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COST COMPETITIVENESS OF CHINESE AND FINNISH FABRICATED METAL INDUSTRIES

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Esipuhe

Kiinasta on kuluva vuosikymmenen aikana tullut synonyymi alhaisen kustannustason maihin siirtyvälle tuotannolle. Ilmiö on saanut nimensäkin Kiinan mukaan. Kiinan vahvasti kasvava talous on vetänyt maahan yhä kiihtyvällä tahdilla ulkomaisia valmistajia. Samaan aikaan yhä useampi yritys harkitsee alihankintayrityksen perustamista Kiinaan tai komponenttien ja osien ostamista Kiinassa toimivilta valmistajilta maan alhaisen kustannustason tai edullisten hintojen takia.

On kiinnostava kysymys, kuinka kilpailukykyinen Kiina tuotantokustannuksiltaan on ja kuinka pitkään kilpailukykyero voi kestää? Nopea talouskasvu merkitsee usein kustannusten voimakasta nousua ja tätä kautta kilpailukyvyn heikkenemistä. Useilla avainaloilla Kiinassa tarjonta ei nopean talouskasvun aikana riittänyt kasvavan kysynnän tarpeisiin. Talouskasvun hidastuminen on merkinnyt Kiinassa puolestaan eräillä aloilla ylikapasiteetin muodostumista.

Kiinassa työvoimakustannukset ovat kasvun vuosina nousseet nopeasti. Talouskasvu on tuonut mukanaan jopa miljardin asukkaan Kiinaan pulan ammattitaitoisesta työvoimasta. Tämä on viime vuosina näkynyt työvoimakustannusten kehityksessä. Vuosina 2000–2007 metalliteollisuuden kokonaistyövoimakustannukset nousivat keskimäärin 8,2 % vuodessa. Suomessa vastaavalla kaudella vuosinousu oli 3,1 % ja Saksassa alle 1 %. Kiinassa työn tuottavuus kuitenkin kasvoi voimakkaasti, mikä kompensoi palkkakustannusten nousun.

Kiinan metallituoteteollisuuden kilpailukyky vaihtelee maan eri osien välillä tuntuvasti. Kehityksen keskuksena usein pidetty Shanghain alue, sijoittuu kiinalaisessa kilpailukykyymmityksessä Kiinan maakuntien keskikastiin. Yhdessä metallituoteteollisuuden alueellisen keskittymisen kanssa joutuu maahan etabloitua yritys tarkkaan harkitsemaan sijaintipaikkaansa myös maan sisällä.

Etlan laatima selvitys Kiinan ja Suomen metallituoteteollisuuden hintakilpailukyvystä ilmestyy mielenkiintoiseen aikaan. Globaalin talouden taantumien seurauksena yritykset tulevat pohtimaan tuotteidensa ja niissä tarvittavien komponenttien valmistuspaikkaa entistä tarkemmin. Kiina säilyttäneen kiinnostavuutensa, mutta miten nykyinen kehitys tulee näkymään maan kilpailukyvyssä?

Haluan lausua kiitokseni raportin kirjoittajille Etlassa ja Renmin yliopistossa Kiinassa.

Matti Spolander
Teknologiateollisuus ry

LI, Enjing – SUNI, Paavo – ZHAO, Yanyun, COST COMPETITIVENESS OF CHINESE AND FINNISH FABRICATED METAL INDUSTRIES. Helsinki: ETLA, Elinkeinoelämän Tutkimuslaitos, The Research Institute of the Finnish Economy, 2008, 38 p. (Keskusteluaiheita, Discussion papers, ISSN 0781-6847; No. 1172).

ABSTRACT: This study focuses on the labour cost competitiveness of fabricated metal industry in China and Finland in particular, using the corresponding German, the US and Estonian industries as a point of comparison in the early 2000s. This study deepens the analysis of the earlier study of the cost competitiveness of the manufacturing industries in the same group of countries. Separate studies focusing on the labour cost competitiveness are carried out in a parallel manner on the paper and pulp and metal industries. The results of these three sector studies deepen the knowledge about the change of competitiveness and its level. Large unit labour cost differences in a common currency were obviously a key factor behind exceptionally rapidly changing international production and trade structures in the late 1990s and early 2000s. The Chinese fabricated metal industry grew by about 22 per cent per year in 2000-2007 as the average annual growth of the value added of world manufacturing volume was only 3 per cent in 2000-2006. Nominal wages as such do not imply good international competitiveness. Chinese wages are, however, low even if their low labour productivity is taken into account and costs per unit of production are compared in a common currency. The relative levels of the Chinese unit labour costs vis-à-vis Germany, using the unit value ratios (UVR) to make the production volumes comparable, were estimated to be about 2 per cent in the fabricated metal industry. The ratio has even declined in early 2000s and has stayed relatively stable after that till 2007. Improving labour productivity in China had compensated for the effects of rapidly rising wages and an appreciating Renminbi. The outlook of the fabricated metal industry is clouded by the difficult global financial crisis, which strongly restricts export possibilities and dampens also the domestic markets of industry. On the other hand the stimulus packages of the government target especially the key demand sectors of the fabricated metal industry.

Keywords: competitiveness, unit value ratio, UVR, fabricated metal industry, NACE 28

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TIIVISTELMÄ: Tutkimuksessa selvitetään Kiinan ja Suomen metallituotteiden kustannuskilpailukykyä ja sen kehitystä 2000-luvun alkuvuosina. Laajemman kuvan saamiseksi Suomen ja Kiinan kustannuskilpailukykyä ja sen osatekijöitä verrataan Viron, Yhdysvaltojen ja Saksan vastaavien toimialojen kilpailukykyyn. Tutkimus syventää vastaavien kemianteollisuuden ja paperiteollisuuden kustannuskilpailukykytutkimusten ohella aiemmin tehtyä tutkimusta tehdasteollisuuden kilpailukykyvystä ja sen tasosta. Tarkoituksena on selvittää globalisaatioon liittyvien etenkin kustannusperäisten muutosten vahvuutta ja potentiaalia. Suuret yksikkökustannuserot yhteisessä valuutassa laskettuina olivat epäilemättä keskeinen tekijä poikkeuksellisten nopeassa maailmantalouden tuotannon ja kaupan rakennemuutoksessa 1990-luvun lopulla ja 2000-luvun alussa. Kiinan metallituotteiden tuotanto (NACE 28) lisääntyi vuosina 1999–2007 noin 22 prosenttia vuodessa. Maailman tehdasteollisuuden kiinteähintainen jalostusarvo lisääntyi vuosina 2000–2006 vain 3 prosenttia vuodessa. Nimellispalkat tai työvoimakustannukset eivät sinällään kuvasta kansainvälistä kilpailukykyä. Halvat kustannukset merkitsevät usein myös heikkoa tuottavuutta. Kiinan kustannukset ovat kuitenkin hyvin edulliset myös tuottavuuskorjattuina eli laskettuna yhtä tuoteyksikköä kohden yhteisessä valuutassa kilpailijoiden kanssa, kun tuotantojen tasot tehtiin vertailukelpoisiksi yksikköarvosuhteiden (UVR) avulla. Kiinan yksikkötyökustannukset Saksan kustannuksiin verrattuina ovat vain vajaat kaksi prosenttia metallituotteiden tuotannossa, kun yksikkötyökustannukset tehdään vertailukelpoiseksi yksikköarvosuhteita hyväksi käyttäen. Suhde jopa aleni 2000-luvun alkuvuosina ja on pysynyt sen jälkeen vakaana vuoteen

2007 saakka. Työn tuottavuuden ripeä kasvu kompensoi työvoimakustannusten nopean nousun ja renminbin vahvistumisen vaikutuksen. Finanssikriisi varjostaa erityisen voimakkaasti Kiina metallituoteteollisuuden näkymiä, koska se rajoittaa voimakkaasti vientimahdollisuuksia ja vaimentaa kotimaista kysyntää. Toisaalta valtion elvytyshankkeet kohdistuvat paljolti alalle tärkeisiin hankkeisiin.

Avainsanat: kilpailukyky, yksikköarvosuhde, UVR, metallituoteteollisuus, NACE 28

Tiivistelmä raportista “Cost Competitiveness of Chinese and Finnish Fabricated Metal Industries¹”

Maailmantalouden rakenne on muuttunut tuntuvasti monessa suhteessa globalisaatioon liittyvän Kiinan talouden avautumisen ja siihen liittyvän rajun muutoksen seurauksena. Kiinan osuus maailmantalouden BKT:sta kipusi ostovoimakorjattuna nopeassa tahdissa runsaaseen 10 prosenttiin vuonna 2007. Kiinan osuus maailman tehdasteollisuuden dollareissa lasketusta jalostusarvosta nousi YK:n teollisuustilaston mukaan vuoden 1980 4.7 prosentista 8.1 prosenttiin vuonna 2000 ja 13 prosenttiin vuonna 2006. Yhdysvaltain osuus oli vuonna 2006 20.5 prosenttia ja Saksan osuus 7.4 prosenttia.

Kiinan kokonaistuotanto on noussut noin 10 prosentin vuosivauhtia vuoden 1979 – 2008 ja jopa hieman tätä nopeammin vuosina 2000–2007. Kiinan tehdasteollisuus on ollut tässä muutoksessa keskeisessä asemassa, kun monikansalliset yritykset ovat käyttäneet avautuneita kustannuseroja hyväkseen järkeistäessään alihankintaketjujaan sekä pyrkiessään tälle erittäin lupaavalle markkinalle. Kiinan tehdasteollisuuden kasvuvauhti on ollut kiinteähintaisella bruttuotoksella mitattuna 2000 - 2007 22 prosenttia. Metallituoteteollisuuden tuotannon määrä (Nace 28) lisääntyi vastaavana ajanjaksona samaa vauhtia. Yksi keskeinen selittäjä Kiinan osuuden nopealle kasvulle on ollut matala kustannustaso.

Raportissa selvitetään Kiinan ja Suomen metallituoteteollisuuden kustannuskilpailukykyä ja sen kehitystä 2000-luvun alkuvuosina. Laajemman kuvan saamiseksi Suomen ja Kiinan kustannuskilpailukykyä ja sen osatekijöitä verrataan Viron, Yhdysvaltojen ja Saksan vastaavien toimialojen kilpailukykyyn. Tutkimus syventää vastaavien paperiteollisuuden ja kemianteollisuuden kustannuskilpailukykytutkimusten ohella aiemmin tehtyä tutkimusta tehdasteollisuuden kilpailuvyvystä ja sen tasosta (Suni Paavo – Ahveninen Harri 2008). Tarkoituksena on selvittää globalisaatioon liittyvien etenkin kustannusperäisten muutosvoimien vahvuutta ja potentiaalia.

Raportissa keskitytään työvoimakustannuskilpailukykyyn osana laajempaa kustannuskilpailukykyä, jossa myös raaka-aineiden hinnan ja niiden käytön tehokkuus sekä tuotteesta saatava hinta ovat keskeisiä tekijöitä. Työvoimakustannuserot nähdään globalisaation keskeisenä muutosvoimana, koska kylmänsodan päätyminen ja etenkin Kiinan avautuminen teki mahdolliseksi edullisen kehittyvien maiden työvoiman ja läntisen teknologian yhdistämisen kannattavalla tavalla. Näiden mahdollisuuksien hyväksikäyttö johti edellä kuvattuun rajuun rakennemuutokseen globaalien tehdasteollisuuden ja erityisesti metallituoteteollisuuden tuotannossa ja kansainvälisessä kaupassa.

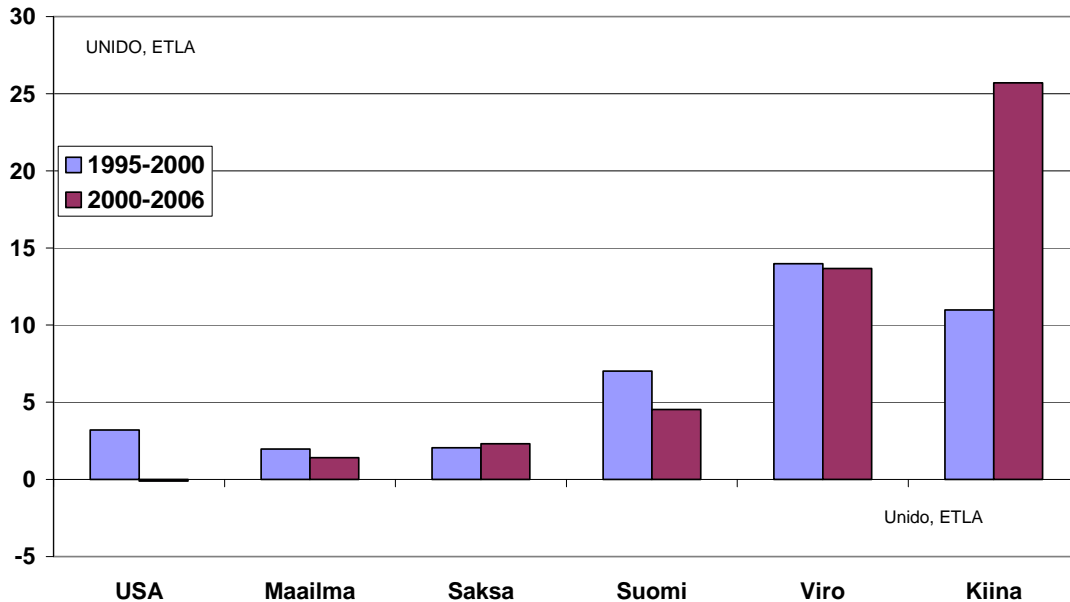
Työvoimakustannuksia eri maiden välillä verrataan ns. suhteellisin yksikkökustannuksin. Vertailu tehdään tavanomaiseen tapaan indekseihin, jolloin kuvataan suhteellisten kilpailuasetelmien muutosta. Tutkimuksessa pyritään ns. yksikköarvosuhteita² käyttäen saamaan selville myös maiden väliset absoluuttiset yksikkötyövoimakustannuserot eli kokonaistyövoimakustannukset yhtä tuoteyksikköä kohden. Samalla selvitetään suhteellisten yksikkötyökustannusten osatekijöiden valuuttakurssien, suhteellisten työvoimakustannusten ja tuottavuuksien kehitystä.

¹ Li, Enjing - Suni, Paavo - Zhao, Yanyun, Cost Competitiveness of Chinese and Finnish Fabricated Metal Industries. ETLA DP nro 1172, 2008. Tutkimus on osa hanketta, jossa on tutkittu Kiinan ja Suomen kustannuskilpailukykyä tehdasteollisuudessa (Suni Paavo - Ahveninen Harri (2007), Cost Competitiveness of Chinese Manufacturing Industries from the Finnish Perspective. Prime Minister’s Office Reports 3/2008.), paperiteollisuudessa (ETLA DP nro 1173, 2008) ja kemianteollisuudessa (ETLA DP nro 1171, 2008).

² Yksikköarvosuhde on yksinkertaistettuna tarkasteltavien maiden tuottajahintojen suhde. Se on ostovoimaparieteetin mittari tuotannon näkökulmasta. Tosin sanoen, jos se on yhtä suuri kuin valuuttakurssi, niin tuottajien kohtaamat hinnat ovat samat. Tarkasteltaessa kokonaistuotantoa ja sen eriä kansantalouden menopuolen näkökulmasta käytetään markkinahintoihin perustuvia pariteettimittareita. Ne eivät sovellu tuottajienmittaukseen, koska verot ja tukipalkkiot vääristävät helposti hintavertailua tuntuvasti.

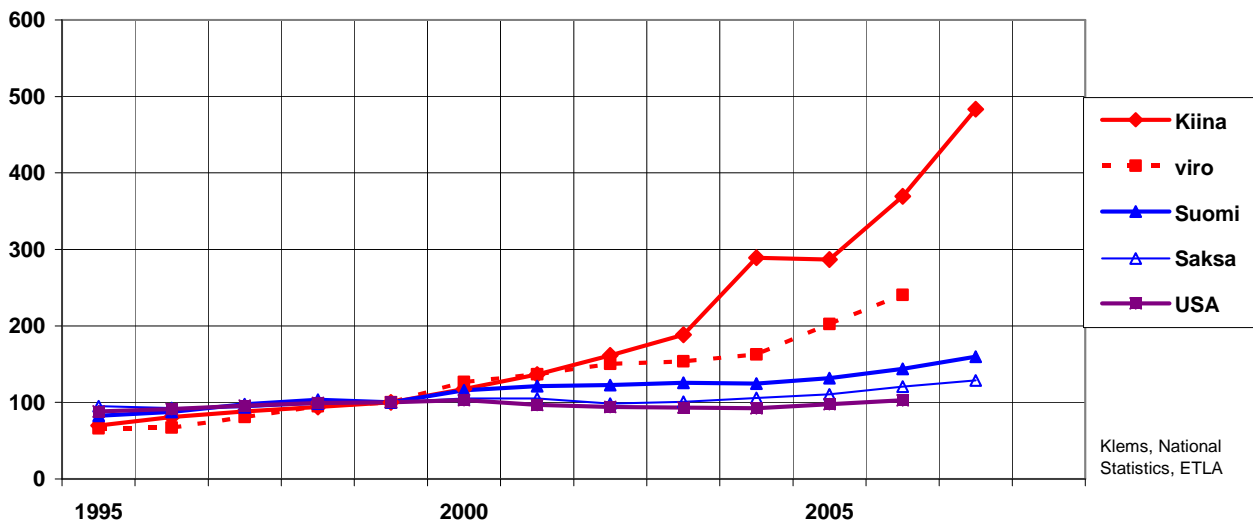
Metallituoteteollisuuden tuotannon määrä, kasvu eräillä alueilla

Keskimääräinen vuosikasvu, %



Metallituoteteollisuuden bruttotuotoksen määrä eräissä maissa

Indeksi, 1999=100



Työvoimakustannuserot

Globalisaation kiihtyminen 1990- ja 2000-luvulla on perustunut kylmän sodan päättymiseen ja kehittyvien maiden, etenkin Kiinan avautumiseen, joka on paljastanut uusia kannattavia liiketoimintamahdollisuuksia. Uudessa tilanteessa esimerkiksi Kiina on hyötynyt teollisuusmaihin verrattuna erittäin alhaisesta palkkatasostaan. Esimerkiksi Kiinan metallituoteteollisuuden kokonaistyövoimakustannukset olivat vuonna 2007 noin viisi prosenttia Suomen ja

Saksan euroissa mitatuista vuotuisista kustannuksista työntekijää kohden. Kiinan kustannukset nousivat nopeasti 2000-luvulla. Metalliteollisuuden kokonaistyövoimakustannukset nousivat euroissa mitattuna 1.7-kertaisiksi vuosina 2000–2007, mikä vastasi 8.2 prosentin vuotuisia kustannusnousua. Vastaava nousu oli Suomessa 3.1 ja Saksassa alle prosentin.

Suhteelliset työvoimakustannukset

Nimellispalkat tai työvoimakustannukset eivät sinällään kuvasta kansainvälistä kilpailukykyä. Halvat kustannukset merkitsevät usein myös heikkoa tuottavuutta. Kiinan kustannukset ovat kuitenkin hyvin edulliset myös tuottavuuskorjattuina eli laskettuna yhtä tuoteyksikköä kohden yhteisessä valuutassa kilpailijoiden kanssa.

Kiinan metallituoteteollisuuden yksikkötyökustannukset Saksan kustannuksiin verrattuina (kustannuskilpailukyky) ovat noin 2 prosenttia, kun yksikkötyökustannukset tehdään vertailukelpoiseksi ns. yksikköarvosuhteita hyväksi käyttäen. Kiinan kustannuskilpailukyky tällä tavalla mitattuna jopa aleni 2000-luvulla. Työn tuottavuuden raju kasvu ylikompensoi työvoimakustannusten nopean nousun ja renminbin vahvistumisen vaikutuksen metallituoteteollisuuden kustannuskilpailukykyyn.

Suuret yksikkökustannuserot yhteisessä valuutassa laskettuina olivat epäilemättä keskeinen tekijä poikkeuksellisen nopeassa maailmantalouden tuotannon ja kaupan rakennemuutoksessa 1990-luvun lopulla ja 2000-luvun alussa. Kiinan metallituotteiden tuotannon jalostusarvon määrä (NA-CE 28) lisääntyi vuosina 2000–2007 vuosittain keskimäärin 25 prosenttia. Maailman tehdasteollisuuden kiinteähintainen jalostusarvo lisääntyi vuosina 2000–2006 vain 1.4 prosenttia vuodessa.

Jalostusarvo ja tuotannon rakenne

Kiinan ja Viron Metallituoteteollisuuden jalostusarvon osuus bruttotuotoksesta on panos- tuotostaulujen mukaan vertailussa olevien teollisuusmaita selvästi pienempi. Työn ja brutto- toimintaylijäämän osuudet ovat myös hyvin alhaiset. Virossa merkittävä määrä tuotannon välituotteista on tuontipanoksia. Tuontiosuus on iso myös Kiinassa maan valtavasta koosta huolimatta. Suomessa tuontiosuus kuvastaa talouden kansainvälisesti verrattuna pientä kokoa.

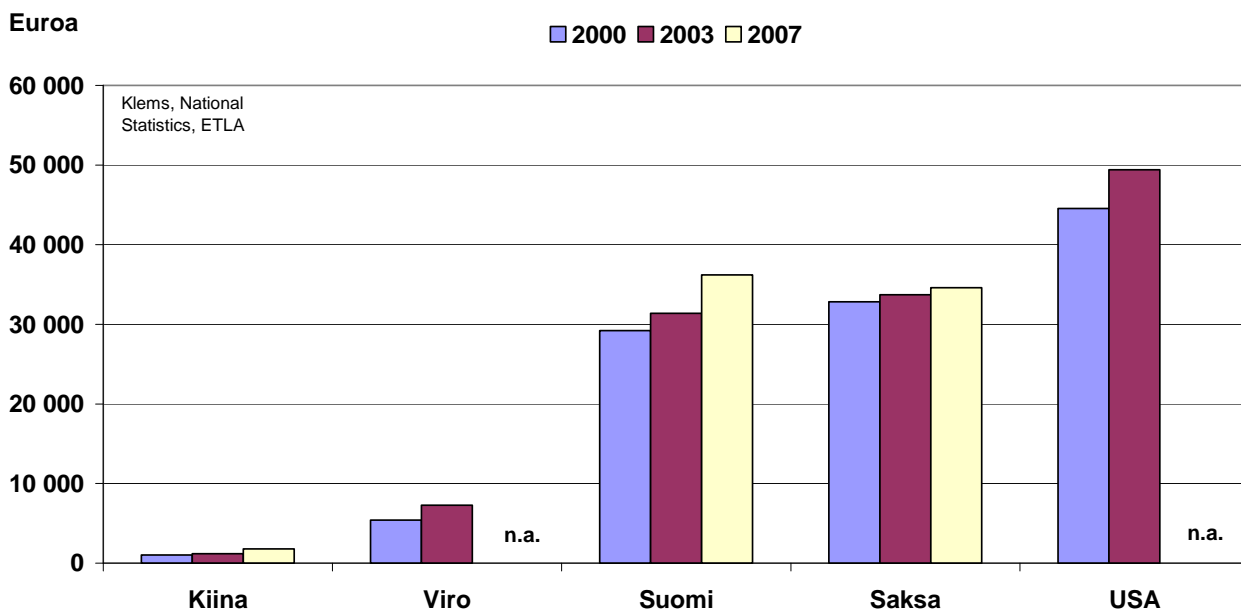
Muutospotentiaali ja sen tekijät

Edellä kuvattujen tilastoiin perustuvien laskelmien valossa Kiinan kasvupotentiaali on edelleen hyvin suuri metallituotteiden tuotannossa. Kiinan suhteelliset yksikkötyökustannukset ovat edelleen vain murto-osa läntisistä kustannuksista. Viron talous on esimerkki pienestä avotaloudesta, joka on esimerkiksi Kiinan taloutta huomattavasti joustavammin sopeutunut muuttuviin oloihin. Viron metallituoteteollisuus on hyödyntänyt kehityspotentiaalin (catching up) Kiinaa nopeammassa tahdissa, koska sen yhteisessä valuutassa ilmaistut yksikkötyökustannukset ovat nousseet jo lähelle puolta Saksan tasosta. Tämä edellyttää jatkossa palkkakustannusten nousuvauhdin laantumista, koska ripeätä työvoimakustannusten nousua ei pystytä enää kompensoimaan tuottavuuden vahvalla nousulla. Viron kruunun sitominen euroon ehkäisee myös valuuttakurssipolitiikan käytön väistämättömään muutokseen sopeutumisessa.

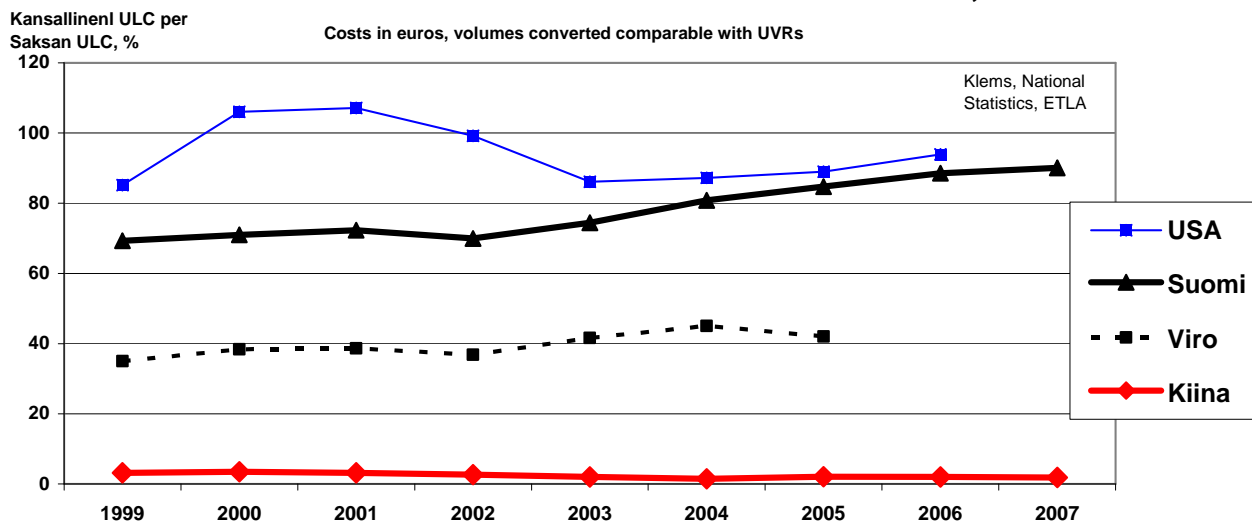
Kiinan talous on poikkeuksellisen kiinnostava sekä suuren kokonsa että muutoksen ja siihen liittyvän maailmanmarkkinavaikutuksensa takia. Kiina on rajussa muutoksessa, mutta talouden perustekijöiden erot muuhun maailmaan ovat edelleen suuret. Palkat nousevat nopeasti, mutta lähtötaso on hyvin alhainen ja talouden rakennemuutos on pitänyt tuottavuuden myös nopeassa nousussa. Tuottavuuden nousu vapauttaa ammattitaidotonta työvoimaa maataloudesta, mikä vaimentaa palkkakustannusten nousua. Ammattitaitoisesta työvoimasta on kuitenkin jo pulaa mikä nostaa uuden työvoimasäädännön ohella työvoimakustannuksia. Kiinan harjoittama renminbin vahvistuspolitiikka 2000-luvun alkuvuosina pienensi myös kustannuseroja. Syksyllä 2008 tämä politiikka muuttui kuitenkin varovaisemmaksi kansainväli- en finanssikriisiin vaikutusten kohdistuessa

voimakkaasti myös Kiinan talouteen. Kiinan kustannusetua kaventaa tuotehintojen hidas kehitys suhteessa vertailumaihin. Osa rajusta tuottavuushyödyistä heijastuu hinnoittelussa.

Metallituoteteollisuuden kokonaistyövoimakustannukset per työntekijä



Suhteelliset yksikkötyökustannukset metallituoteteollisuudessa Saksan suhteen, %

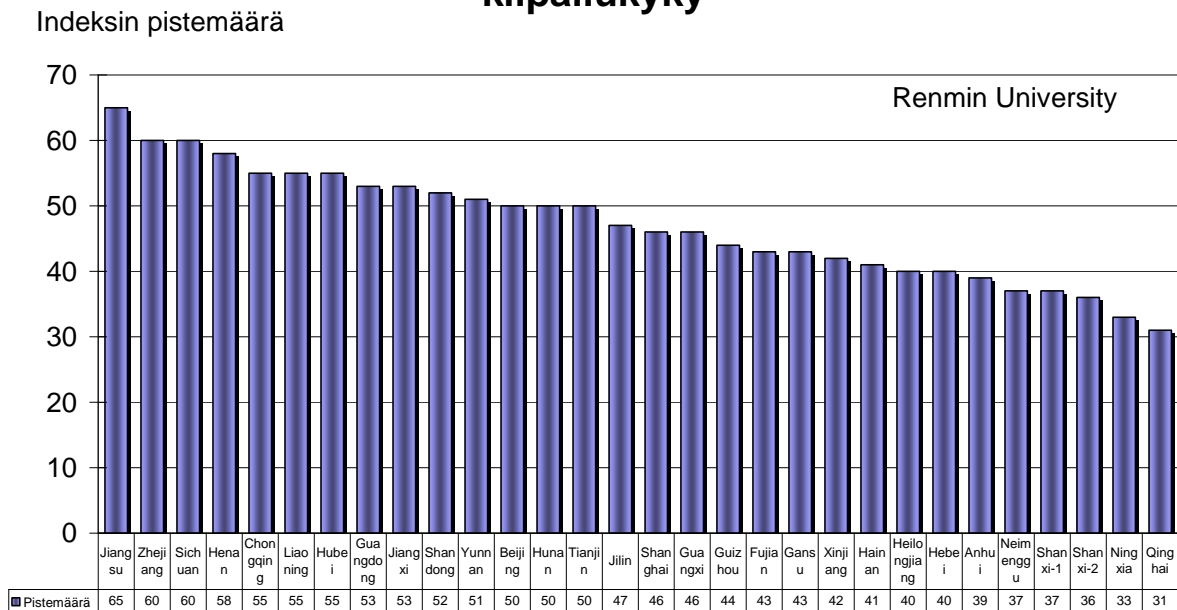


Kiinan metallituoteteollisuus muutoksessa

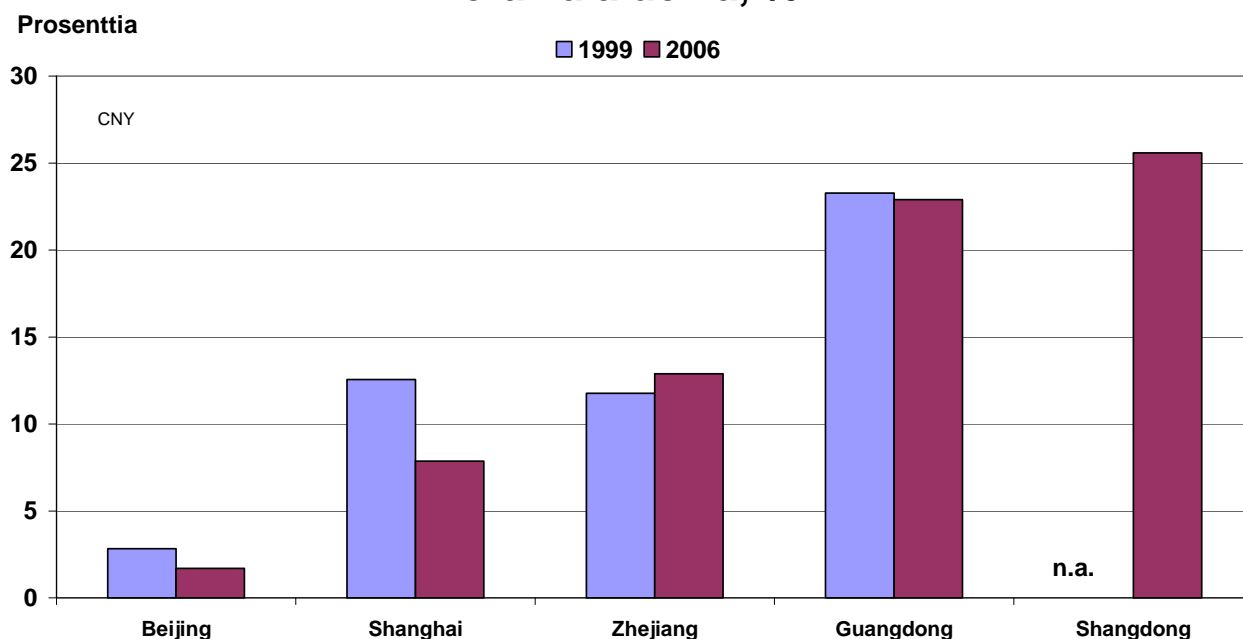
Kiinan metallituoteteollisuus on rajussa muutoksessa kuten suurin osa maan tehdasteollisuudesta. Tuotanto on keskittynyt muutamaamaan maakuntaan (Guangdong, Jiangsu, Zhejiang, Shandong, Shanghai ja Hebei), jotka dominoivat tuotantoa. Guangdong tuottaa Kiinan maakunnista eniten metallituotteita. Sen markkinaosuus oli yli 20 prosenttia, vaikka sen kilpailukyky Kiinan muihin maakuntiin verrattuna on heikko. Shanghai ja Shandong ovat merkittäviä metallituotteiden tuottaja-maakuntia, joiden taloudellinen kehitystaso on maakuntien korkeimpia. Viisi suurinta maakuntaa yhteensä 22 maakunnasta tuottaa yli 70 ja 10 suurinta tuottajaa lähes 90 prosenttia Kiinan kokonaistuotannosta. Keskittynyt tuotanto viittaa tuotannon vahvaan klusteriluonteeseen.

Kiinan metallituoteteollisuus koostuu suuresta joukosta yrityksiä, joten liiketoimintaympäristö on hyvin kilpailullinen ja työvoimakustannukset alhaiset. Toisaalta tuotteiden hintataso ja voittomarginaalit ovat myös alhaiset. Kiinan kilpailukykyisimmät metallituoteyritykset, mitattuna Renmin yliopiston kilpailukykyindeksillä, ovat Jiangsu, Zhejiang, Sichuan, Henan ja Chongqing. Kuulut maakunnat Guangdong ja Shanghai sijoittuvat ovat kilpailukykymittauksessa vasta 8. ja 16. sijalle, vaikka niiden markkinaosuudet ovat suuria.

Kiinan metallituoteteollisuuden alueellinen kilpailukyky



Kiinan metallituoteteollisuuden tuotanto-osuudet eräillä alueilla, %



Kiinan metallituoteteollisuuden rakenne on hyvin tehoton. Jo ennen finanssikriisin vaikutusta joillakin erityisaloilla oli tuntuvasti ylikapasiteettia ja toisaalta useiden avainalojen tarjonta oli riittämätöntä vahvan kasvun tarpeisiin. Useimpien yritysten pieni koko ja tekee tuotannosta tehotonta ja ehkäisee innovatiivisten menetelmien käyttöönottoa tuotannon jalostusarvon parantamiseksi.

Kansainvälisen rahoituskriisin vaikutukset

Odottamattoman pahaksi syventynyt kansainvälinen rahoituskriisi varjostaa erityisen paljon Kiinan metallituoteteollisuuden näkymiä. Se rajoittaa vientimahdollisuuksia ja pehmentää kotimarkkinoita. Useat kansainvälisistä markkinoista kuten Yhdysvallat, Japani ja euroalue ovat taantumassa ja siitä toipuminen kestää pidempään kuin tavallisesti talouden toimintaan keskeisesti vaikuttavan rahoituskriisin syvyyden takia. Lukuisa joukko alan yrityksiä on jo mennyt konkurssiin mm. Guangdongissa. Kilpailu kuitenkin edelleen kiristyy, vaikka raaka-aineiden kuten teräksen ja värimetallien halpeneminen helpottaa vähän tilannetta. Energian maailmanmarkkinahintojen aleneminen ei kuitenkaan juuri kevennä kustannuksia, koska hinnat ovat vahvasti subventoituja.

Kiina hallituksen syksyllä 2008 julkistamat talouden elvytystoimet kohdistuvat paljolti infrastruktuuri-investointeihin, mikä lisää erityisesti metallituotteita valmistavan teollisuuden kysyntää.

Kiina – kilpailija, mutta myös potentiaalinen yhteistyökumppani

Kiinan metallituoteteollisuudesta on tullut alan keskeinen vaikuttaja verraten lyhyessä ajassa. Kiina on vertailukelpoisin hinnoin (yksikköarvoja käyttäen) laskettuna jo maailman suurin metallituotteiden tuottaja, vaikka. Tähän vaikuttaa alhaisten yksikkötyökustannusten ohella kiinalaisten tuotteiden hyvin halvat hinnat. Kustannuserot viittaavat kuitenkin siihen, että Kiinan dominointi tällä alalla jatkuu, kunhan maailmantalous normalisoituu.

Kiinan metallituoteteollisuuden nopea jatkokehitys edellyttää edelleen – kuten muillakin aloilla – tieto-aidon saamista teollisuusmaista, joissa pyritään parantamaan kotimaisten tuottajien tuottavuutta nopeasti kasvavien kehittyvien markkinoiden ja niiden edullisten tuotantokustannusten avulla.

Raaka-ainekustannusten, etenkin energiakustannusten suurten muutosten sekä työvoimakustannuserojen kilpailukykyvaikutukset Kiinan ja Suomen metallituoteteollisuuteen vaativat vielä lisäselvityksiä. Esimerkiksi kustannuskilpailukyvyn tason mittaamista pitäisi kehittää kilpailukyvyn paitsi tason tarkemman selvittämisen, myös kilpailukyvyn muutoksen vaikutusten arvioimiseksi. Lisätutkimus ja kehityksen seuranta syventäisi tietoa metallituoteteollisuuden muutosprosessista. Tämä on erityisen merkityksellistä sen takia, että Kiinalla ja muilla kehittyvillä talouksilla on vielä paljon kehityspotentiaalia (catching up). Nykyinen kriisi pysäyttää kehitysprosessit joksikin aikaa, mutta kunhan palataan normaaliin, alan kehitysprosessit voivat jatkaa kehitystään.

Kansainvälinen kilpailukyky ja yritysten toimintaympäristö

Meneillään oleva kansainvälinen finanssikriisi ja maailmanlaajuinen taantuma korostavat kustannuskilpailukyvyn merkitystä kansallisella ja yritystasolla, koska se merkitsee kilpailun kiristymistä ja yritysten hinnoitteluvoiman heikkenemistä.

Kiinan teollisuudessa työvoimakustannusten nousu, renminbin vahvistuminen (vaikeuttaa vientiä ja vahvistaa tuontia), pula ammattitaitoisesta työvoimasta, uusi työvoimalainsäädäntö työntekijöiden olojen kohentamiseksi ja investoinnit ympäristöongelmien parantamiseen ovat heikentäneet Metallituoteteollisuuden kustannuskilpailukykyä.

Kiinan teollisuus hyötyy toisaalta tuntuvasti kotimarkkinoiden vahvasta kasvusta. Teollisuusmaiden yritykset pyrkivät pienentämään lisääntyviä kustannuksiaan pyrkimällä jalostusarvoltaan parempiin tuoterakenteeseen laatua ja tuottavuutta parantamalla. Kiinalaiset yritykset pyrkivät samaan kehitykseen hyödyntämällä hyvää kansainvälistä kilpailukykyään sekä suuria maan sisäisiä kehitysmahdollisuuksia.

Maailman metallituoteteollisuus (NACE 28), joka tuotti UNIDOn tilastojen mukaan noin viisi prosenttia maailman tehdasteollisuuden jalostusarvosta kiintein hinnoin laskettuna vuonna 2006, on Kiinan nousun takia suuressa muutoksessa. Kansainvälisesti toimivien yritysten on tässä tilanteessa seurattava tarkasti erityisesti Kiinan kilpailukyvyn ja tuotannon kehitystä, yhteistyömahdollisuuksia, Kiinan markkinoiden kehitystä sekä kilpailun kiristymistä kansainvälisillä markkinoilla kiinalaisten tuotteiden lisääntyvän merkityksen takia.

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1. Introduction

This study, which deals with the cost competitiveness of the fabricated metal manufacturing in China, Estonia, the US, Germany and Finland, is one of the other three complementary studies, following the overall analysis of international competitiveness. The first one, the general description of the cost competitiveness developments of the manufacturing industry was made to the Council of the Finnish Prime Minister. The other two complementary studies review the developments in the chemical as well as paper industries.

This study starts with the review of the general developments of the industries to give an overview framework for the description of cost competitiveness. After that the unit labour costs (ULCs) are described and compared in the selected countries on an aggregate level as well as by decomposing the costs into labour costs and productivity. We also describe fragmented nature of the Chinese fabricated metal industries by comparing the developments also by provinces.

In this study, we focus on manufacture of fabricated metal products, except machinery and equipment industry (NACE 28). This industry covers a large number of commodities varying from structural metal products to manufacture of wire products. Steel prices, non-ferrous metal prices as well as labour costs affect most significantly on the production costs in this industry.

From perspective of this industry, it is natural to concentrate on labour costs in this study as it is the differences of unit labour costs between industrialised and developing countries, which create large incentives for changes in geographical pattern of production and trade.

Comparisons of labour costs are made by relative unit labour costs and their developments between the economies in the fabricated metal industries. The level comparison of costs is made by utilising so-called unit value ratios (UVRs³) using Germany as a reference economy. The level comparison is supplemented by decomposition of relative unit labour costs (RULCs) to relative wage costs, productivity and exchange rates.

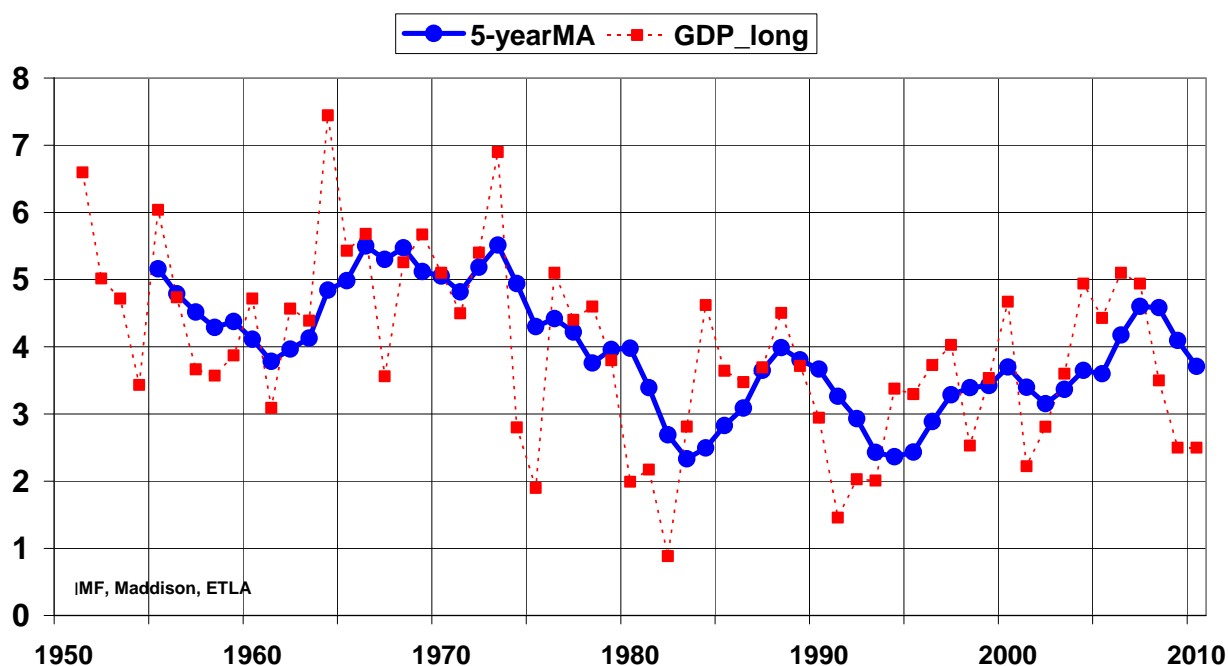
In the last chapter the results are reviewed and conclusions put forward.

³ UVRs can be used to convert production volumes comparable. See Suni-Ahveninen 2008 p.8.

2. Background

World economic growth has greatly benefitted from the globalisation, in which developing countries, especially China, have got strong momentum in their economy. In the early 2000s developing countries have made a most significant contribution to the world economic growth. China alone contributed around one percentage points to the world average growth of close to five per cent in 2001-2007. Strong global growth was boosted by the emergence of China due to its liberalisation policies since end of 1980's into international community as well as the strengthening growth of other developing countries as technological changes made it easier both to transfer technology and to optimise the processes of the multi-national enterprises on a global basis. At the same time, more efficient production practises kept inflation in control in spite of strong growth. The tide turned in 2008, when the US and Euro Area slid into recession and the growth started to decelerate worldwide.

World GDP Growth 1950-2010



2.1. Global financial crisis in 2008

The year 2008 marked a drastic change in the global economic development as the global financial crisis, which started already in August 2007, deepened into a very severe crisis in September 2008.

The exceptionally strong growth in early 2000s was, however, also due to very easy monetary circumstances due to strong savings in the developing countries. This is so-called savings-glut named by the chairman of the US Federal Reserve Paul Bernanke.

Easy monetary environment with low interest rates was on reason behind the surge of subprime loans in the US, which by definition are loans with less than normal probability of pay back. These loans came very popular and they share of the US mortgages rose from negligible close to 20 per cent by 2006, declining afterwards. Usual practise was to package these loans with other loans to a financial instrument called CDOs (Collateralized Debt Obligations). This operation made it possible to spread the risk of these high yielding products to other agents globally. While CDOs were risky, they were often insured against the default by so-called CDS (Credit Default Swaps). All went fine until housing prices begun to decline. This resulted in rising foreclosures and subsequent decreases in balance sheets of banks.

Problems of financial markets developed into international financial crisis already in August 2007, but the severity of the problem was revealed in autumn 2008, when international financial markets were nearly collapsing after infamous investment banking institution Lehman Brothers filed for chapter 11 bankruptcy protection and the largest US insurer AIG was taken into government control. In short, the leverage based growth changed to deleverage based problems in the financial sector. These problems are transferring into problems of the real economy during autumn 2008 and in 2009.

The outlook of global economy is very gloomy. The US and the Euro Area have entered into recession and the growth prospects have strongly worsened also in other developed countries as well as in emerging economies. The year 2009 will obviously be very weak and a turn-around to better may be very slow in site of strong policy reactions by the central banks and governments. Weak demand may be a prolonged, as the reason for worse development is the financial crisis, which has badly deteriorated the function of this key sector.

The medium-term economic outlook for fabricated industries changed substantially worse in 2008 as well due to recession in key production areas the US and Euro Area. A recent large decline in raw material prices and steel and energy in particular, however, gives some relief.

3. World fabricated metal industries

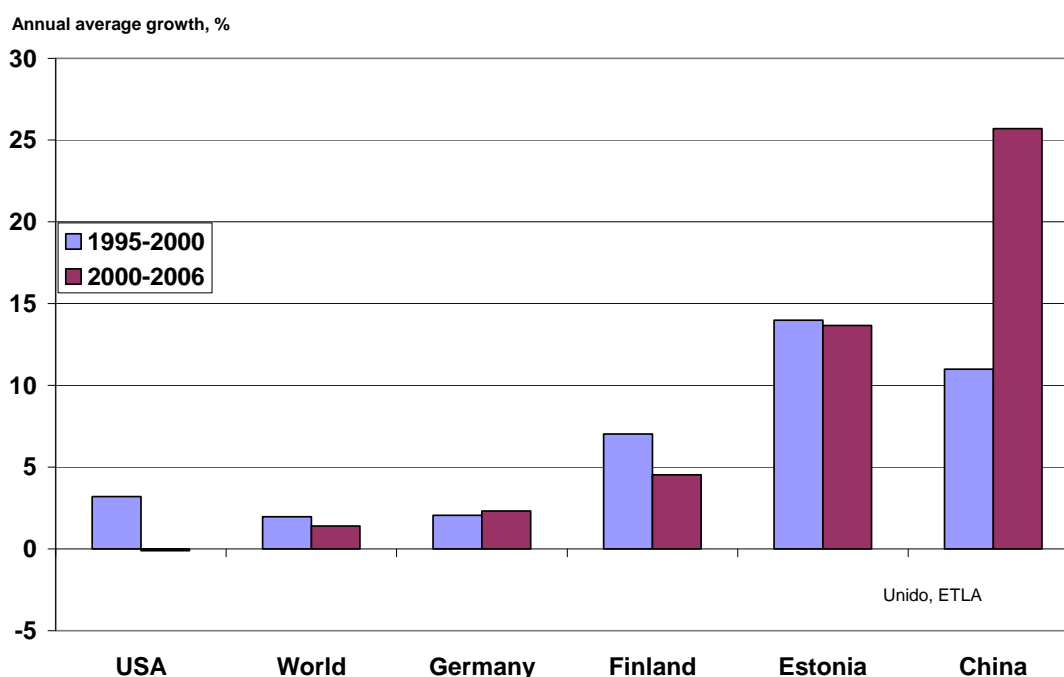
3.1. Fabricated metal manufacturing in selected countries

World manufacturing industries, in general, have gained from globalisation with a few exceptions, if the growth in the volume of value added is concerned. In the late 1990s, the growth strengthened from early 1990s. The growth moderated, but remained strong in 2000-2006. The annual averages of the growth in volume of value added were 2.5, 3.2 and 3 per cent (UNIDO 2008) in the periods 1990-1995, 1995-2000 and 2000-2006, respectively. The growth rates, however, varied substantially between different industries. The industry, which has gained by far most, is the radio, television and communication equipment industry. Its volume of value added grew 26 and 12 percent per annum in the latter two periods. The value added of fabricated metal production grew 2 and 1.4 per cent annually in the respective periods. (See attached graph and table in the Annex 1.)

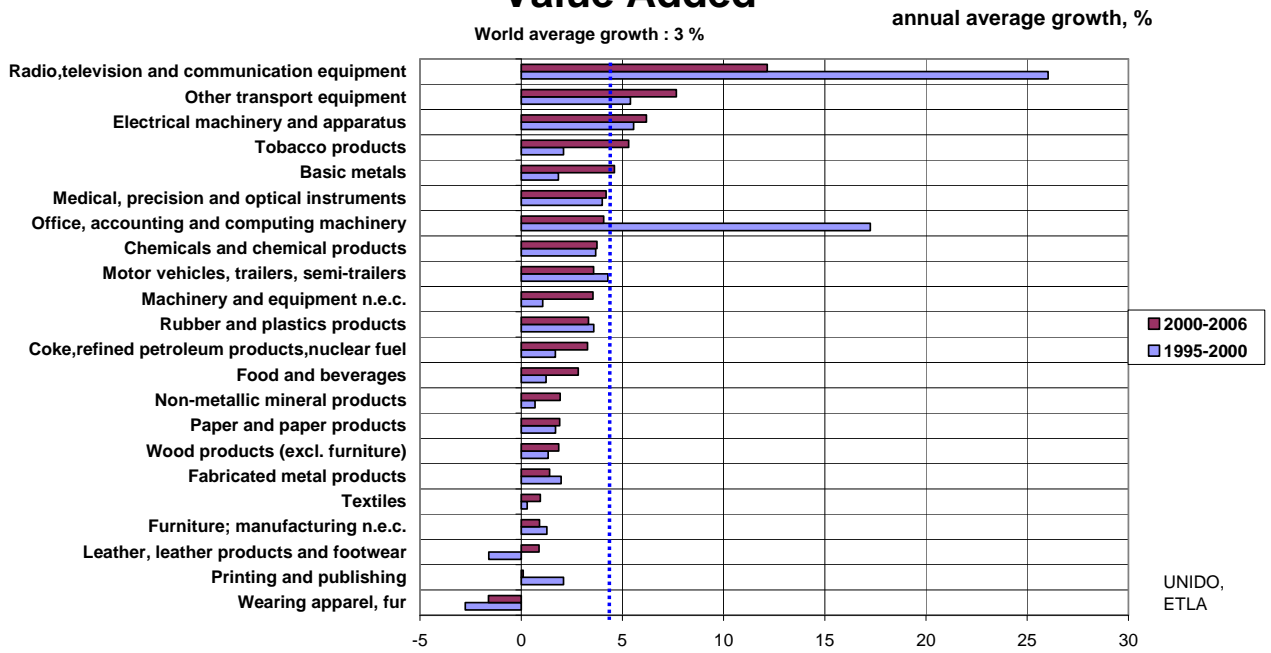
Rapid Chinese growth has changed world share of manufacturing and also the shares in the fabricated metal industries. The share of China of the world fabricated metal product industry has risen from 3.7 per cent in 2000 to 7.3 per cent in 2006 in prices of 2000 (UNIDO 2007).

Fabricated metal industries have gained less from the globalisation and a related strong growth in developing economies and China in particular than many other manufacturing industries. World production of fabricated metal industries has grown slower than the average growth in the manufacturing industries since mid 1990's. Chinese volume of value added fabricated metal products grew, however, by 21 per cent annually in 2000-2006 compared to 21.5 per cent average growth in Chinese manufacturing.

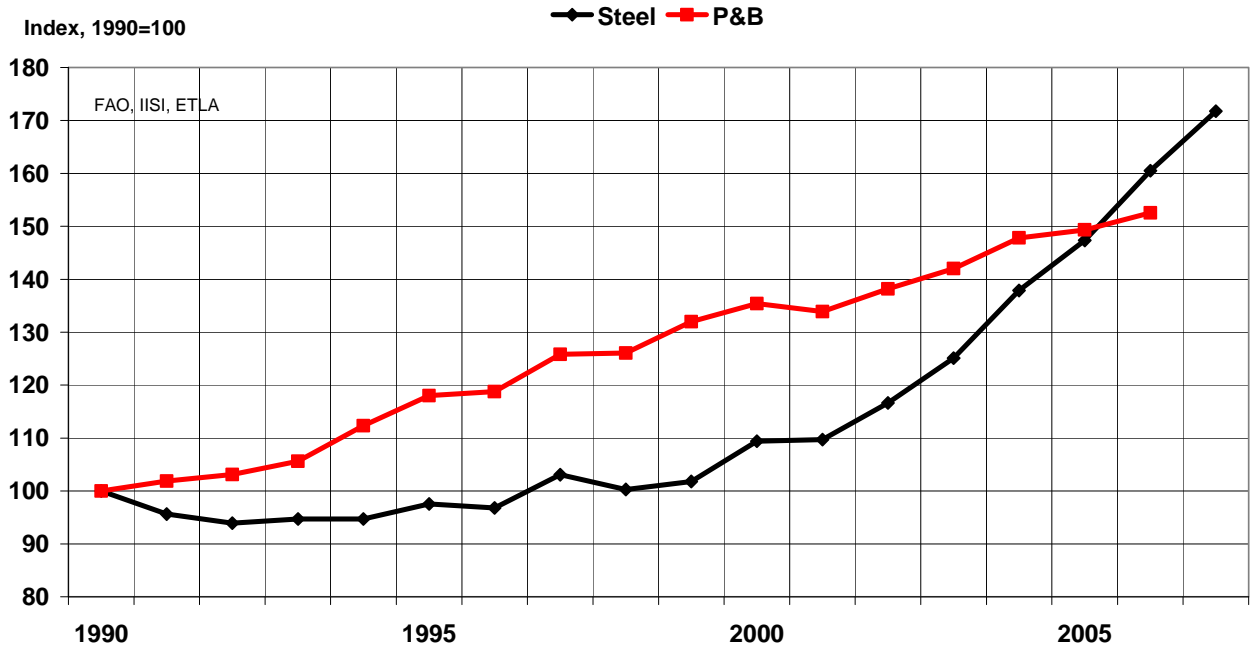
World Output Growth in Fabricated Metal Industry



Growth in Volume of World Manufacturing Value Added



World Steel and Paper&Board Production



The comparison of an important input sector of fabricated metal industries, the global steel industry and paper and pulp industries is striking. Steel industry was in very bad difficulties in the 1980s and 1990s but gained lot of strength in the early 2000s led by Chinese industrialisation (see e.g. Suni 2008). Paper and pulp industries on the other hand performed better in earlier decades, but benefited much less for Chinese led globalisation than the steel industry. There are several reasons for this development. On the one hand, the demand in mature economies has even declined due to e.g. technological change. On the other hand the growth in developing countries and especially in China has been manufacturing driven, which has been very intensive in use of fabricated metal products and steel.

15 Leading Countries in Fabricated Metal Industries		
	Per cent of World Value Added	
	2000	2006
USA	22.6	20.3
Japan	16.2	12.4
Germany	9.9	10.2
China	3.7	7.3
Italy	6.2	6.1
France	5.7	5.6
UK	5.1	4.9
Canada	2.9	2.6
Brazil	2.4	2.4
Spain	2.3	2.3
Indonesia	1.5	2.0
Republic of Korea	1.9	1.8
Mexico	1.6	1.6
Austria	..	1.4
Netherlands	1.3	1.2
	83.3	82.1
Source: UNIDO		

In case of steel, Chinese developments marked first a huge increase in demand and a subsequent production deficit, which turned into surplus already in 200x. In 2008, the markets collapsed as general developments deteriorated very pronouncedly due to the financial crisis. In paper and paper product industry the development was similar, but demand in the early 2000s was less paper intensive. Asian and especially Chinese large production deficits changed into a small surplus for many products already in 2006 and surpluses have grown after that. In both industries, there is large overcapacity under current economic circumstances and firms around the world are cutting their production to balance the markets.

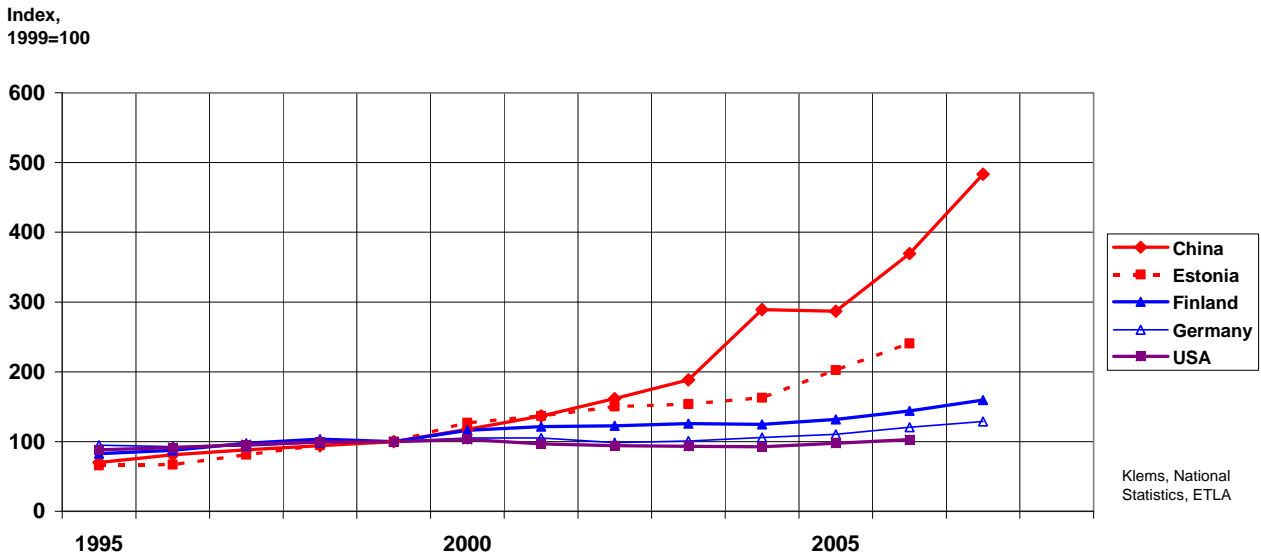
The growth of Chinese production of fabricated manufacturing has been very rapid close to average Chinese manufacturing growth. Chinese growth has started from a very low level and it has not been able to compensate the moderation of growth in the industrial countries. The key for good Chinese developments lies in the opening up of China. China, Soviet Union and other centrally planned economies aimed to work together isolating themselves from the other world economy. Planning and co-operation between the other planning economies were, however, not as productive as in the firms outside the planning systems or/and countries were not able to expand mutual co-operation well enough. As a result the economic collapse of the planning systems and the opening of these economies created new setting to international division of labour.

China decided to start changing its economy towards market-orientated economy in the 1989 by the decision of the communist party. This move has proved to be very fruitful for the China. Opening up of the Chinese frontiers revealed huge differences in labour costs per unit of production or ULCs calculated in a common currency. This created a large incentive to invest into China and led to a rise in investments in China to profit from this new opportunity. The development has been especially rapid in the course of the 2000s. As a result a huge change has taken place in China making it e.g. it the world largest manufacturer and also an important producer of fabricated metal products growing in six years to the fourth largest producer in 2006 from the rank of the seventh in 2000 in volume terms according to UNIDO (2008).

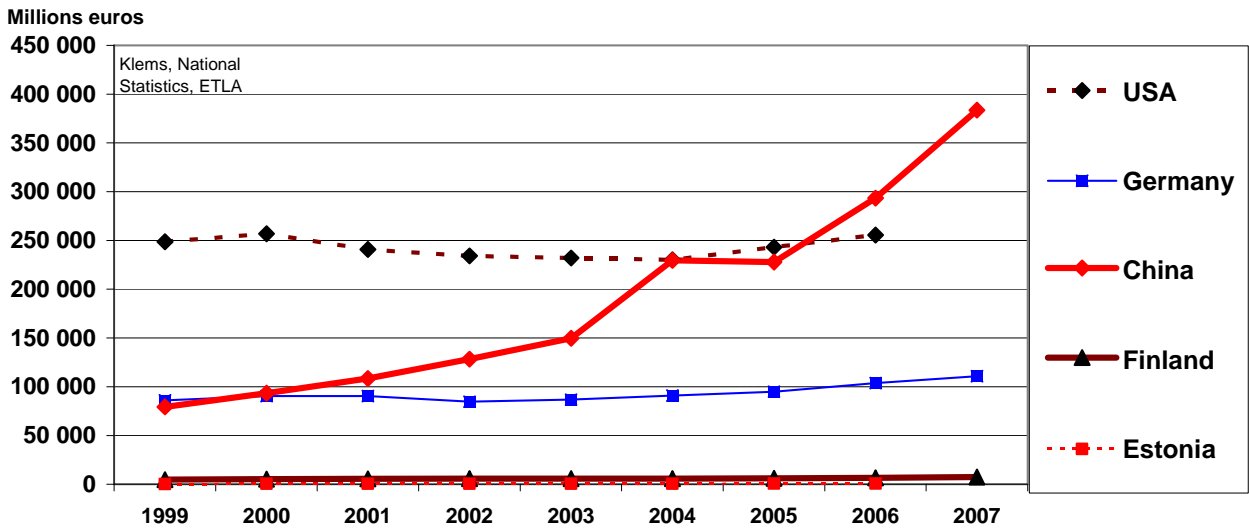
Fabricated metal production is strongly concentrated in terms of countries as 15 countries produce around 85 per cent of world value added. Four largest countries make up about half of the world fabricated production. However, in cases of base metals and machinery and equipment only three leading countries break the share of 50 per cent in world production. In office, accounting and computing machinery, the US alone made 63 per cent of world production in 2006 in volume terms according to UNIDO.

In this study we usually measure, with some exceptions, the output as a gross output instead of value added. By this selection we try to catch a general picture of all the costs, although the main focus is in labour costs. In terms of volume of gross production (nominal production deflated by the ex-factory prices), the growth rates in fabricated metal production like in case of other industrial branches, has been impressive and well above the rates in the selected other countries. However, the growth has been somewhat below the average in Chinese manufacturing. The annual average growths of Chinese fabricated metal outputs were around 20 per cent in 1999-2007, respectively. In comparison, the annual average growth in manufacturing was 22 per cent in the same period.

Volume of Output in Fabricated Metal Industry in Selected Countries



Output in Fabricated Metal Industry millions of 1999 euros using UVRs



The level volume of output in fabricated metal production has followed the pattern of value added. The production in the US, Germany, Finland and even in Estonia has been stagnant, if compared to rapid growth in China.

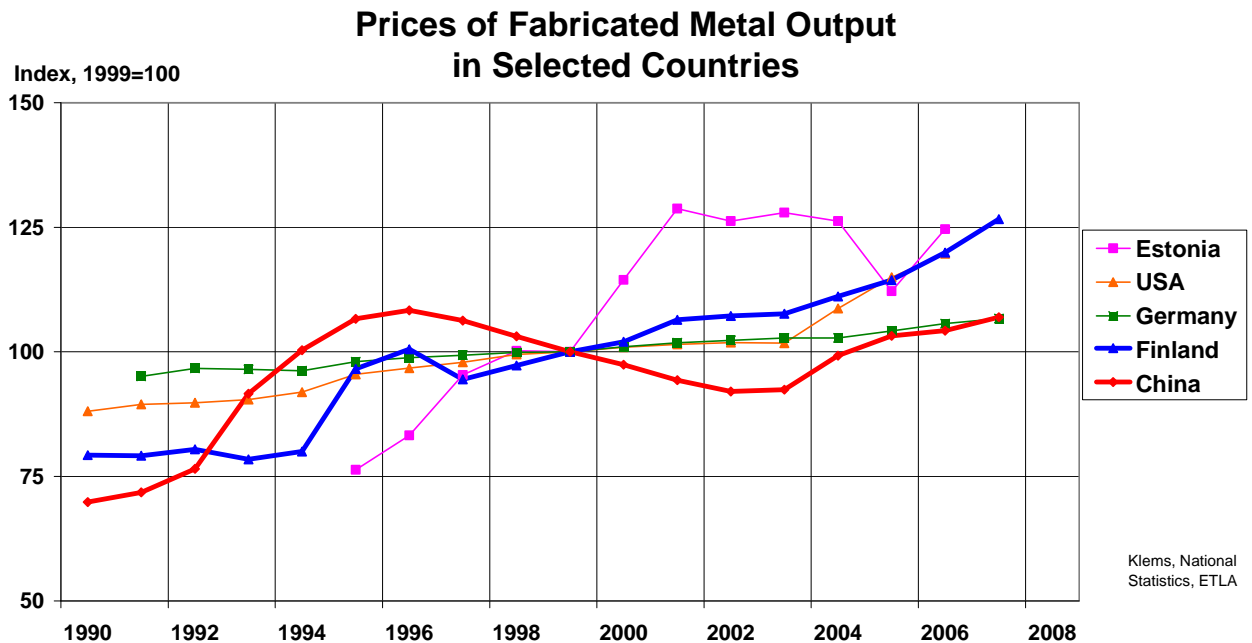
The rapid Chinese growth has had a significant impact on the global production structure of fabricated metal industries as China has step by step become more dominant globally.

In all the other selected countries, the growth has been modest. The average annual growth rates in Finland and Germany were 6 and 3.2 per cent in 1999-2007. In Estonia, production grew annually by 13.5 per cent in 1999-2006, while the US production grew only a half a percent in a year.

Average price levels⁴ of fabricated metal industries seem to vary surprisingly much between China and the other countries in selection. The US price level declined below the German level in 2003 and 2004 thanks to a depreciation of the US dollar vis-à-vis euro. In 2005-2006, the dollar fluctuated rather strongly vis-à-vis euro, but annual averages were rather stable turning the US prices into rise in terms of German prices. This tendency has obviously continued in 2007 as the USD continued its depreciation.

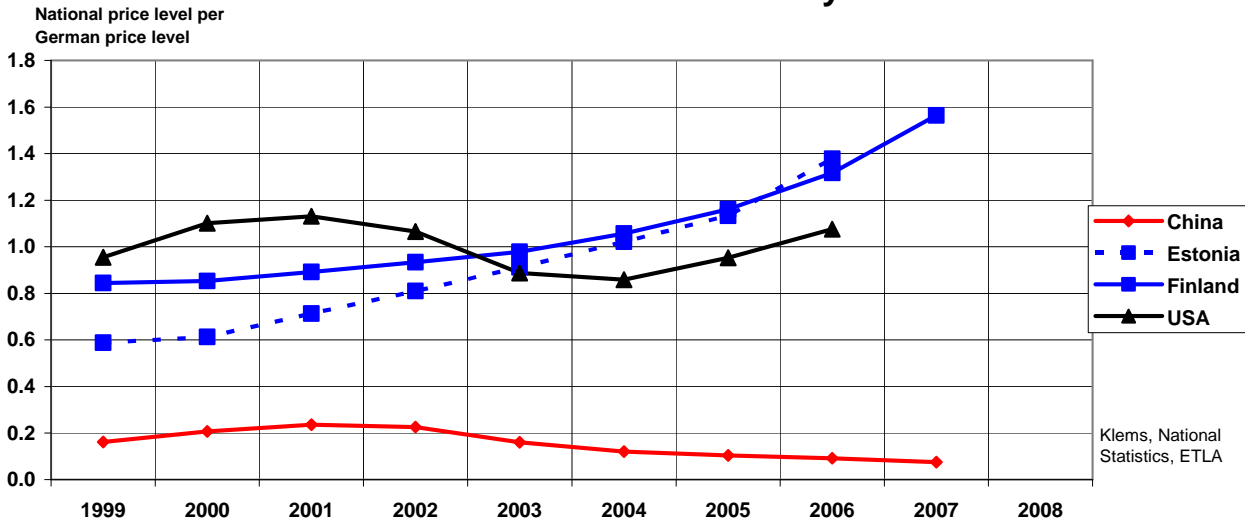
The average Chinese price level of fabricated metals was only about 10 per cent of that in Germany in 2007. Chinese prices have also declined since 2002 in comparison to German level partly due to the appreciation of renminbi, partly reflecting a rise in the productivity due to modernising production capacity. Also, the pricing of foreign firms of their own Chinese production for their own use have obviously reflected the low wage levels in China, which has improved their profitability in the home countries.

However, it has to be noted that the price levels reflect the average prices of different composition of products, which causes downward bias in the Chinese levels. Industrialised countries produce normally more value added products with higher prices, while Chinese production has been concentrated on low-value added products with low prices, although the intention is to raise the value added contents of products.



⁴ Unit value ratio vs. Germany divided by the nominal exchange rate.

Comparative Price Levels vs Germany in Fabricated Metal Industry



3.1.1. Cost structure of output

In the group of selected five countries, the most developed nations use considerably less intermediate goods in their fabricated metal production than Estonia and China. The share of intermediate goods of gross production of fabricated metal production varies in three developed countries between 55 per cent in the USA, close to 60 per cent in Germany and Finland. In 2006-7, all the shares had risen somewhat. In Estonia and China, intermediate goods made up more than 70 per cent of their gross productions.

The cases of Estonia and China are of special interest due to their rapid growth in the early 2000s up to 2008. The high intermediate good shares mirror low share of value added by definition. In China, the low share of value added of gross production was reflected as expected in low share of labour compensation. However, also the share of gross profits was also very low as Chinese products were obviously priced with low margins. This is seen in low prices if compared to Germany, only about 10 per cent of German prices, as well as a large number of bankruptcies during autumn 2008 caused by the darkened economic outlook due to financial crisis.

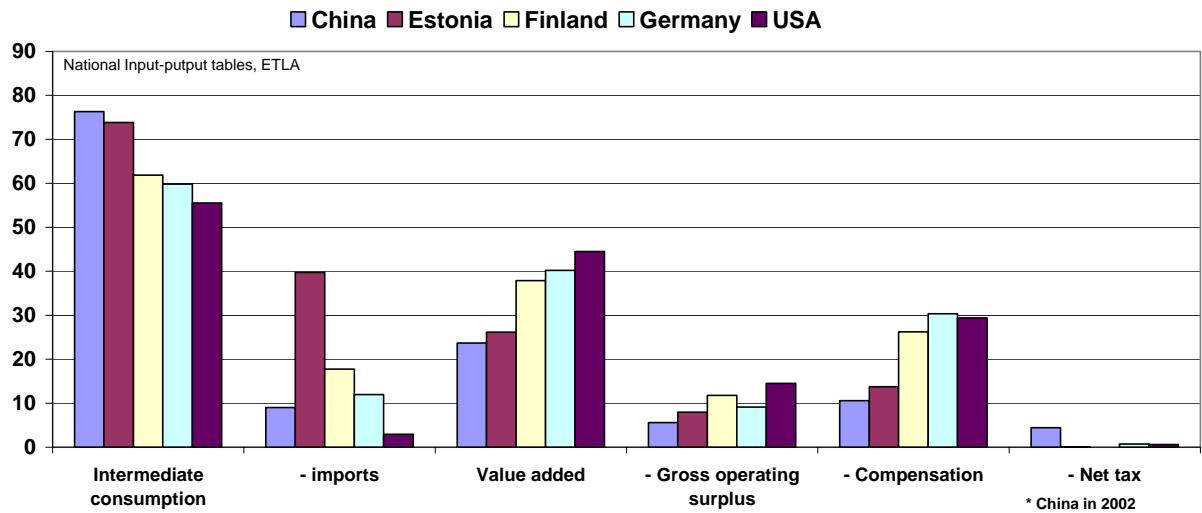
Chinese fabricated metal industries had an unusually large share of net taxes on production (production taxes less subsidies). Chinese labour compensation per person has risen very rapidly, but production has risen even more rapidly, which has decreased the share of labour compensation of the gross output in recent years.

In Estonia, the value added share of gross production was higher than in China as were the shares of labour compensation and profits. Net taxes were negligible like in the three selected industrialised countries. The wages have risen in Estonia very rapidly, albeit less rapidly than in China. Productivity has not been able to compensate the wage raise and consequently, the labour cost competitiveness has deteriorated sharply (see chapter 4).

The US share of intermediate goods of gross production was clearly the lowest in the beginning of the 2000s in the group of selected countries. It has, however, risen after that and is now close to the level in Germany. The US development has obviously reflected the globalisation-led change in the production structure. The use of foreign US owned intermediate goods as well as foreign good have risen in order to make production more efficient and profitable. The Finnish share is clearly higher than in Germany and in the US. This obviously reflects the necessity of a small country both to specialise and use the international division of labour.

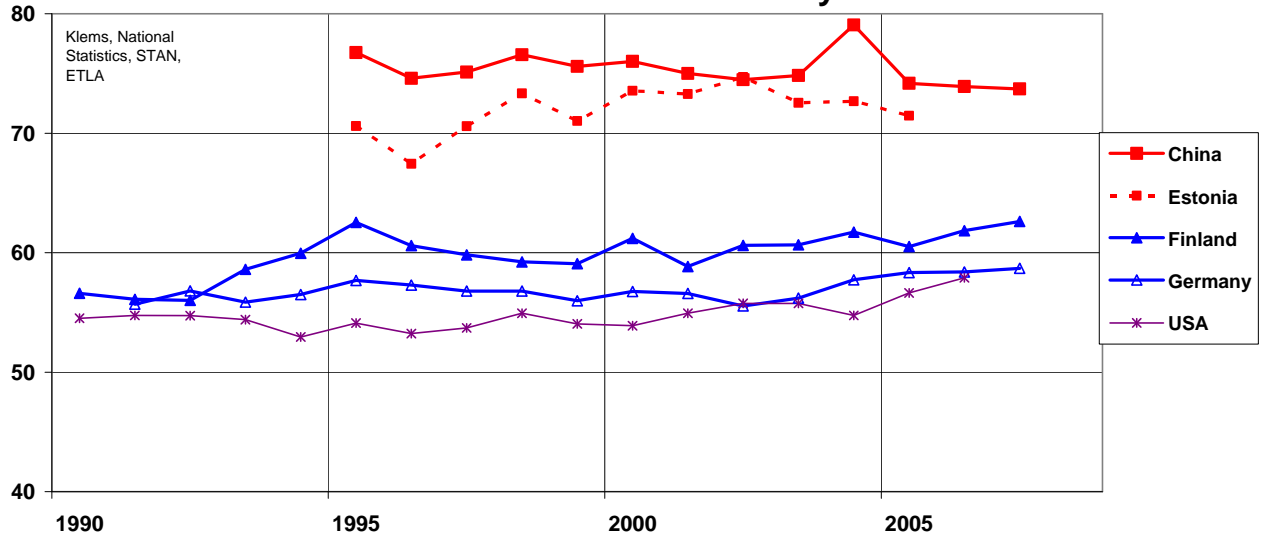
Composition of Output in Fabricated Metal Industries, in 2000*

% of gross production



Use of Intermediate Inputs per Unit of Gross Production in Fabricated Metal Industry

Index, 1999=100



Use of intermediate goods in fabricated metal industries in 2000 * by sectors, % of gross output					
	USA	Germany	Finland	Estonia	China *
Fabricated metal industry (Nace 28)					
Intermediate use	55.5	59.4	61.9	73.8	76.3
- Fabricated metal industry	10.0	15.9	10.4	14.3	11.1
- Iron and steel	10.4	13.9	26.6	..	33.0
- imports	10.3	12	17.8	39.7	7.3
* Chinese imports estimated by the OECD (2002) Source: Input-output tables (OECD)					

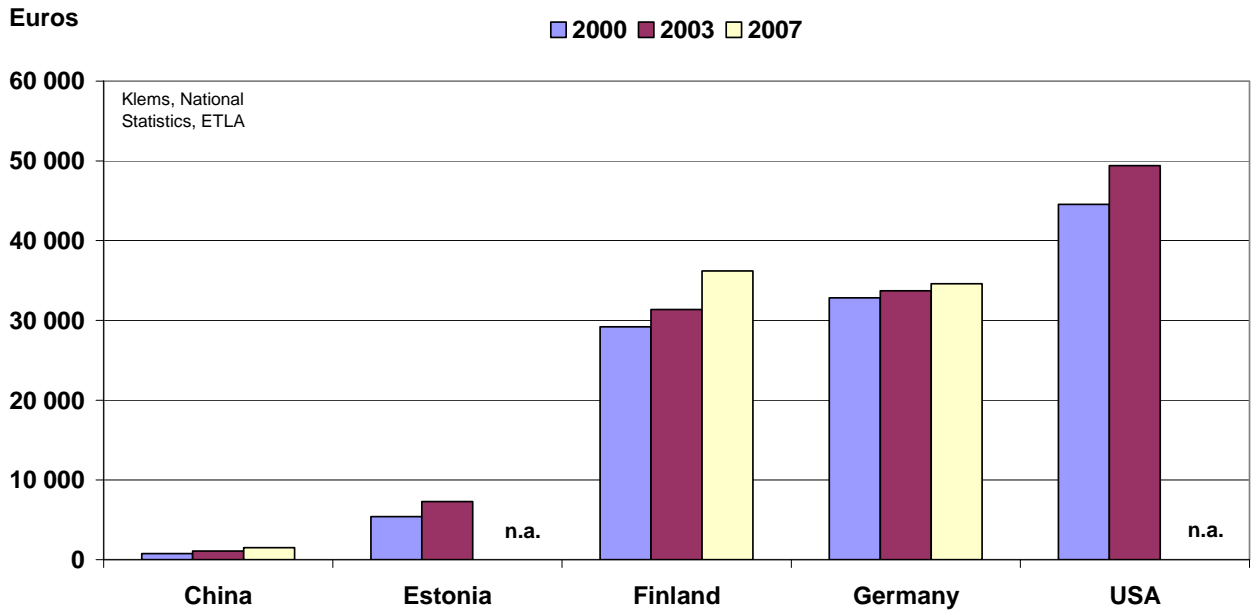
Firms in the fabricated metal manufacturing are less linked to the firms in the same industry than the firms, e.g., in chemical and paper industries. In chemicals and chemical products industry (excluding pharmaceuticals), the input shares from the same industry varied between 21 and 28 per cent in the group of selected countries with the exception of Estonia with a share of 4 per cent. In paper industry, these shares varied between 33 and 35 per cent. The input shares of gross production from the same industry in fabricated metal manufacturing varied from 10 per cent in the US to 16 per cent in Germany. The import shares were naturally higher in the smaller countries reaching 18 per cent in Finland and almost 40 per cent in Estonia. The share was the lowest in China, which reflect both its abundant resources and its relatively low value added production.

3.2. Fabricated metal industry in China

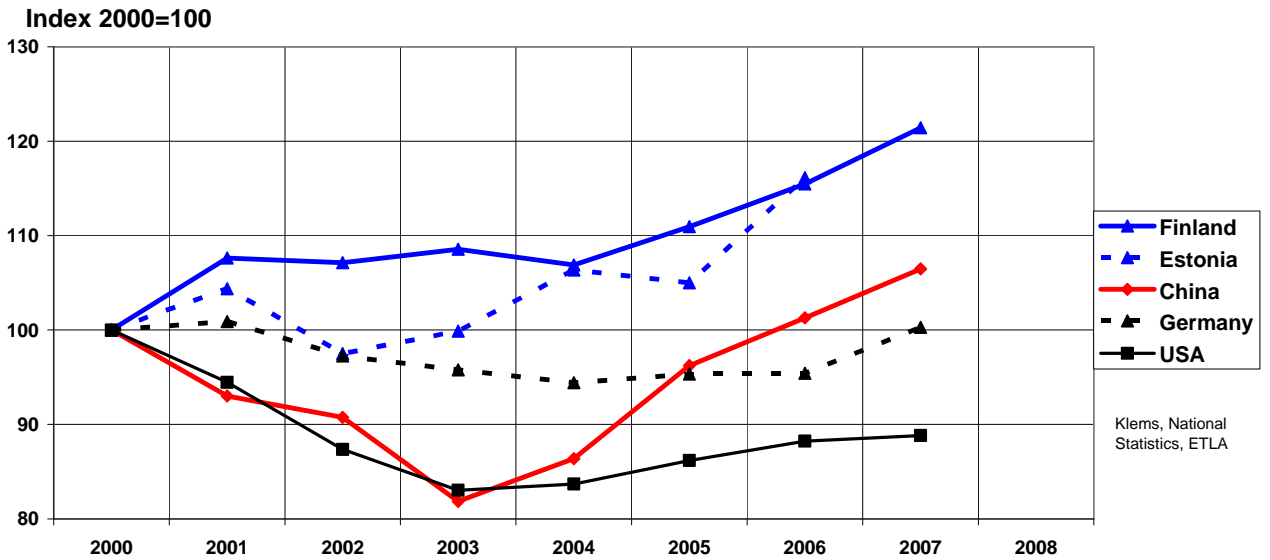
In China the fabricated metal industry like most industries has started to grow from the low level, which partly explains the high growth rates. The growth accelerated in the 2000s. China surpassed the US as a largest producer of fabricated metal products, if measured with volume of gross output in comparable units. China is now the far largest producer in this sector with this measurement. However, in terms of value added, the US is in a better position.

Chinese fabricated metal production like paper production has grown in line with the average of the manufacturing in the 2000s so far, though the very rapid growth in the radio, television and equipment production has raised the average.

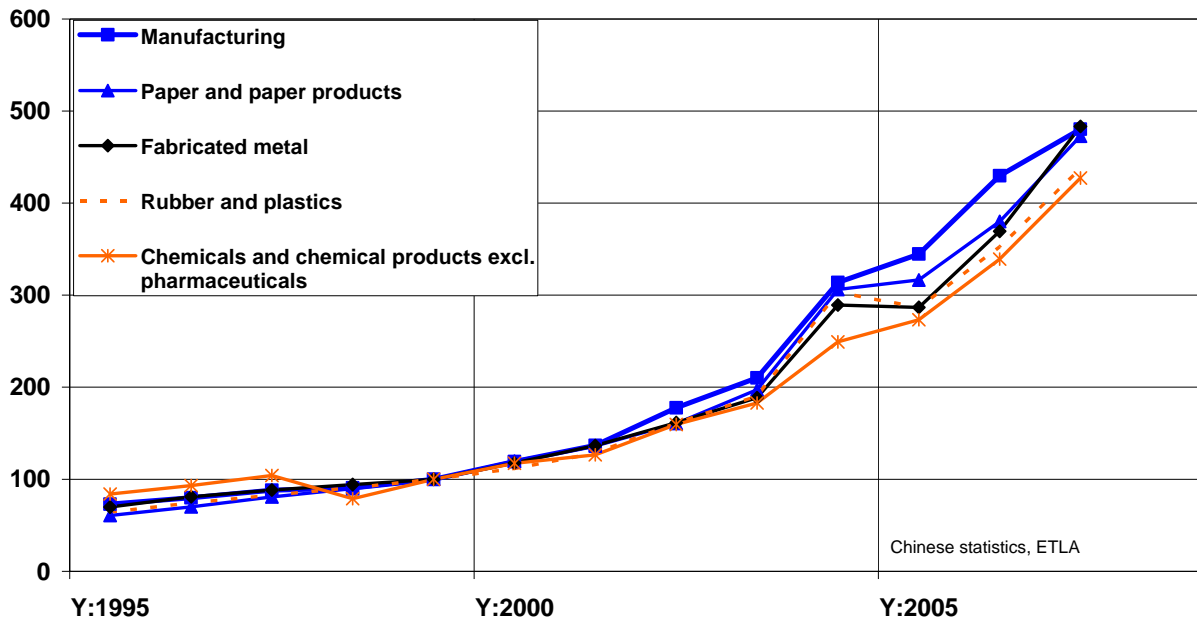
Annual Labour Compensation per person in Fabricated Metal Industry



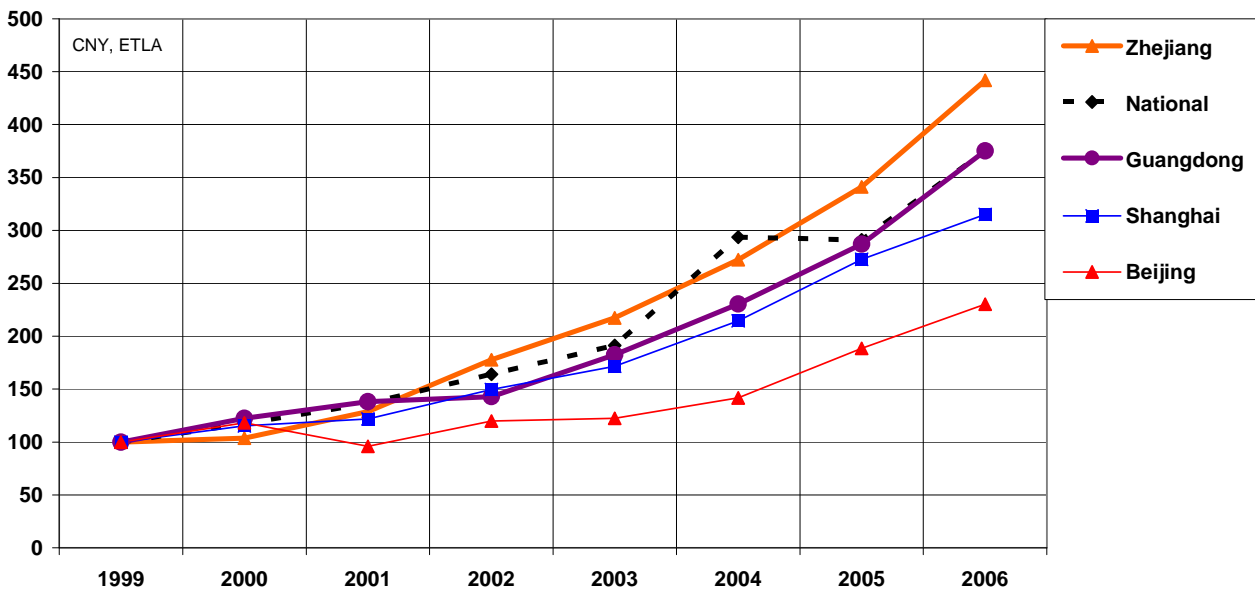
Employment in Fabricated Metal Industries in Selected Countries



Chinese Gross Output in volumes



Fabricated Metal Production Volumes in China by Provinces



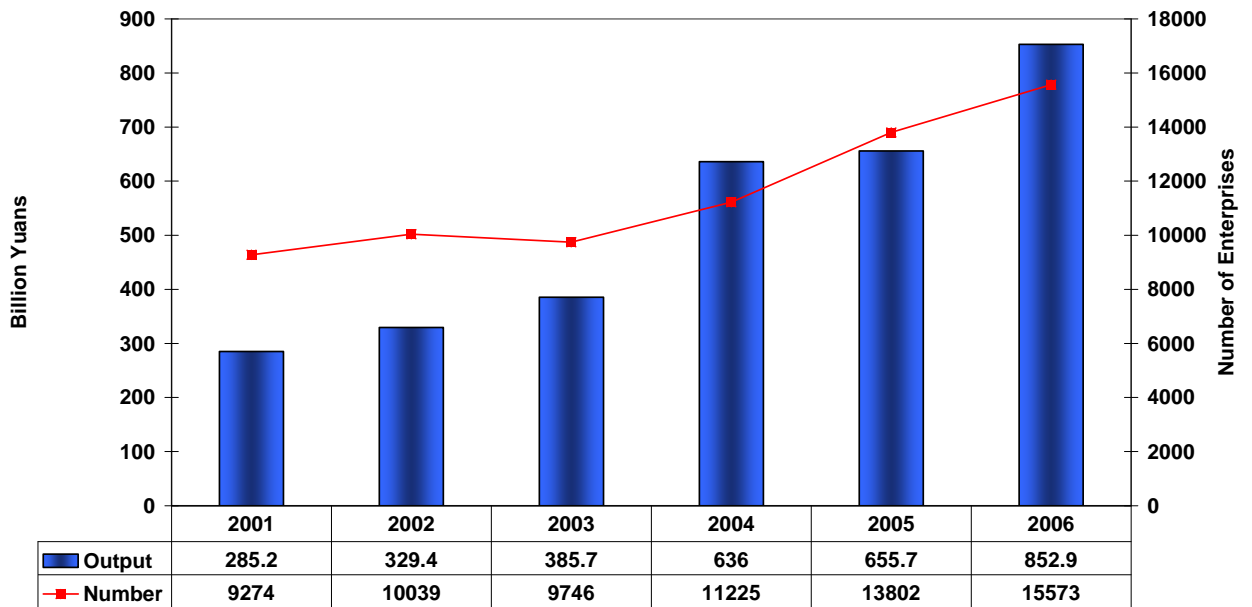
3.2.1. The development process of fabricated metal industry in China

The rapid Chinese economic development in fabricated metal industry can be described by the rapid increase in the gross industrial output and the number of companies. After having a rapid increase from 2003 to 2004, the increase slowed down in 2005, but returned back to a

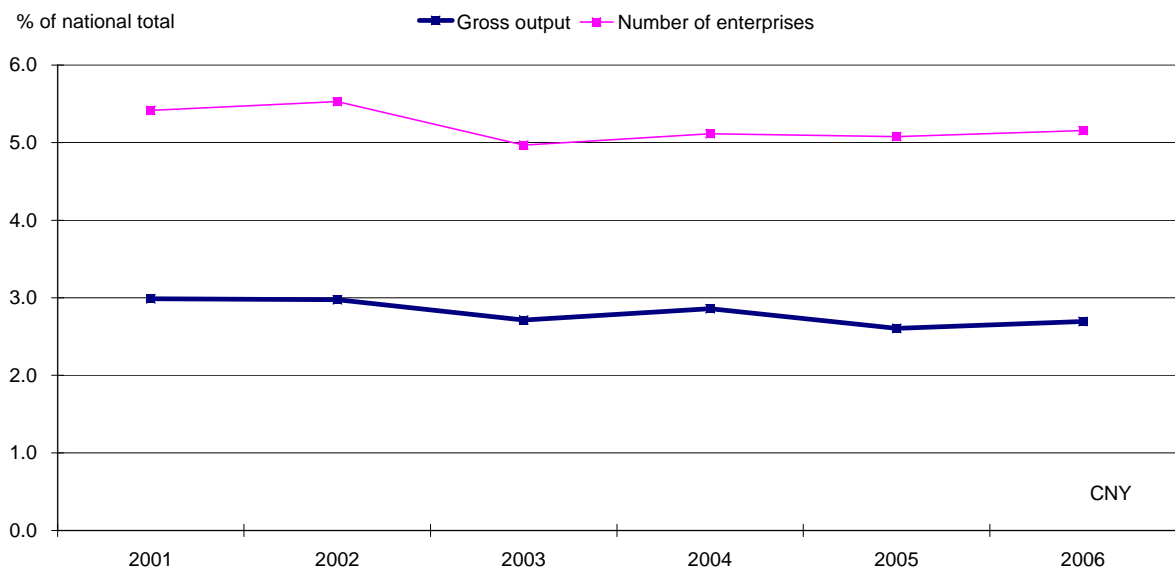
quick increase in 2006. The value of gross industrial output nearly doubled by increased from 285.2 billion to 852.9 billion yuans in 2001-2006. The number of enterprises rose a bit slower, but the rate was still impressive 67.9 per cent.

The percentage shares of fabricated metal output and number of enterprises of national totals have been relatively stable in spite of the strong rise in absolute values. The share gross industrial output has even slightly decreased.

Gross Output and Number of Companies in Chinese Fabricated metal Industry



Gross output and Number of Enterprises of the Fabricated Metal Industry



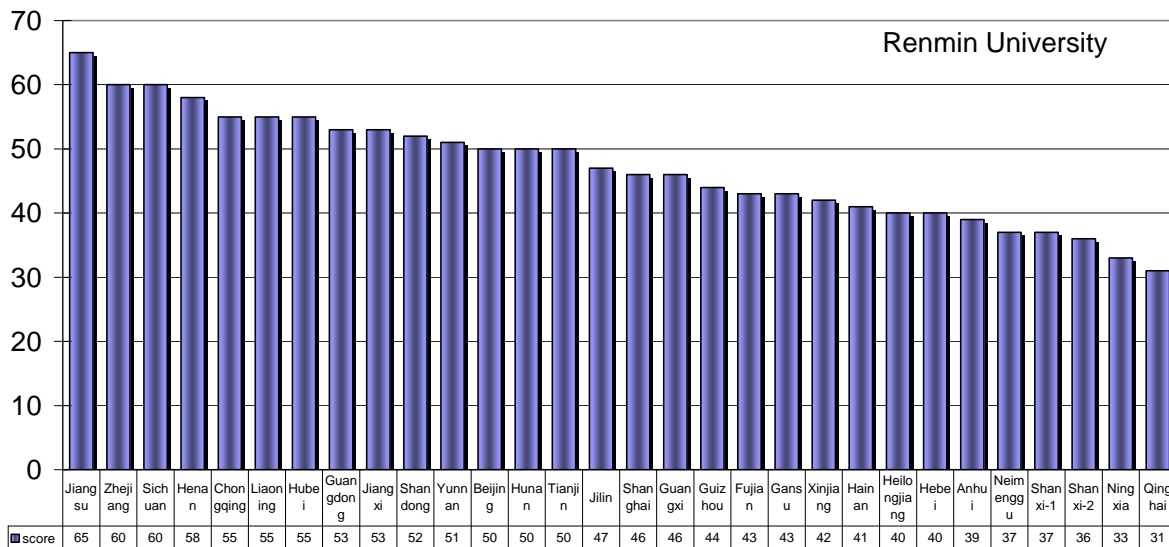
3.2.2. Fabricated metal industries in Chinese regions

The scale of the production as well as the trends in the fabricated metal production vary significantly in China by regions, although the production is strongly increasing in all the regions if compared to the global developments. Prices of the products have been relatively stable in spite of strong rises of wages and raw material costs. This reflects a strong rise of the productivity in the sector like in most manufacturing sectors in China.

In the Center of Applied Statistics (CAS) of the Renmin University, the competitiveness of the Chinese regions is studied in order to reveal the strengths and weaknesses of industrial sectors. The final result of the general regional competitiveness is expressed as a balance of responses to seven measures. Larger the balance better is the competitiveness of the region.

There are significant differences between different provinces. The scores vary from 31 to 65. Jiangsu, Zhejiang and Sichuan perform very well. They are characterized by a strong ability for independent R&D and applications and their markets shares are high. The score of Anhui, Neimenggu, Shanxi-1, Shanxi-2, Ningxia and Qinghai are below 40. They have inadequate level of investments in innovation and they are weak in using applications. In Eastern regions, all the provinces except Anhui are performing well. Differences between Western provinces are, however, large. Sichuan ranks the 3rd, while Qinghai is the worst province if the competitiveness is concerned.

Regional Competitiveness of Fabricated Metal Industry by Provinces



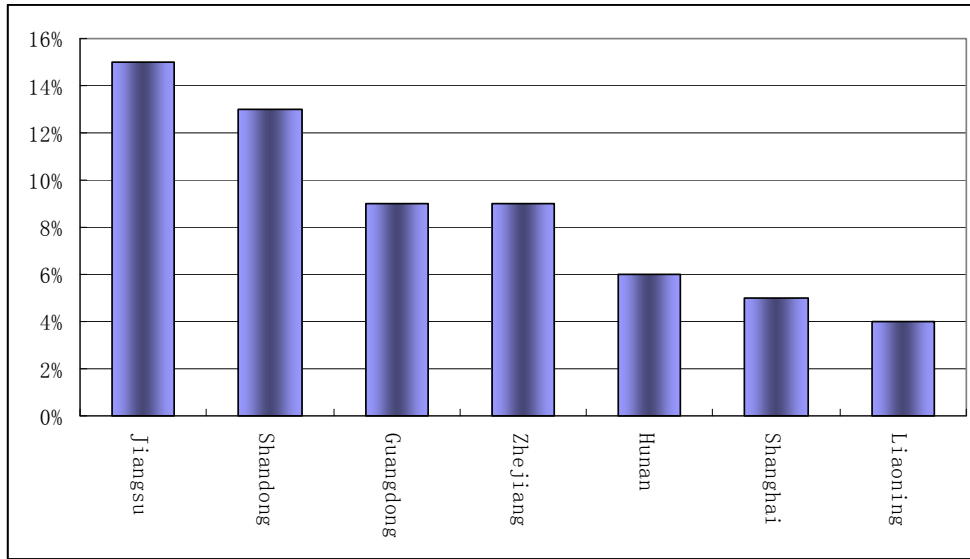
3.2.3. Performance of the main provinces

We focus mainly on five provinces: Shanghai, Zhejiang, Guangdong, Shandong and Beijing. These provinces can be characterized as medium ones, they are not bad neither the top ones. Zhejiang ranks 2nd in regional competitiveness, which is the best rank among the five provinces. Other provinces like Shanghai are far behind.

The top five provinces by market shares are Guangdong, Jiangsu, Zhejiang, Shandong and Shanghai. The competitiveness of Guangdong is not very strong, but its market share is, however, relatively high, more than 20 per cent of the total. Shanghai and Shandong have also relatively high shares. Their location is good and economic stage relatively high among all the provinces. The top five provinces produce over 70 and the top ten provinces account for more than 88 per cent of the fabricated metal production in a whole country, which reveals a clear clustering trend.

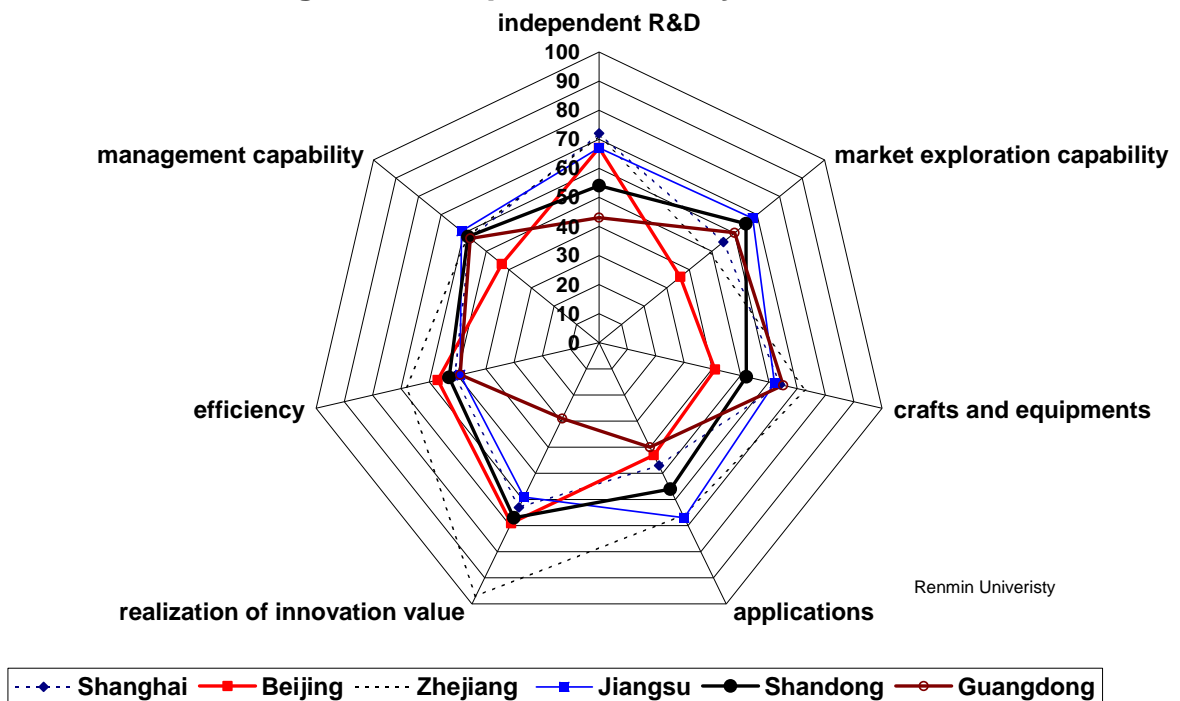
The market shares of top ten provinces in the Chinese fabricated metal industry	
Province	Market shares (%)
Guangdong	23.05
Jiangsu	17.80
Zhejiang	12.65
Shandong	9.70
Shanghai	8.17
Hebei	4.51
Liaoning	4.14
Tianjin	3.54
Henan	2.61
Fujian	2.47

Percentage share of number of enterprises in selected Chinese provinces



The top five provinces by the number of enterprises are Guangdong, Zhejiang, Jiangsu, Shandong and Shanghai, which account for about 68 per cent of the number of enterprises. Guangdong accounts for 21% and it has also the largest market share. However, its synthesis competitiveness does not bring it to the group of the strongest provinces. Guangdong needs to advance its innovation activity to maintain its good relative position by many other measures.

Factors of Regional Competitiveness by Selected Provinces



In the attached chart the details of the seven factors that influence the competitiveness are shown. Zhejiang and Jiangsu perform well with most of the factors, but they both perform badly by management and efficiency, which reveal their disadvantages. Guangdong and Shanghai perform unsatisfactorily by all the factors, but the market shares and number of are high. It may be a hint of the future bad development of these two provinces. In order to maintain their positions, improvements of their innovation capacity are called for.

3.2.4. Challenges of regional developments

The provinces with strong innovation ability distribute all across the China, like Jiangsu, Zhejiang, Shandong, Henan, Hunan, Hubei, Guangdong and Shanxi. Some of the regions are important producing and selling bases, some are important regions in technological innovations. Provinces like Zhejiang, Jiangsu, Shanghai and Guangdong are the strongest; most of the enterprises are situated in these provinces, which provide an obvious clustering advantage. In 2006, the R&D investment of the four provinces accounted for 72.5 per cent of the whole country's R&D investments. The value of new products accounted for 57 per cent and the added value of profits accounted for 50 per cent of the national totals.

Chinese rapid developments have many aspects in the fabricated metal industry. First, the quantity of production has increased dramatically. In 2000-2004, the average annual increase of metal production was more than 18 per cent. Imports and exports are both rising rapidly. Third, improvement of equipment and craft is taking place rapidly mainly due to the imports of foreign advanced equipments. Fourth, regional distributions have changed substantially. The clustering advantage has developed in recent years and the economics of scale has extended. Ten years ago, there were less than 30 enterprises, whose capacity of production was more than 30 thousands tons. Today, there are more than 60 enterprises of this size and five of them are listed on the stock markets.

There are also obstacles for production of fabricated metal industry in China. The structure of production is not rational. Both over-production and structural shortages exist at the same time.

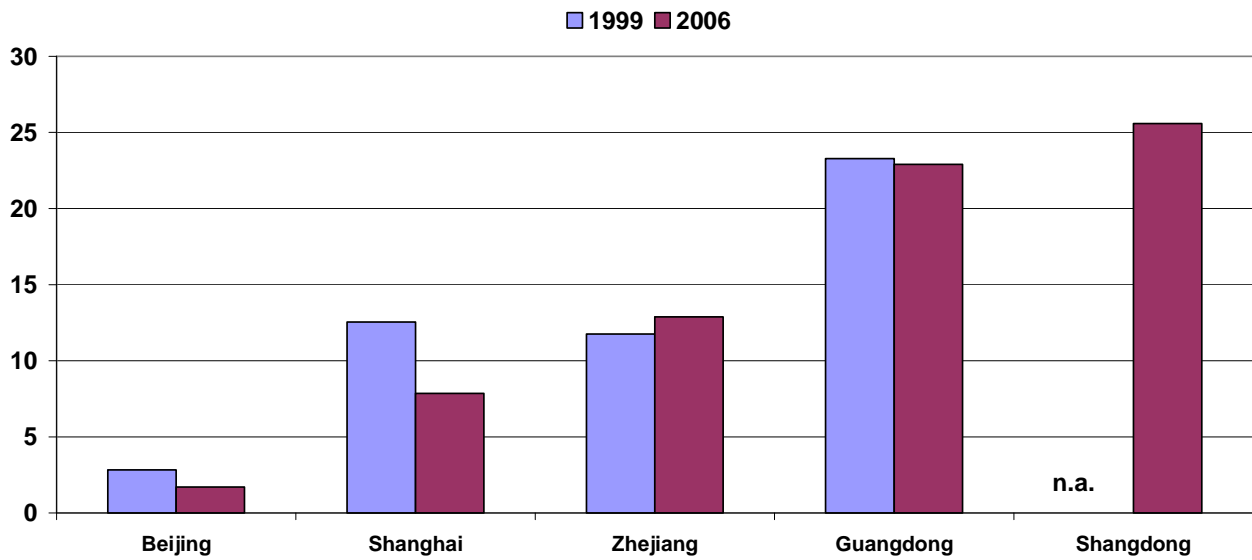
The industry is also weakened by the inadequate innovations. The small scale of most enterprises together with low industrial concentration leads to the low efficiency, low capacity utilisation rates and high energy cost per unit of production. These factors are detrimental for the efficient use of advanced equipments and skilled labour force.

The shock of financial crisis has strongly influenced the fabricated metal industry. Because of the weaker demand and the pessimism attitude of market, the main fabricated metal product demand has deteriorated both abroad and at home especially in autumn. A huge number of low-margin firms have got into bankruptcy e.g. in Guangdong. Competition is getting more fierce also in this sector, tough decreasing raw material prices like steel prices, non-ferrous metal prices give some relief. The decline of the world market prices of energy do not affect similarly because of regulations of domestic prices.

In response to the rapidly deteriorating economic situation in autumn 2008, Chinese government has issued an investment plan of 4000 billion yuans to simulate investments, especially in infrastructure. Metal related industries will benefit from this package. Although the immediate effects will be rather small, we this policy will boost the metal industry significantly.

Fabricated Metal Production in Selected Chinese Provinces, Share of National Total

Per cent



4. Cost competitiveness of fabricated metal industries

The success of a firm or an industry in global competitiveness depends on its ability to produce goods in a profitable way. The management of costs of the production has a key role in this respect in competitive markets. Opening up of the markets in globalisation spawns competition and calls for efficient use of resources. Labour costs are in a key role in this respect due both to their large share in production costs, albeit strongly varying between industries, and the large differences in labour costs between economies, especially between industrialised countries and emerging markets like China. That is why we focus on the role of labour costs in describing the developments in cost competitiveness

4.1. Unit labour costs in selected countries

In this chapter we describe the development of unit labour costs and its components fabricated metal industry (NACE 28) in the selected countries. Unit labour cost (ULC), i.e. labour costs per unit of gross output in volume terms has developed strikingly different way in China than in the other countries reviewed.

Chinese ULC declined in 1999-2004 and has risen slightly since 2004. Labour compensation (wages plus other costs) have more than doubled in 1999-2007 by growing 10.6 per cent in a year. Productivity, however, increased even more resulting in stagnant unit labour costs. Real wages have risen rapidly as well in the growth period as consumer inflation has been stable until 2007/8, when food prices rose significantly. However, even then employees of the sector have raised their real earnings. In 2008 a drastic change has taken place as described earlier. This led to pronounced decline in the employment in the fabricated metal manufacturing as production are strongly cut due to both rapidly deteriorating demand development and very dark outlook. This obviously ceases also the strong rise of the earnings.

Estonian production has risen rapidly, but labour compensation has risen even more rapidly. Unit labour costs of the industry have been on a rise since 1995 until 2005, when they declined. Global crisis affects strongly the Estonian production. National account data is published in a long lag, but the trend in the industry has changed in the 2007-2008

In Finland, the unit labour costs rose very strongly in early 1990s after the Depression as real output developed sluggishly and wages rose rapidly from the low level. The trend turned lower in the beginning of the 2000s as demand from industrialised countries dampened after the burst of the techno bubble. After 2005, the Finnish fabricated metal industry begun to benefit from the very strong global economic growth as Euro Area countries started to recover from a rather long stagnant period. Labour costs continued their rapid rise, but unit labour costs turned to decline in 2006-2007 as strong growth in production improve the productivity pronouncedly.

German development of unit labour costs in the early 2000s differs strongly from the developments in the other selected countries. German economic growth was weak after strong growth in 2000. Growth of the production of fabricated metal products even ceased in 2001 and declined by over 6 per cent in 2002 after strong growth in the turn of the century. Employment even declined rapidly 2002-2004. As a result wage development was

also very moderate. Production per person rose rapidly, however. Unit labour costs have declined in 2003-2007.

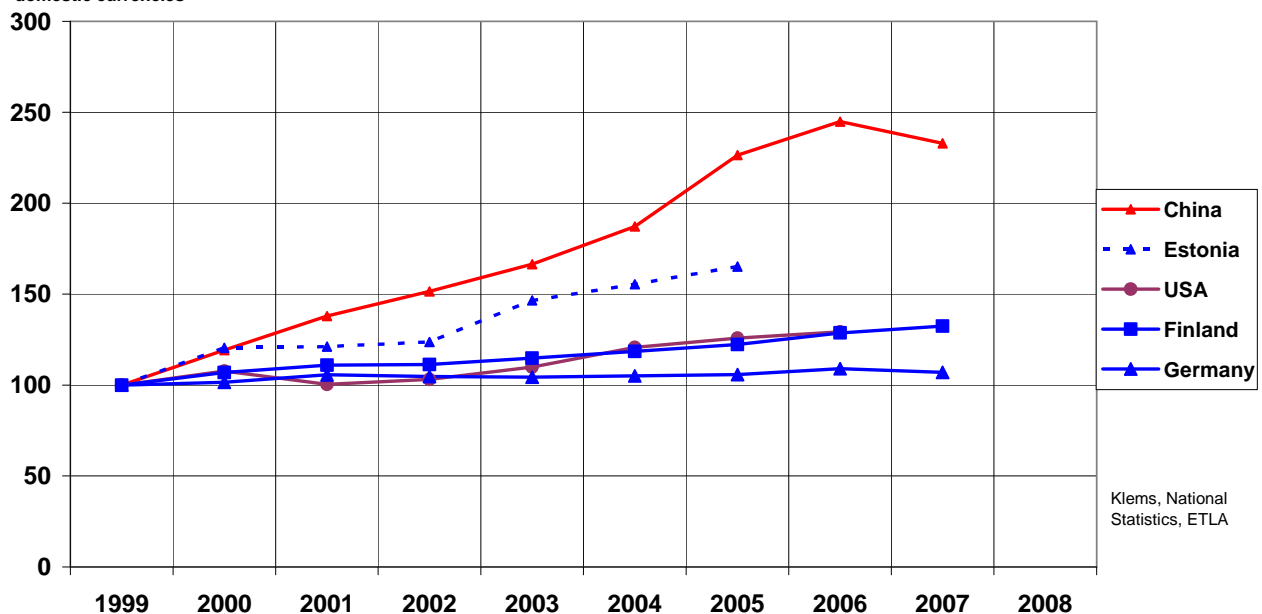
The US unit labour costs have risen slightly in 1999-2006. The US economy was in recession in the end of 2001. However, unit labour costs of fabricated metal industry rose in the year. Labour compensation reacted to worse economic situation by declining strongly, but production declined even more. Both production and labour compensation started to grow in 2002. However, the ULC stayed stable in 2004-2006.

Financial crisis is affecting the US producers very strongly. The US drifted into recession in December 2008 according to “official” definition determined by the NBER (NBER 2008). However the seasonally adjusted quarterly GDP declined only in the fourth quarter according to estimates made in late 2008. However, the GDP growth rates in the last two quarters of 2008 appear to be negative. The Outlook for the US economy and for its fabricated metal producers is dim.

From the perspective of metal producers the difficulties of the big three car makers is especially worrisome. High gasoline prices, low growth and financial crisis have driven the large US car producers, General Motors, Ford and Chrysler close to bankruptcy. Government has made bail out plans, but they have not gone well further in the congress. The firms may be too big to fail. However, if a bankruptcy or bankruptcies take place, it would have a devastating effect on the industry in the US as well as on the foreign producers both directly and indirectly. It would mean a big rise in unemployment and demand for cars and other products. It would also quite certainly call for protectionist measures to safeguard the rest of the industry.

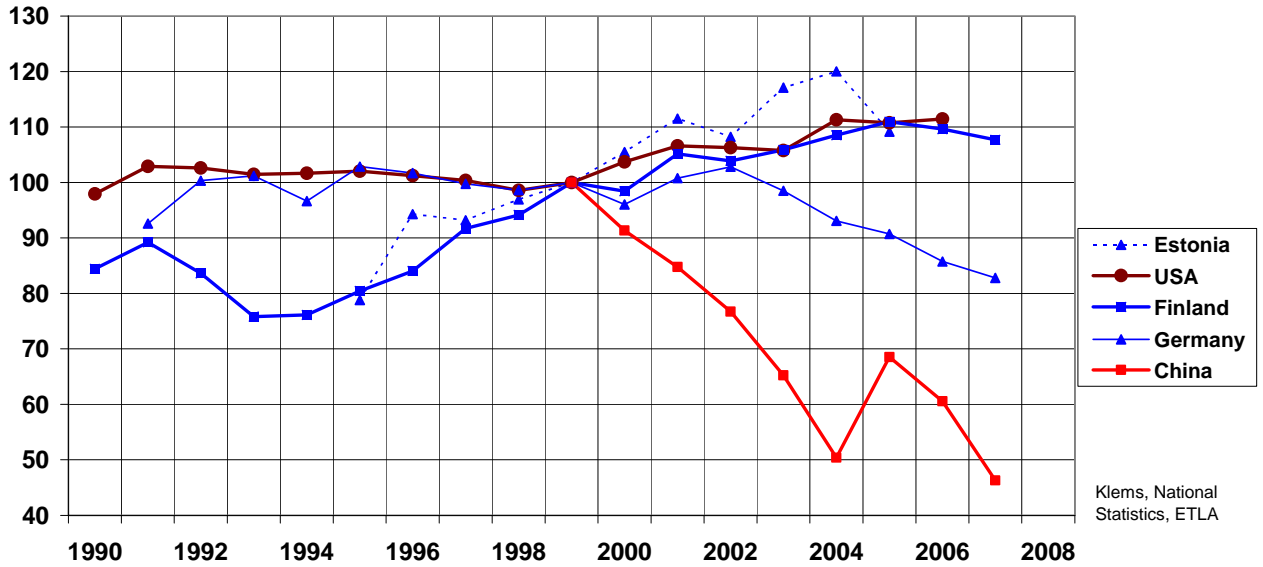
Wages per Person in Fabricated Metal Industry in Selected Countries

Index, 1999=100, in
domestic currencies



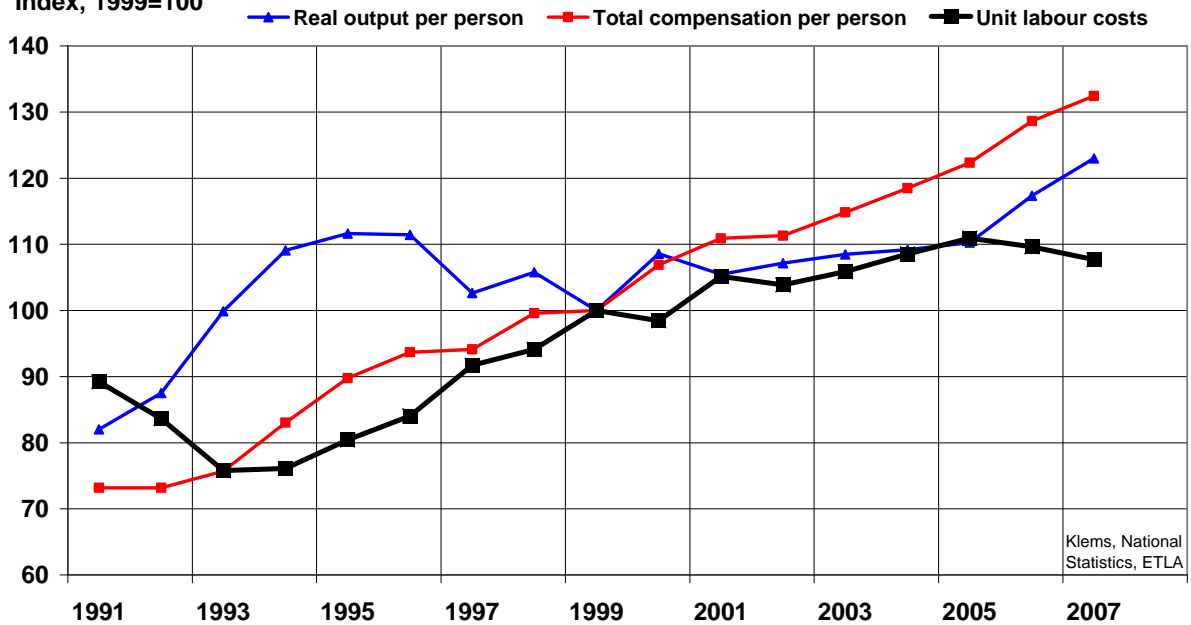
Unit Labour Costs in Domestic Currencies in Fabricated Metal Industry

Index, 1999=100

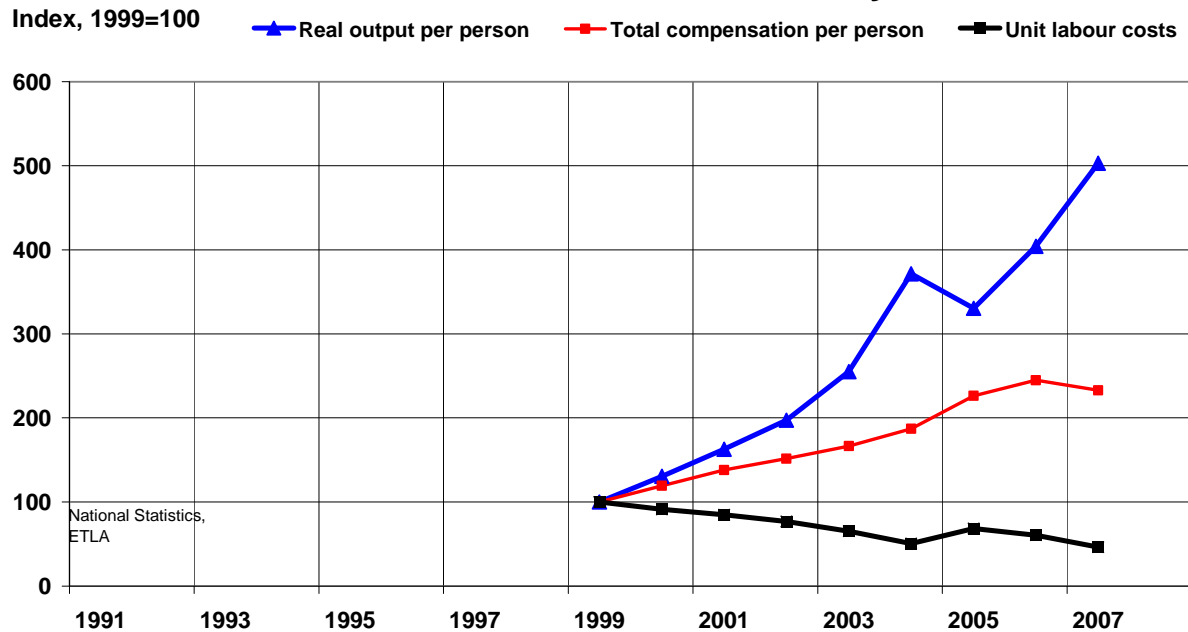


Finnish Wages, Productivity and Unit Labour Costs in Fabricated Metal Industry

Index, 1999=100



Chinese Wages, Productivity and Unit Labour Costs in Fabricated Metal Industry



4.2. Relative unit labour costs in selected countries

In this chapter we compare labour costs of fabricated metal production (NACE 28) in selected countries. In comparison of labour costs, we start by converting the labour compensation in different countries into euros. In addition to this easily misleading measure, we calculate also relative unit labour costs (RULC)⁵ both as indices as usual and also in levels using German costs as a comparison basis to achieve relative productivity-corrected wage levels. This is achieved by converting labour compensation into euros and volumes of production into comparable units by using unit value ratios, UVRs⁶ from 1999.

The average Chinese annual nominal labour compensation per employee is close to four per cent of both German and Finnish labour compensation in fabricated metal industry in 2007. Estonian labour compensation was respectively about a quarter of the Finnish and German costs in 2005.

Labour costs differ substantially between nations, if calculated in a common currency and it is basically a normal situation. However, in normal circumstances unit wages in a common currency should be close to each other in all the countries as nominal wage differences do not normally reflect the productivity of the labour.

⁵ $RULC = e \cdot ULC^* / ULC = (e \cdot Comp^* / Q^*) / (Comp / Q) = (e \cdot Comp^* / L^* / Q^* / L^*) / (Comp / L / Q / L)$, ULC = unit labour costs, e = exchange rate Comp = labour compensation, Q = volume of production (converted to comparable units with UVRs), L = Employment, * denotes foreign country

⁶ UVR = unit value ratio. Converts volumes into common currency. See Suni-Ahveninen 2008.

Wages and wage compensation in Chinese Fabricated Metal industry in 2004							
	Average wage per employee (in yuans)	Pension, medical insurance as % of wage	Housing fund & subsidies as % of wage	Welfare fund per employee as % of wage	Labour, unempl. insurance as % of wage	Average compensation per employee (in yuans)	Costs per average wage, %
Metal products	13030.5	7.4	1.3	10.5	1.9	15777.4	13.7
Ordinary machinery manufacturing	14395.0	13.2	3.0	12.7	3.8	19102.2	19.5
Electric equipment and machinery	14609.6	9.2	2.1	10.7	2.2	18126.1	14.9
Special purpose equipment manufacturing	14985.6	15.9	3.1	12.1	5.2	20423.9	20.4
Smelting & pressing of nonferrous metals	15225.7	13.9	3.5	15.0	5.1	20920.1	23.5
Instruments & office machinery	16147.3	11.9	8.2	10.7	3.7	21719.8	22.6
Transportation equipment manufacturing	17706.4	15.3	5.1	14.2	6.2	24928.8	25.5
Electronics and telecommunications	19387.8	8.6	2.8	10.4	1.8	23943.9	14.9
Smelting & pressing of ferrous metals	20370.1	16.4	4.2	13.0	9.0	29037.5	26.2
Manufacturing	13974.3	10.90	2.86	11.59	3.77	18043.6	18.2

Source: Banister 2007

Annual total labour compensation of employees in fabricated metal industry									
	Euros per employee					%	%	%	%
	2000	2003	2005	2006	2007	Newest /2005	Newest /2000	Newest vs Finland	Newest vs Germany
China	1037	1183	1477	1627	1808	122.4	174.3	5.1	5.3
Estonia	5423	7298	8534	100.0	157.4	25.5	25.0
Finland	29214	31382	33433	35155	36196	108.3	123.9	100.0	104.6
Germany	32836	33734	34194	35234	34596	101.2	105.4	95.6	100.0
USA	44559	49422	52221	53981	..	103.4	121.1	153.6	153.2

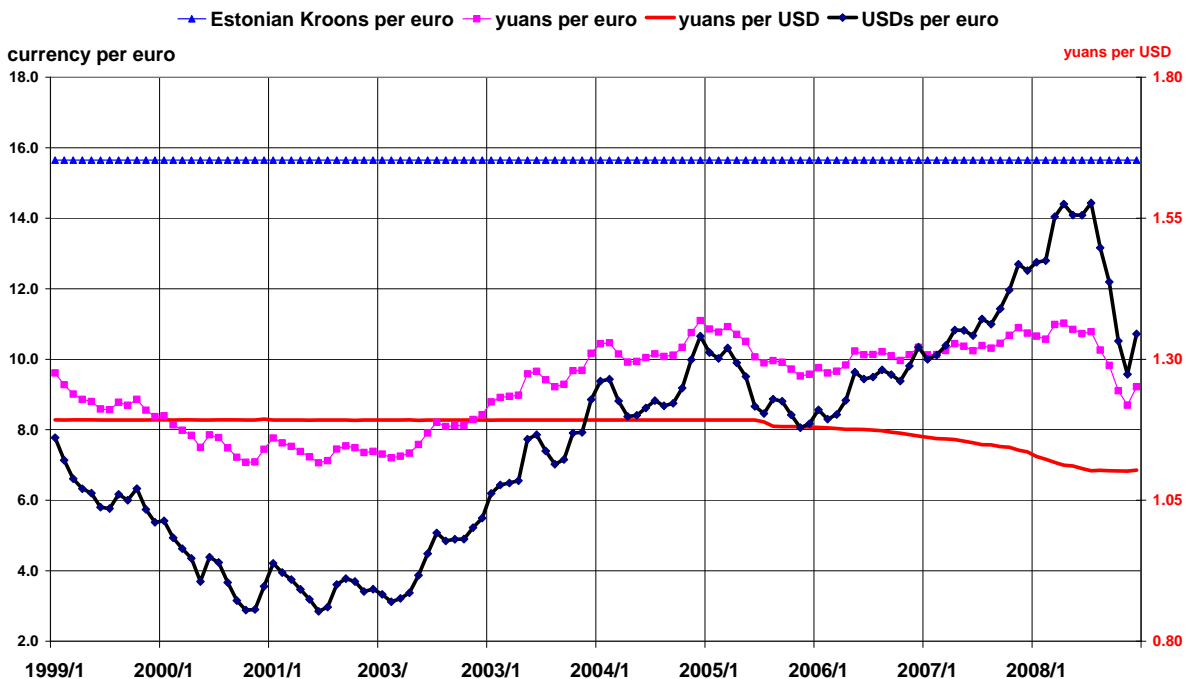
Source: KLEMS, Chinese statistics, ETLA

It is the wage costs per unit of production in a common currency, which matters in international competitiveness assessment instead of nominal labour costs as such. The differences in the unit wage costs take into account differences in productivity and exchange rates and thus reflect true competitive potential of the industry or the firm. Countries with low wages suffer normally from poor infrastructure, low level of skills of the labour force, political instability and/ or isolation from the other economies, which factors should equalise the unit costs.

Before globalisation either labour costs in common currency and per unit of production have been close to each other giving little incentive to expand production in low-wage countries, or their has been limited access to these markets. In fact, in the end it is the profitability, which matters and thus also the development in the other costs and their productive use also matter.

In process of globalisation differences in relative unit labour costs in common currency will spur both foreign and domestic investments and production in low unit cost locations and dampens the production growth in expensive locations. Differences in unit labour costs in a common currency gradually diminish as labour costs rise slower in expensive countries than in low-wage countries and/or exchange rate will appreciate in low wage countries vis-à-vis high wage countries. This may happen rather quickly like it seems to happen in Estonia or slowly like in China. In Estonia, the economic adjustment takes place quickly as the economy is very small, which makes it possible to benefit from the catching up potential quickly.

Selected Bilateral Exchange Rates



China is huge, most populous nation in the world with very large labour reserves. In China, there is, in principle, a very large labour force potential in rural areas as the increase in the productivity of low-productive farming and other labour intensive production

will release unskilled low-wage labour force for to the other purpose. Basically, this hinders rises in the labour compensation of un-skilled labour force and keeps the wide differences between China and especially industrial countries.

In fact, this large difference between China and Germany has somewhat declined in the 2000s as Chinese labour compensation has risen very rapidly and German wage development has been very sluggish. The low Chinese compensation included also some additional elements to wages like pension and medical insurance payments, although they are usually lower than the ones in the industrialised countries. In case of metal manufacturing, these additional costs were around 14 per cent of the wages in 2004. The share is well below 18 per cent, which is the average in manufacturing. Low share reflects very low profit margins as low labour costs relate to very low prices of fabricated metal products. As seen earlier, the Chinese price level was only 15 per cent of the German ones in 2007.

Exchange rate affect often very strongly on international competitive positions. If a currency appreciates strongly like the US dollar in 1999-2000 during the first years after the introduction of euro, the relative unit costs worsened. Once the USD started to weaken e.g. due to its large imbalances, the improvement in cost position encouraged exports and discouraged imports. The US relative unit labour costs were still a bit below the German ones in 2006. The development after that has been dominated by the exchanger rate, which weakened strongly against euro in 2007 and early 2008. However, in the latter part of 2008, it has got much strength. This is a bit strange as the current and forecast imbalances as well as the difficult crisis should weaken the dollar. Obviously, its role a world currency as well as a large size of the US markets has compensated this effect so far.

Finland and Germany are members of Euro Area, and that is why their bilateral cost position depends on their domestic reasons. In case of Finland, this has led to deterioration of the Finnish cost competitiveness or the restoring of the previous bad German cost competitiveness with the help of wage moderation in the circumstance of low growth. In fact, the level of the Finnish labour costs is still somewhat below the German ones.

Estonia has tied its currency vis-à-vis euro. The Estonian development of the RULC has been worrisome in general, but in case of fabricated metal industries, it has not lost its cost competitive advantage like in case of many other industries. The Estonian relative labour compensation vis-à-vis Germany has risen from 15 per cent in 1999 to 25 per cent in 2005 with newest information available for Estonia. The rise has started, however from the very low level as a heritage from the Soviet period. Relative unit labour costs ratio on the other hand have risen only five percentage points to a bit over 40 per cent in 2005 as productivity has advanced well. This catching up potential has obviously decreased in 2006-2008.

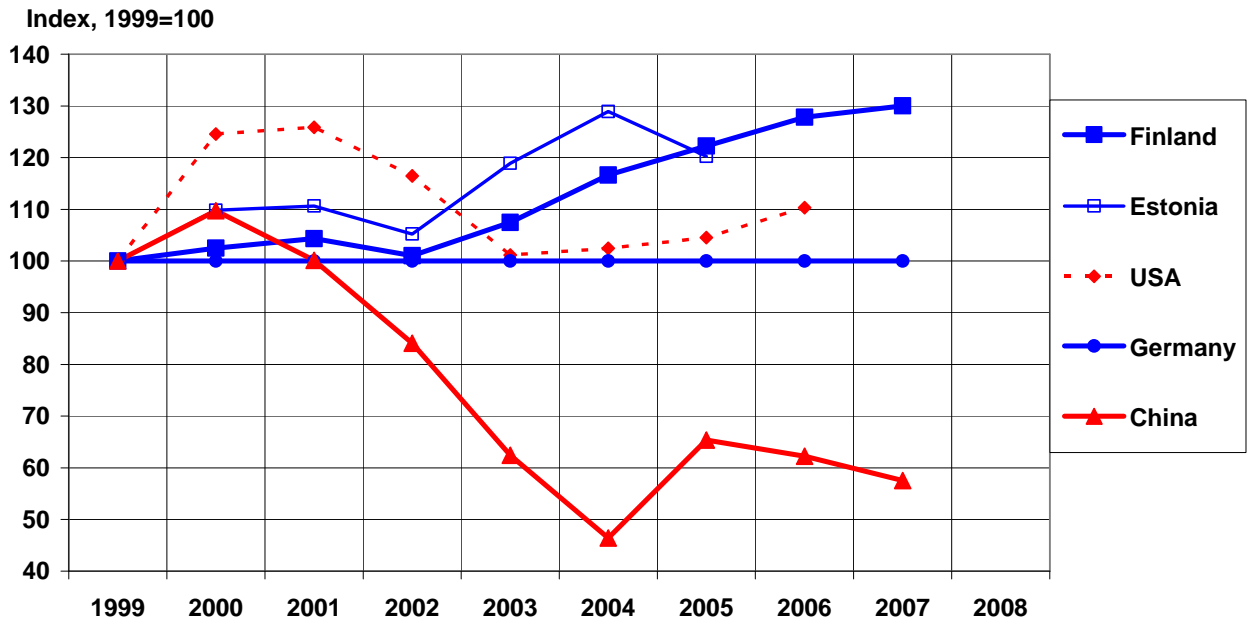
Chinese development of fabricated metal industry like manufacturing industries in general differs significantly from the development in other countries in comparison. Nominal labour compensation has been in a rapid rise in 2000-2007. In 2007, total labour compensation in fabricated metal product industry was 2.2 times higher than in 1999 in yuans. Annual average rise in compensation was 10.6 per cent. There is large regional and occupational variation in compensations. In leading provinces, there has been even lack of labour force in recent years until summer 2008. Similarly, the lack of experienced management has raised the wages of skilled personal.

Chinese unit values have been very low and relatively stable in spite of rapid rise in wages as productivity has also risen strongly due to a “creative destruction”. Chinese labour compensation relative to Germany was only a bit over 5 per cent in 2007, while productivity corrected relative unit labour costs ratio was only about two per cent in case of fabricated metal manufacturing. Chinese metal production is concentrated into few provinces with two leading provinces, Shandong and Guangdong produced about than half of the production in 2007.

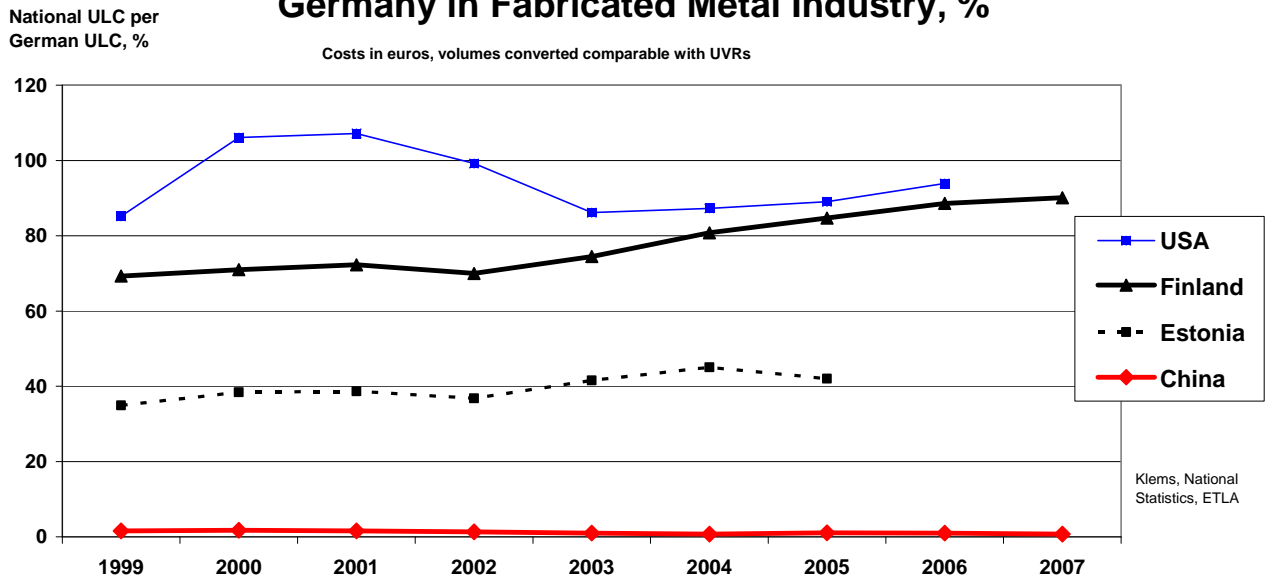
There are still much room for catching up in fabricated metal industries in China. Cost advantage has diminished slightly but strong productivity growth has alleviated the pains. On the other hand, in the beginning of 2008, the new labour force became effective. The new law applies to all employers independent of the number of employees. The law aims to protect the workers by e.g. restricting the use of temporary employees. As such it raises the costs and restricts the ability of low margin firms to operate in China. The announced restrictions of the safety regulations have the same effect.

Unit Value Ratios and Exchange Rates vis-à-vis euro in Selected Industries and Countries in 1999					
	Germany	USA	Finland	Estonia	China
Manufacturing	1.0	0.98	0.98	10.80	5.62
Paper and paper products	1.0	1.10	0.91	11.20	12.00
Chemical products excl. pharmaceuticals	1.0	1.17	0.72	9.07	4.77
Rubber and plastics	1.0	1.36	1.08	14.30	4.77
Fabricated metal production	1.0	1.02	0.84	9.20	2.79
National currency/€	1.0	1.07	1.00	15.65	8.82

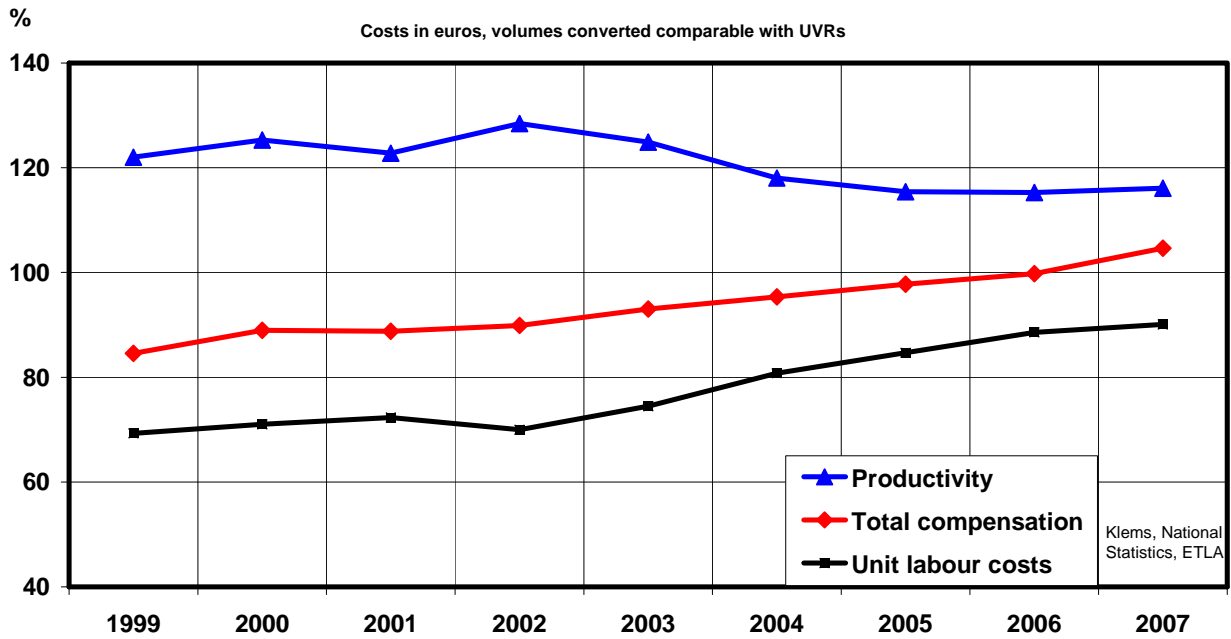
Relative Unit Labour Costs in Common Currency vs. Germany



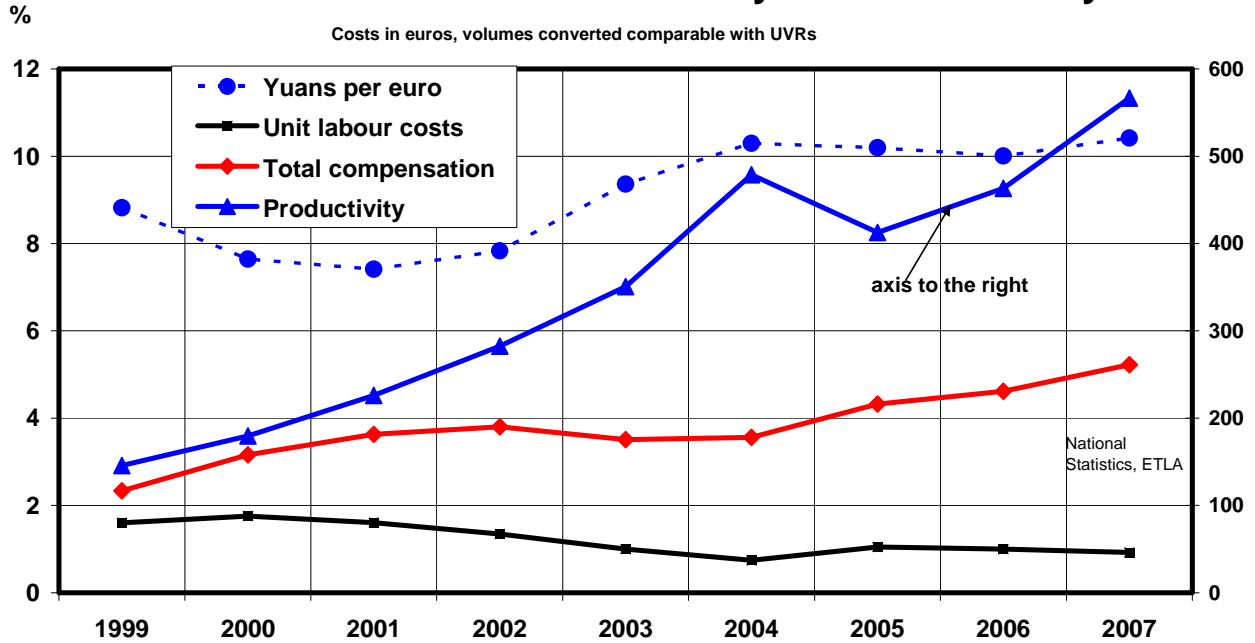
Relative Unit Labour Costs in Common Currency vs. Germany in Fabricated Metal Industry, %



Relative Unit Labour Costs, Productivity and Labour Costs in Fabricated Metal Industry: Finland / Germany



Relative Unit Labour Costs, Productivity and Labour Costs in Fabricated Metal Industry: China / Germany



5. Conclusions

Objectives

This study focuses on the labour cost competitiveness of the fabricated metal industries in China and Finland in particular, using the corresponding German, US and Estonian industries as a point of comparison. The fragmentation of the Chinese industry was taken into account by describing the developments also by regions. This study deepens the analysis of the earlier study of the cost competitiveness of the manufacturing industries in the same group of countries. Separate studies focusing on the labour cost competitiveness are carried out in a parallel manner on the chemical and paper industries. The results of these three sector studies will be evaluated in due time, with the objective of drawing conclusions on globalization and competitiveness.

Wage levels

The theme is very important as the revitalisation of globalisation in the 1990s and early 2000s has revealed new profit possibilities, as China and many other emerging economies began to take part in the global economy in the aftermath of the cold war. In a new situation, many of the emerging markets, China in particular, have benefited from very low wages. For example, in China the level of the nominal labour compensation in euros was only about 4.2 per cent in the fabricated metal product of the Finnish compensation in 2007. The rise of the Chinese labour compensation in the early 2000s was, however, 13.3 per cent per annum. In comparison the annual rises of the Finnish and German labour compensations in the fabricated metal industry were 7 and German 0.8 per cent, respectively.

Unit labour costs and relative unit labour

Large unit labour cost differences in a common currency were obviously a key factor behind exceptionally rapidly changing international production and trade structures in the late 1990s and early 2000s. The volume of Chinese fabricated metal value added grew by 22 per cent per year in 2000-2007 as the average annual growth of the value added of world manufacturing volume was only 3 per cent in 2000-2006.

Nominal wages as such do not imply good international competitiveness. Chinese wages are, however, low even if their low labour productivity is taken into account and costs per unit of production are compared in a common currency – i.e. relative unit labour costs in a common currency. The relative unit labour costs as indices, as usually calculated, do not reflect the levels of competitive situation, but only a change in the circumstances.

A key to the rapid global structural change were large differences in relative unit labour costs levels between developed countries and developing countries, China in particular. Large differences revealed large Chinese competitive potential after the opening up of the economy after the cold-war isolation.

Relative levels of the Chinese unit labour costs vis-à-vis Germany, using the unit value ratios to make the production volumes comparable, were estimated to be only around two per cent in the fabricated metal industry, while the nominal compensation was a bit more than five per cent in 2007. The ratio has even risen in the course of the 2000s. Improving labour productivity in China had compensated for the effects of rapidly rising wages and an appreciating Renminbi. In case of fabricated metal industry, the low costs and tough competition are, however, reflected also on very low price levels in international com-

parison. Low relative costs and low prices obviously reflect a very large competitive potential, although also low quality and a product composition diminishes the competitive edge.

Value added and structure of inputs

The Chinese and Estonian fabricated metal production is of a less value added production type than that in the selected industrialised countries. The shares of labour compensation and profits are low as well according to input - output tables. Estonia imports a substantial amount of its intermediate goods. Shares are also large in China in spite of its large size and in Finland due to its small size.

Development potential and its drivers

According to the calculations, which are based on the available statistical information, there is still a large potential for a continuation of the strong structural change in global fabricated metal manufacturing. In China, the relative unit labour costs are still only a fraction of those in industrialised countries. The Estonian economy is an example of a small emerging with a flexible economy compared to bigger economies like China. Unlike in other industries under study, Estonia has been capable to keep its relative labour compensation per person as relative unit labour costs rather well in control. The Estonian relative labour compensation vis-à-vis Germany has risen from 15 per cent in 1999 to 25 per cent in 2005 with newest information available for Estonia. Relative unit labour costs ratio on the other hand have risen only five percentage points to a bit over 40 per cent in 2005. This catching up potential has obviously decreased in 2006-2008, but there seem to be potential available, though the recent financial crisis is a brake for all the developments in the near future. Estonian kroon (currency) is tied to the euro, the currency of its main trade partners. This implies painful adjustments of the economy as the further rapid wage rise is difficult due to very gloomy demand prospects.

The case of China is especially interesting due to its huge size and big impact on the world markets in manufacturing in general and in fabricated metal production in particular. The economic growth is fast, but the foundations of the huge economy change slowly. Wages are rising fast, but the starting level has been very low and so far the productivity has risen strongly as well. The productivity rise in agriculture can release the low-skilled labour force for manufacturing and help to alleviate the cost pressure. However, there is a lack of skilled labour, which in addition to the obligations set up by the new labour law adds up to increasing labour compensation. The policy of renminbi appreciation has also diminished the labour cost differences, but this policy is now probably ceased because of the global financial crisis. The Chinese product price level is only about 10 per cent of the prices in the other countries in comparison as a part of the productivity gain has been reflected in the price developments.

Chinese fabricated metal industry in a process of change

The Chinese fabricated metal industry production is undergoing a process of profound change in the same way as most of the other Chinese manufacturing. Production is so far concentrated into top five provinces Guangdong, Jiangsu, Zhejiang, Shandong and Shanghai, which produce over 70 per cent of Chinese fabricated metal production while ten top provinces produce close to 90 per cent of production.

The fabricated metal industry consists of a large number of enterprises, so the business environment is very competitive, labour costs are low, but so are the prices and profit

margins. The most competitive enterprises (as measured by the competitiveness index created by the Renmin University) are located in Jiangsu, Zhejiang, Sichuan, Henan and Chongqing. Guangdong and Shanghai perform unsatisfactorily by all the factors, but the market shares and number of are high. The famous and dominant provinces Guangdong and Shanghai ran only the 8th and the 16th in the regional competitiveness ranking.

Impact of current global financial crisis

The outlook of the fabricated metal industry is clouded by the difficult global financial crisis, which strongly restricts export possibilities and dampens also the domestic markets of industry. Many of the important export markets like the US, Japan and the Euro Area are in a recession, and the recovery will take more time than in normal downturns as the financial crisis appears to be extremely severe. The situation got very severe already in autumn 2008, when a large number of low-margin firms have got into bankruptcy e.g. in Guangdong. Competition is getting fiercer also in this sector both globally and in domestic markets, tough decreasing raw material prices like steel prices, non-ferrous metal prices give some relief. The decline of the world market prices of energy do not affect similarly because of regulations of domestic prices.

In response to the rapidly deteriorating economic situation in autumn 2008, Chinese government has issued an investment plan of 4000 billion yuans to simulate investments, especially in infrastructure. Metal related industries will benefit from this package. Although the immediate effects will be rather small, we this policy will boost the metal industry significantly

China – a competitor but also a potential partner

In a longer term, the Chinese fabricated metal industry is raising its impact on the global economy from an already significant level. In this process, in addition to attractive production costs, the knowledge from the industrialised countries as well as strongly expanding domestic markets play key roles. The Chinese development calls for more knowledge from the industrialised countries, while enterprises from industrialised countries wish to improve their productivity by using a low-cost and low-price environment where the markets are expanding fast.

The important cost impacts of changes in raw material costs, especially energy and even labour compensation on the competitiveness of Finnish and Chinese industries are still poorly understood. For example, the continuous measurement of the levels of unit costs could be developed and used to monitor the relative competitiveness. This kind of further study would enable a deeper analysis of competitiveness of the industry. This development approach would be justified as there is still a lot of catching up potential implying also rapid future business growth in the fabricated metal industry, despite the current cyclical setbacks.

Implications of international competitiveness for further business development

The current global economic recession will accentuate the importance of international cost competitiveness at the national and corporate levels.

The industries in China will face the impacts of increasing labour costs, strengthening value of the Renminbi Yuan (affecting exports negatively but enabling imports), shortage of skilled human resources and costs of pollution abatement investments as well as stricter domestic labour regulation, which will somewhat reduce the current cost competitiveness advantage of the Chinese metal industries.

The Chinese fabricated metal industries have benefitted and will benefit from the high growth rate of the domestic market after the financial crisis. The companies in industrialised countries will attempt to alleviate the cost increases by moving towards products with higher value added, overall quality improvements, and constant productivity gains. The Chinese companies also share this view while the companies have large catching up potential both internationally and by provinces as shown by the competitiveness indicators.

Global production of fabricated metal products, consisting of about a tenth of world value added, is in a strong change. It is advisable for metal companies that operate internationally to monitor closely the competitiveness of the Chinese fabricated metal industries, emerging co-operation and marketing opportunities in China, and the competition challenge gradually arising from the Chinese companies in world markets.

Annex 1. Manufacturing production and unit value ratios

Comparing manufacturing production volumes 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 prices of expenditure side of national accounts on a detailed basis after correcting for the disturbing items. This is in many cases both difficult and cumbersome. The second, a more 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. These ratios are weighted together to get a higher level aggregates of different industries as well as ratios for manufacturing (Ruoen-Manying 2001).

$UVR_{i,j} = \sum w_i * uvr_k$, 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. The ratios are usually 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 UVRs calculated in the KLEMS project for the year 1997 were used as a starting point. The 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 gross output price indices (ex-factory price indices in China) in respective countries.

Annex 2 .Volume Growth of World Value Added in Manufacturing

ISIC	Industry	1995-2000 % p.a	2000-2006 % p.a
18	Wearing apparel, fur	-2.8	-1.6
22	Printing and publishing	2.1	0.1
19	Leather, leather products and footwear	-1.6	0.9
36	Furniture; manufacturing n.e.c.	1.3	0.9
17	Textiles	0.3	1.0
28	Fabricated metal products	2.0	1.4
20	Wood products (excl. furniture)	1.3	1.9
21	Paper and paper products	1.7	1.9
26	Non-metallic mineral products	0.7	1.9
15	Food and beverages	1.2	2.8
23	Coke, refined petroleum products, nuclear fuel	1.7	3.3
25	Rubber and plastics products	3.6	3.3
29	Machinery and equipment n.e.c.	1.1	3.5
34	Motor vehicles, trailers, semi-trailers	4.3	3.6
24	Chemicals and chemical products	3.7	3.7
30	Office, accounting and computing machinery	17.3	4.1
33	Medical, precision and optical instruments	4.0	4.2
27	Basic metals	1.8	4.6
16	Tobacco products	2.1	5.3
31	Electrical machinery and apparatus	5.6	6.2
35	Other transport equipment	5.4	7.7
32	Radio, television and communication equipment	26.0	12.2
	Manufacturing	3.2	3.0

Source: UNIDO, ETLA

Annex 3. The data

Data for Estonia, Finland, Germany and USA are provided by KLEMS-project (KLEMS 2007) and it is updated by the more fresh data from Stan data bank, OECD and national sources.

Klems data: <http://www.euklems.net/>

STAN (STructural ANalysis Database) data:

http://www.oecd.org/document/62/0,3343,en_2649_34445_40696318_1_1_1_1,00.html

Chinese data is collected from Chinese Statistical Yearbooks, Chinese Labour Statistical Yearbooks and Chinese Regional Yearbooks.

Input output tables or 2000: Finland, Germany, USA and China (2002). Provided by the OECD.

http://www.oecd.org/document/26/0,3343,en_2649_34445_38069722_1_1_1_1,00.html

In case of China, the national input-output table differs from the table provided by the OECD. Both are utilised in this study. OECD has calculated the import-table, which is not available from the national sources. Regional input-output tables of China are provided by the Statistics China.

The Chinese data is not very exact due to the developing nature of the country as well as developing statistical techniques. However, it can be utilised for the analysis and government uses it in its decision making. There are studies, which show inaccuracies in the statics. We agree to conclusions by Gregory Chow, Princeton University (2005) "... official data are by and large reliable, granted unavoidable errors in certain cases ... Needless to say, any serious scholar using the Chinese official data, as in using any other data, would need to exercise caution in his research even if the data are not purposely falsified".

Annex 4. A Map: China by provinces



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