3*) by multiplying both sides of equation (3) by the exchange rate.

$$(3^*) \text{ ExGOS}^*/Y^* = E - (1/P^*)x(\text{ExI}^*/Q^* + \text{ExW}^*/Q^* + \text{ExNT}^*/Q^*)$$

$$= E - (1/P^*)x(\text{ExI}^*/Q^* + \text{ExW}^*/Q^* + \text{ExNT}^*/Q^*)$$

x = multiplication operator

E = exchange rate (in this case foreign currency per unit of domestic currency)

Q* = volume of foreign production multiplied by a unit value ratio, UVR

Q* = uvr x Q**, uvr = unit value ratio, Q**, = volume in the country's own currency

The difference between the foreign and domestic profitability (4) in a common currency can be used as a measure of a final competitiveness. It is influenced by the differences between foreign and domestic prices as well as by the differences between the three cost components.

$$(4) \text{ Comp} = \text{GOS}/Y - \text{ExGOS}^*/Y^* =$$

$$1 - E$$

$$- [(1/P)x I/Q - E/P^*x I^*/Q^*]$$

$$- [(1/P)x W/Q - E/P^*x W^*/Q^*]$$

$$- [(1/P)x NT/Q - E/P^*x NT^*/Q^*]$$

Relative profitability of manufacturing between the domestic and foreign manufacturing sectors depends on prices and exchange rates, which these sectors face as well as differences in use of intermediate goods, labour compensation and net taxes measured in the same currency. All these variables are scaled with comparable volume of production (Q or Q*)

The means which change the use intermediate inputs, labour productivity or net taxes change also profitability ceteris paribus. The equation (4), however, is based on an identity. It gives a useful tool to spot the weak and strong features of manufacturing in different countries.

Manufacturing production and unit value ratios

When comparing manufacturing production volumes of production in different countries, neither the exchange rates nor expenditure-based PPPs are suitable. Taxes, subsidies and similar other items disturb the market price information from the perspective of a firm. In practical terms, however, both of these two approaches, in addition to the nominal exchange rates, are sometimes utilised (Klems 2007) The first PPP-based correct approach is to use expenditure approach prices on a detailed basis after correcting for the disturbing items. This is in many cases both difficult and cumbersome. The second practical approach, which is adopted also in this study, is the use of so-called unit value ratios (UVRs).

UVRs are calculated at the first stage on a rather low disaggregation basis as unit value ratios. They are weighted together to get a higher level aggregates of different industries and the level of manufacturing (Ruoen-Manying 2001).

$UVR_{i,j} = \sum w_i \cdot uvr_k$, aggregated unit value ratio in the first aggregation level

w_i = volume weight

k = commodity k

$uvr_k = (value_k / quantity_k)_i / (value_k / quantity_k)_j$, the unit value ratio of the commodity k between countries i and j .

The UVRs are usually calculated using weights of both countries. The final UVRs are usually calculated as a geometric average of these two UVRs with different weights. The ratios are normally calculated for a certain year, e.g., 1997 like in the case of the KLEMS project (KLEMS 2007). The UVRs for the other years, if needed, are estimated using suitable price indices in the two countries as the basic calculation is very burdensome.

In this project the UVR's calculated in the KLEMS project for the year 1997 were used in manufacturing as a starting point. These UVRs in 1999, in the first year of the introduction of the euro were, however preferred in order to decrease potential sources of inaccuracy due to a change in currency regimes. The 1999 UVR were calculated from the 1997 values (1995 in case of China) by using valued added deflators in respective countries.

Table 4 Unit value ratios (UVRs) and exchange rates in manufacturing.

	UVR		Exchange rates, national currencies per euro
	1997	1999	1999
Chinese yuan / German euro *	5.946	5.56	8.8227
Finnish euro / German euro	1.004	0.979	1.0000
Estonian kroon / German euro	10.684	10.798	15.6466
US dollar / German euro	0.993	0.979	1.0658



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