1st FIW Special - International Economics

Long Term Patterns of International Merchandise Trade

Author: Roman Stöllinger (wiiw)

Scientific Assistance: Beate Muck (wiiw)

This FIW Special International Economics takes a long term perspective on international merchandise trade and tracks specialisation patterns of 19 world regions over the period 1980 to 2009. The data reveals that the path of trade specialisation is not predetermined: globalisation may intensify initial specialisations or may induce technological upgrading leading to new specialisation patterns. The emergence of the highly successful East Asian electronics cluster is easily discernible from our analysis as is the catch-up process of Eastern Europe. The experience of these dynamic regions contrasts with that of the African regions, West Asia and to some extent South America, whose primary role in the world economy is still that of oil and raw material suppliers. We also show that international trade in technology intensive industries has broadened geographically. High income countries in Europe, Japan and the US which dominated trade in high tech manufactures until the 1980s have suffered a considerable loss of market shares to the benefit of emerging East Asian countries causing a lot of concern about the EU's export performance in high technology industries among European policy makers. R&D policy has become a major component of Europe's industrial policy which is intended to support the continuous process of technological upgrading high income countries need to remain competitive in world markets. European high income regions have been successful in this respect in the sense that their export structures continue to shift towards more technology intensive industries despite the losses of global market shares which must be seen as a consequence of a broader participation in world trade. We read the major shifts in global world trade over the past decades and in particular the 'rise of Asia' as evidence that active trade and industrial policies *can* ignite and support the industrialisation process and technological upgrading within the manufacturing sector. At the same time Eastern Europe showed that a technological catch-up process can also be achieved by relying on foreign direct investment and deep trade integration with more advanced trading partners in the region. In contrast, the policies pursued by South American countries after the debt-crisis of the 1980s did not seem to have fostered significant technological upgrading. Given the undetermacy of trade specialisation over time and the multiple paths to technological upgrading we believe that international trade rules should ensure – more than they do now – that *all* countries have the required policy space to implement policies that foster structural changes in their economies.

Long Term Patterns of International Merchandise Trade

1. Introduction

This FIW Special International Economics takes a long term perspective on trends and developments in international merchandise trade stretching from 1980 to 2009. The analysis is global in coverage and undertaken on the basis of 19 world regions, including five European regions[1]). The objective is to uncover long term trends in merchandise trade, including shifts in global market shares and paths of export specialisation. In some instances we try to relate the trade developments to the economic policies – mainly trade and industrial policies – pursued in respective regions. The export specialisation of countries or regions is investigated by looking at their exports at the level of industries, whereby the industries are grouped together according to their technology content using OECD's technology classification (see Hatzichronoglou, 1997) [2]).

Splitting-up exports by technology content (of the exporting industries) allows tracking the patterns of specialisation and in particular the extent of industrialisation and/or technological upgrading that the regions have undertaken during the past 30 years. With the help of the trends unveiled by the data we derive answers to questions related to trade and globalisation. In particular we are concerned with the questions, whether and to what extent the wave of globalisation that started around the mid-1980s has helped certain regions to move their production structures towards industrial goods and whether technological upgrading is a natural consequence of this globalisation process. Within Europe, we document the success of the Eastern European[3]) countries in shifting their export structures in the direction of more technology-intensive industries thereby converging to the export structure of Central Europe. Furthermore, the emergence of the South East and East Asian high tech cluster is discussed, including a comparison of the ASEAN countries' experience with that of South America.

A major concern for European policy makers is their countries' export performance in high-tech industries. Therefore we will also take a closer look at Central Europe's global export market shares in high and medium-high tech industries and compare the developments with those of other advanced regions, in particular the US and Japan.

The working hypothesis of this paper is that the opportunities provided by globalisation in terms of structural change and growth could not be seized equally by all countries and regions. This view is supported by Hausmann – Hwang – Rodrik's (2007) who show that a country's level of export sophistication matters for economic growth. We apply Hausmann – Hwang – Rodrik (2007) framework to our dataset which serves as additional motivation for looking at global exports by technology content.

[1]) Austria will be included in the analysis as part of the Central Europe region (including also Belgium-Luxembourg, Switzerland, Germany, France and the Netherlands). For a full list of regions and their members see Appendix 1.

[2]) The analysis is based on data from UN Comtrade downloaded with the WITS application tool at the industry level (International Standard Classification of All Economic Activities (ISIC) Rev.2.). Given our long time span we cannot use most recent industry and technology classifications as these do not exist for earlier periods.

[3]) In this paper Eastern Europe includes the Czech Republic, Slovakia, Hungary, Poland, Romania, Bulgaria, Albania and the Former Yugoslawian Countries.

Our analysis of the data presented in this FIW Special International Economics leads us to the conclusion that international trade and economic integration is, *on average*, beneficial for participating countries. At the same time trade openness and specialisation as such do not guarantee growth and development for all countries and regions involved. This is due to the fact that a series of regions are locked-in in unfavourable specialisations and their inability to move their production and export structure towards more technology intensive and higher value added industries. In other words, international trade provides great opportunities but gains from trade are neither automatic nor universal. This nuanced view of globalisation implies that active trade and industrial policies, if coupled with an outward-orientated and generally open trade regime, may be essential tools that enable countries to gain from international trade and specialisation.

This FIW Special International Economics proceeds as follows: section 2 provides an overview of positions and global shifts in export market shares. Section 3 starts out with some evidence on the positive relationship between export sophistication and growth and then proceeds with the major results on the global developments of export structures by technology content and technological upgrading. Section 4 concludes by discussing the implications for trade and industrial policies.

2. Positions and shifts in global export market

This section recapitules some major trends in global trade since the 1980s including the emergence of new trading powers which is reflected in their increased export market shares. It also serves the purpose of introducing the 19 world regions to the reader. The export market shares of all regions in the period 2005-2009, along with changes of their market shares since the mid-1980s are shown in Figure 1.

A first observation is that exports are rather concentrated within the four major trading regions[4]) – Central Europe (EUC), the United States (US), Japan (JA) and China (CN). Together they accounted for more than 45% of global exports in the period 2004-2009[5]). In previous years, global exports were similarly or even more concentrated with the four major trading regions accounting for half of global exports in the late 1980s and the early 1990s.

The slight decrease in export concentration is the result of a broader participation of different regions in international trade, in particular since the beginning of the 1990s. The loss of shares in global exports experienced by the 'traditional' major trading powers[6]), i.e. Central Europe, the US and Japan, is to a large degree the consequence of the emergence of China and other emerging regions as more active players in global trade. China's trade performance over the last three decades is indeed outstanding: between 1980-1984 and 2005-2009 China managed to increase its share in global exports by 9 percentage points to reach 10.3% in the

[4]) The major trading regions have or had an export market share of 10% or more in at least one of the six 5-year periods under consideration.

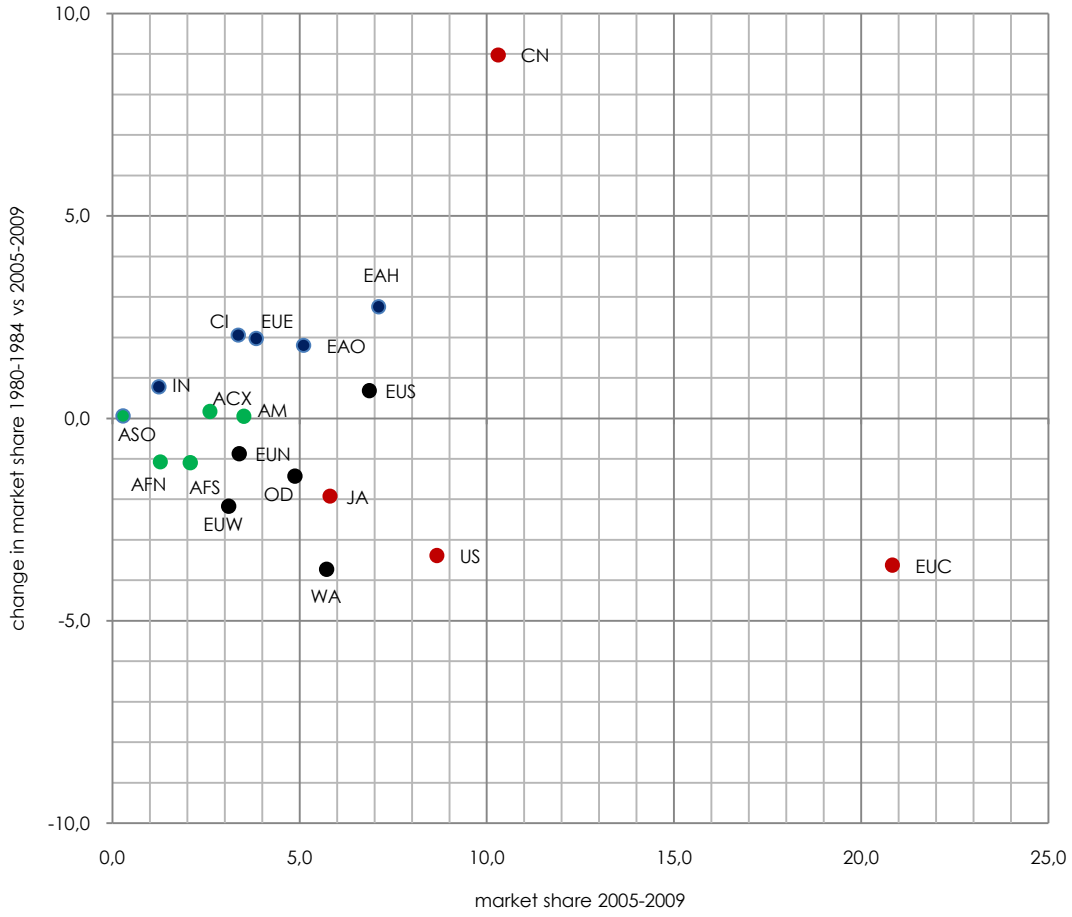
[5]) Note that these regions do not correspond to free trade areas such as the EU27 or NAFTA. If one included, for example, the remaining EU-countries into the calculation, the market share of the major trading regions would increase by another 14-15 percentage points to roughly 70%. Likewise including the US' NAFTA-partners, Canada and Mexico, would further increase this export market share.

[6]) The same is true for the other developed regions Northern Europe (EUN), Western Europe – which is the UK - (EUW) and Other Developed Countries (OD) which also experienced losses in market shares.

period 2005-2009. This remarkable gain in market share is visualised in Figure 1 where China is positioned at the very top of the diagramme.

Figure 1: Shares in global export markets and changes in market shares by region

Export market shares in 2005-2009 (horizontal axis) in percent, changes in export markets shares from 1980-1984 to 2005-2009 (vertical axis) in percentage points



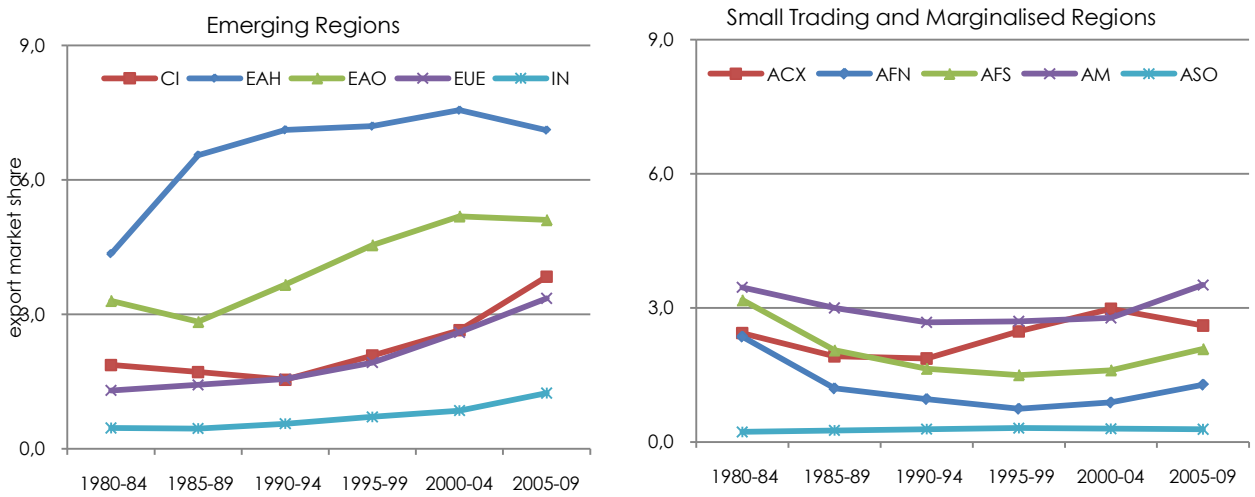
Source: UN Comtrade (WITS download), wiiw-calculations. Calculations of export market shares include intra-regional trade. Regions are colour coded: Red = major trading regions; blue = emerging regions; green = small or marginalised trading regions; black = other. JA=Japan, CN=China, EAH=East Asia High Income, EAO= Other East Asia; EUC=Central Europe, EUE=East Europe, EUN=Northern Europe, EUS=Southern Europe, EUW=Western Europe (UK); US=USA, ACX= Central America and Mexico, AM=South America, OD=Other Developed; AFN=North Africa, AFS=Other Africa, WA=West Asia, CI=Commomwealth of Independentr States, IN=India, ASO=Other South Asia.

Using the gains in market shares since the early 1980s as indicator we can identify High Income East Asia (EAH), Other East Asia (EAO), India (IN), the former Commonwealth of Independent States (CI) and Eastern Europe (EUE) as emerging regions - next to China which we qualify as a 'major trading region'. In Figure 1 these emerging regions are found on the upper left hand side (shown in blue). Note that some of these emerging regions still have rather low export market shares and their gains since the early 1980s appear to be relatively modest. In the case of India for example, the gain in market share amounted to 0.8 percentage points. Expressed in terms of its 1980-1984 market share, however, this constitutes a 167% percent increase! High Income East Asia which started much earlier to integrate into the world economy than both China and India increased its market share from 4.4% in the early 1980s to 7.1%

in the period 2005-2009, making it the fourth 'largest' trading region after Central Europe, China and the US (overtaking Japan).

In contrast to the obvious successes of these emerging regions there is also a number of regions whose export market share show no clear upward trend or even a declining trend as in the case of North Africa (AFN) or Other Africa (AFS). Similarly, Other South Asia (ASO) remains marginalised in world trade with a stagnant export market share of 0.3%. Even South America (AM) basically stagnated in terms of global export market shares over the last three decades. The different trends that distinguish 'emerging trading regions' from what we may call 'small trading and marginalised regions' are better seen when looking at the development over time. Figure 2 highlights the marked differences between the two groups showing the clear upward trend in market shares discernible in emerging markets – a feature that is absent in the small and marginalised regions. Figure 2 also shows that in some of the emerging regions, notably in the South East Asian regions, the growth of global market shares has already flattened out after the very rapid increase during the 1990s.

Figure 2: Global export market shares of emerging versus small and marginalised regions, 1980-2009



Source: UN Comtrade (WITS download), wiiw-calculations. EUE=East Europe, EAH=East Asia High Income, EAO= Other East Asia; ACX= Central America and Mexico, AM=South America, AFN=North Africa, AFS=Other Africa, CI=Commomwealth of Independentr States, IN=India, ASO=Other South Asia.

It is also interesting to compare the trade performance of individual regions which were initially in similar positions. For example, Other South East Asia (EAO), which comprises mainly the ASEAN countries except Singapore, and South America both started out with a global export market share of approximately 3% in the early 1980s. Obviously, the development paths of these two regions in terms of exports shares were very different during the 1990s and until 2005. Other South East Asia was able to increase its share in global exports to over 5% in 2005-2009 while South America's share basically stagnated.

The marked differences in the development of global market shares across regions is a first indication that the gains from trade offered by a generally more open and liberal trade envi-

ronment, particularly since the 1990s[7]), have been distributed very unequally across world regions.

3. Export Structures, Technological Upgrading and Growth

This section deals with changes in the world regions' export structures. To this end we will mainly track the development of exports by technology content, employing OECD's technology classification which distinguishes between low-tech, medium-low, medium-high and high tech industries as well as an unclassified category which contains non-manufacturing goods such as unrefined oil.

Before doing so, however, we use Hausmann – Rodrik – Hwang's (2007) empirically derived measure of export sophistication to demonstrate that a country's export structure seems to be systematically related to a country's subsequent growth experience.

3.1 Export sophistication and economic growth

To calculate a country's level of export sophistication (or productivity level of exports) a productivity level is assigned to each product which depends on the weighted income of the countries exporting this product. A country's level of export sophistication is then obtained by summing up over all assigned productivity levels weighting with the share of the respective product in the countries' export basket. In essence, this means that a countries' level of export sophistication is the higher, the more it exports products predominantly exported by high-income countries[8]).

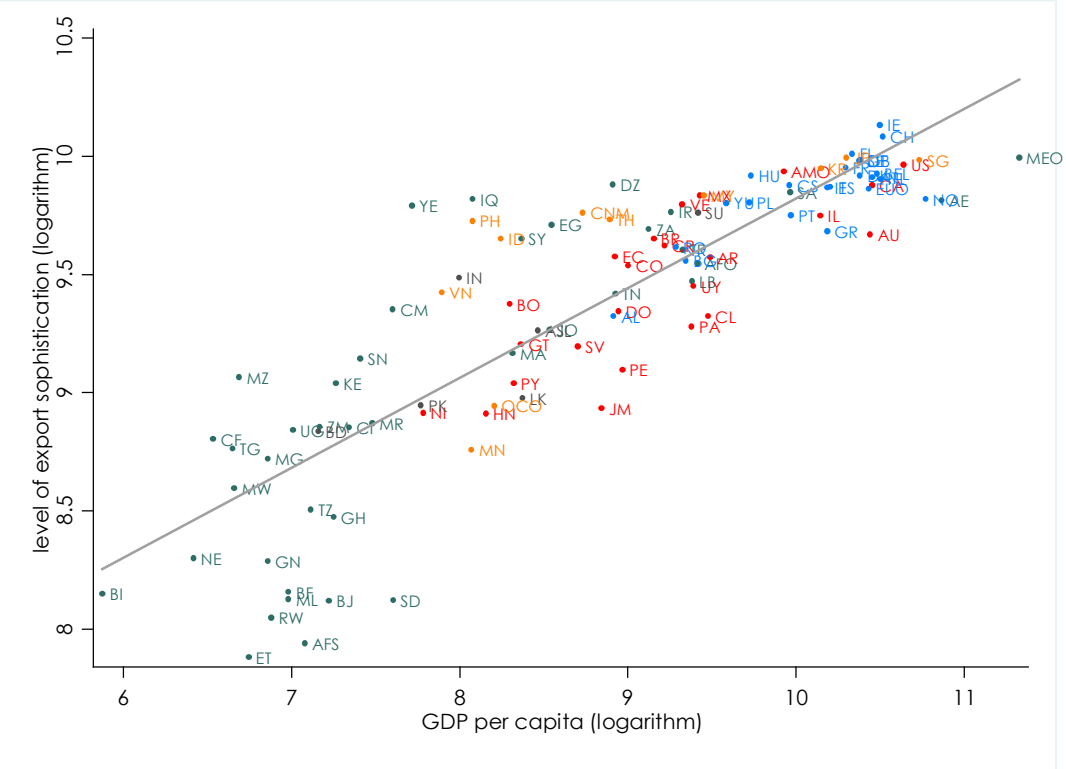
Given the construction of the productivity level of exports, it is clear that this measure is highly correlated with GDP per capita. This is shown in Figure 3 for the year 1995 – the middle of our period of investigation. Countries below the line have a comparatively low level of export sophistication given their income level while the opposite is true for countries above the line. In Figure 3 the countries are colour-coded with the colours indicating the 'wider regions' which are South East and East Asia, Europe, Americas, Africa and West Asia and a region termed 'Other' which includes India, Other South Asia and the Commonwealth of Independent States[9]).

[7]) A major step was the conclusion of the Uruguay Round and the creation of the WTO in 1995. In parallel to progress in multilateral trade negotiations regional integration also deepened, above all in Europe, South East Asia and North America (e.g. creation of NAFTA in 1994).

[8]) For details see Hausmann – Rodrik – Hwang (2007).

[9]) The wider regions are defined as follows: *South East and East Asia (SEEA)* includes Japan, China, East Asia High Income, Other East Asia. *Europe* includes Central Europe, East Europe, North Europe, South Europe, West Europe. *Americas and European Offsprings (Americas)* include USA, Central America and Mexico, South America, Other Developed. *Africa and West Asia (Africa+)* includes North Africa, Other Africa, West Asia. *Other* includes India, Other South Asia, Commonwealth of Independent States.

Figure 3: Relationship between GDP per capita and the productivity level of exports, 2005



Source: World Development Indicators, UN Comtrade, wiiw-calculations. Colours indicate the 'wider region' a country belongs to: *Orange = South East and East Asia (SEEA)* including Japan, China, East Asia High Income, Other East Asia. *Blue = Europe* including Central Europe, East Europe, North Europe, South Europe, West Europe. *Red = Americas and European Offsprings (Americas)* including USA, Central America and Mexico, South America, Other Developed. *Green = Africa and West Asia (Africa+)* including North Africa, Other Africa, West Asia. Grey = *Other* including India, Other South Asia, Commonwealth of Independent States.

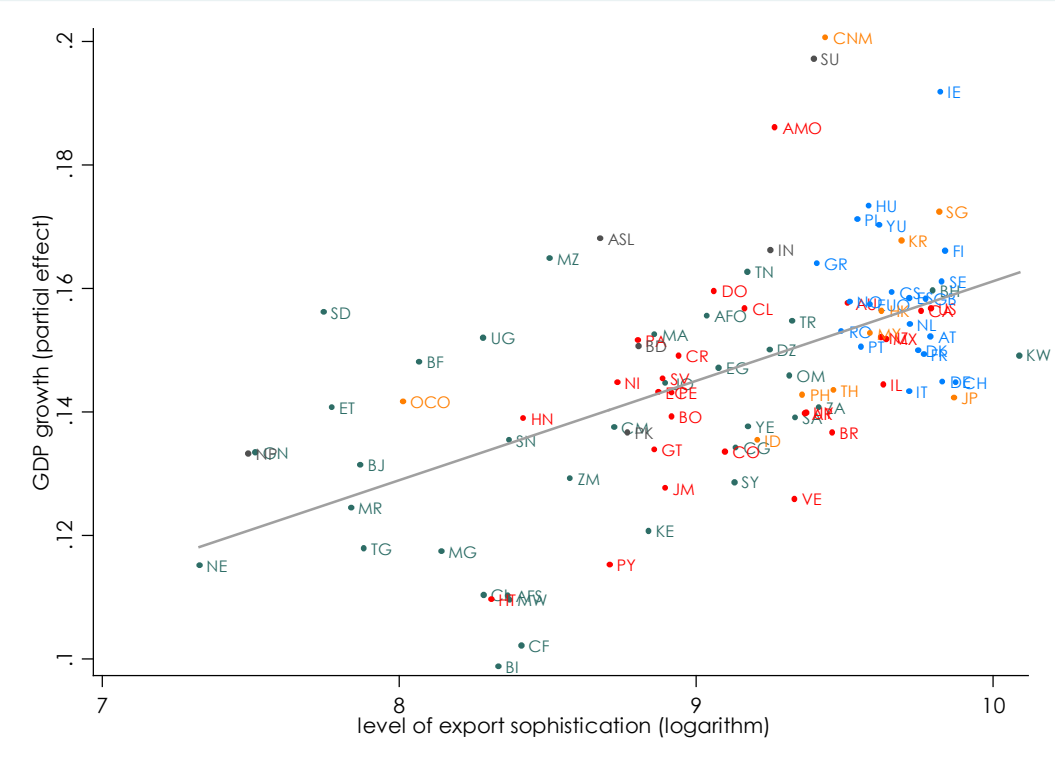
Note that most of the South East and East Asian countries (orange coloured) and in particular the emerging countries in the region are above the regression line, indicating their export basket is 'more sophisticated' than their current income level would suggest. For example, in 2005 the Philippines (PH) had a PPP-adjusted GDP per capita of about 3,000 US-Dollars but its productivity level of exports (approximately 17,500) was close to that of Poland (PL) which had a GDP per capita of 13,800 US-Dollars. Likewise, the GDP per capita level of Canada (CA) was about three times that of Malaysia (MY) but the productivity levels of exports of both countries were very similar. Moreover, China figures among the countries whose productivity level of exports exceeds by far its level of GDP per capita.

The income level that is associated with a country's export basket is an interesting measure as such but it is primarily interesting because it is found to be associated to a country's future growth rate. Following Hausmann – Rodrik – Hwang (2007) we regress GDP growth from 1995-2005 on initial GDP per capita in 1995 and the initial level of export sophistication. The result suggests that there is a statistically highly significant relationship between the level of export sophistication and economic growth: a 10% increase in the level of export sophistication increases subsequent growth by 0.16 percentage points. The positive (partial) relationship between GDP per capita growth in the period 1995-2005 and the level of productivity level of exports in 1995 is visualised in Figure 4.

The level of export sophistication is a rather crude measure but it is sufficient to show that in addition to possible efficiency gains from specialisation, international trade most likely also impacts a country's long term growth rate. The positive relationship between the level of ex-

port sophistication and growth is in line with the view that the main effect from trade and specialisation are not gains from increased allocative efficiency which are unambiguously positive. Rather, for most countries the major effect from international trade will be a *growth effect* which may be positive or negative, depending on the path of export specialisation a country embarks on. In some instances this may imply that countries which specialise according to current comparative advantages may forego higher growth rates that would have been possible if the country had endeavoured to move its production and exports to more 'sophisticated' industries which may at that stage be not totally in line with its endowment structure and technology.

Figure 4: Partial Relationship between growth of GDP per capita and initial productivity level of exports, 1995-2005



Source: World Development Indicators, UN Comtrade, wiiw-calculations. Colours indicate the 'wider region' a country belongs to: *Orange = South East and East Asia (SEEA)* including Japan, China, East Asia High Income, Other East Asia. *Blue = Europe* including Central Europe, East Europe, North Europe, South Europe, West Europe. *Red = Americas and European Offsprings (Americas)* including USA, Central America and Mexico, South America, Other Developed. *Green = Africa and West Asia (Africa+)* including North Africa, Other Africa, West Asia. Grey = *Other* including India, Other South Asia, Commonwealth of Independent States.

Since high income countries tend to export products with higher technology content there is a link between exporting products from high tech industries and a high level of export sophistication.

3.2 Export structures by technology content

The fact that a country's export structure matters for its growth performance is an additional motivation for investigating the structural development of exports over time. As already mentioned we do this by disaggregating merchandise exports into exports of low, medium-low, medium-high and high tech industries as well as commodity exports.

Table 1 provides an overview of the relative shares of each of the five categories in the region's total exports for the periods 1980-1984 and 2005-2009[10]). Obviously, the 19 world regions show very different patterns of specialisation: high-income regions export relatively more products of medium-high and high tech industries while low-income regions have higher shares of commodities (unclassified) and products of low technology as well as medium-low technology industries in their export basket.

Table 1: Exports of regions by technology content, comparison 1980-1984 vs 2005-2009

1980-1984	low	medium-low	medium-high	high	unclass
South East & East Asia					
JA	5,0	20,1	53,4	20,5	0,9
CN	36,3	18,9	8,4	1,7	34,6
EAH	29,8	34,3	15,0	16,4	4,4
EAO	18,5	10,6	2,0	7,2	61,7
Europe					
EUC	17,9	24,8	42,5	7,6	7,2
EUE	30,2	32,8	19,9	1,4	15,6
EUN	29,9	21,8	25,0	5,1	18,2
EUS	29,6	26,2	30,5	5,7	8,0
EUW	12,5	21,7	32,5	9,7	23,6
Americas & European Offsprings					
US	10,6	12,6	38,7	18,0	20,1
AM	22,3	24,6	7,2	1,5	44,4
ACX	9,6	16,1	10,9	5,3	58,1
OD	23,9	16,0	26,5	3,9	29,7
Africa+					
AFN	3,5	12,5	1,8	0,3	81,9
AFS	7,1	18,1	3,0	0,3	71,5
WA	1,2	7,5	0,7	0,3	90,2
other					
IN	31,9	23,2	6,3	1,6	37,0
ASO	50,7	10,0	2,2	0,5	36,6
CI	4,2	41,3	6,8	0,2	47,5

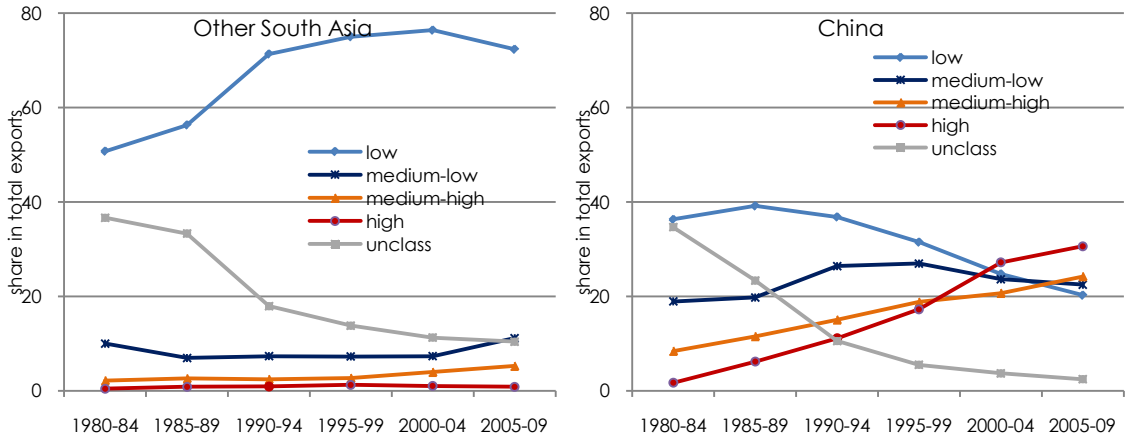
2005-2009	low	medium-low	medium-high	high	unclass
South East & East Asia					
JA	2,3	16,5	60,7	19,7	0,8
CN	20,2	22,5	24,2	30,6	2,4
EAH	5,3	22,2	33,7	37,7	1,1
EAO	18,6	13,9	17,0	31,3	19,3
Europe					
EUC	13,2	19,5	46,9	14,6	5,6
EUE	17,9	22,1	41,2	13,7	5,0
EUN	15,8	19,4	30,4	12,3	22,0
EUS	18,8	19,6	42,1	14,7	4,8
EUW	10,0	20,2	40,0	19,5	10,3
Americas & European Offsprings					
US	9,6	14,9	43,7	23,2	8,6
AM	20,7	20,1	14,0	2,2	42,9
ACX	11,8	13,4	36,6	17,9	20,3
OD	14,8	18,8	25,6	7,9	32,9
Africa+					
AFN	8,0	12,6	7,8	1,4	70,3
AFS	6,1	21,6	7,6	0,9	63,8
WA	4,9	15,8	9,8	1,4	68,0
other					
IN	20,5	40,1	20,0	5,8	13,6
ASO	72,3	11,2	5,3	0,8	10,4
CI	6,4	32,6	11,5	1,0	48,6

Source: UN Comtrade (WITS download), wiiw-calculations. JA=Japan, CN=China, EAH=East Asia High Income, EAO= Other East Asia; EUC=Central Europe, EUE=East Europe, EUN=Northern Europe, EUS=Southern Europe, EUW=Western Europe (UK); US=USA, ACX= Central America and Mexico, AM=South America, OD=Other Developed; AFN=North Africa, AFS=Other Africa, WA=West Asia; CI=Commomwealth of Independentr States, IN=India, ASO=Other South Asia.

In several regions the integration into the world trading system has led to dramatic shifts in their export structure. The path and direction of specialisation may however be very different, not necessarily following the predictions of conventional trade theories. We illustrate this point by comparing the changes in export specialisation along the technology dimension of Other South Asia (ASO) and China (CN) (Figure 5).

[10]) For the classification of industries into the technology intensity categories see Apendix 2.

Figure 5: The 'Fruits' of Globalisation: Specialisation - South Asia vs. China, 1980-2009



Source: UN Comtrade (WITS download), wiiw-calculations.ASO=Other South Asia, CN=China (including Macao).

A first observation is that both Other South Asia and China moved away from exporting commodities – which in both regions accounted for approximately 35% of exports in 1980-1984 – to exporting manufactures. But this is as far as commonalities go. Other South Asia which already started with a very high share of low tech manufactures in 1980-1984 (approx. 50%) further specialised in low tech exports which increased to more than two thirds in the period 2000-2004. This reflects the increasing share of garments and other textiles in the export basket of countries like Pakistan and Bangladesh. In contrast, little dynamism is found in high, medium-high and even medium-low tech products. In other words, in South Asia globalisation has intensified an existing comparative advantage in low technology industries, implying little technological upgrading.

The development in the Other South Asian region, which excludes India, contrasts with the experience of China. Over the 1980s and 1990s, China managed to continuously reduce the share of exports produced by low tech industries which had been the dominant industries until the mid-1990s and to expand the exports of high tech and medium-high tech industries. In 2005-2009, the share of high tech products stood at 30%, among the highest in the world.

This favourable shift in the export structure reflects China's integration in the Asian production networks, particularly the creation of the Asian electronics cluster (see for example Gaulier – Lemoine – Ünal-Kesenci, 2007). In this integration process China benefited greatly from Japan's leadership in high tech industries such as electronics and its industry structure gradually approached that of Japan.

China's technological upgrading was also supported by the inflow of foreign direct investments (FDI). Motivated by low costs of labour in China foreign multinationals started to shift labour-intensive stages of production (often assembling) to China, particularly from the mid-1990s onwards. The exports of these multinationals, including US, Japanese but also European firms, of course also shape the structure of China's trade. All these factors helped China to diversify its economy and to shift its export structure away from commodities and into manufacturing.

Trade openness and selective openness for FDI were cornerstones in China's highly successful export-led growth strategy. But China's catch-up process was not simply the result of an increasingly open trade and investment regime. China, like several South East and East Asian

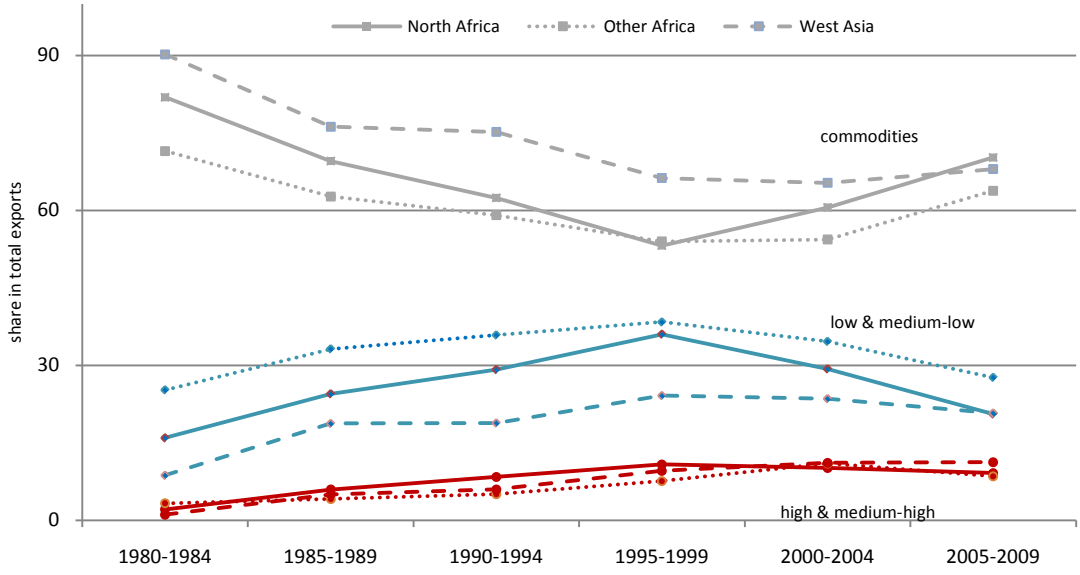
countries before, made extensive use of active industrial policy targeting selected industries (e.g. optical and consumer electronics), providing support support for both state-companies and start-up firms. Other features of Chinese industrial policy were arrangement with foreign firms to transfer their technologies in exchange for privileged market access and the setting of technology standards to the advantage of domestic firms in order to reduce technological dependence on foreign firms (Linden, 2004)[11]).

In the above comparison, Other South Asia served as an example of a region that is locked-in with a rather unfavourable export structure producing low tech manufactures (which is presumably in line with its current comparative advantages).

Figure 6 shows the export structures of three more regions which over the last three decades found it impossible to diversify away from their initial specialisation. These are the resource-rich regions North Africa (AFN) and West Asia (WA), which are both heavily engaged in exporting oil, and Other Africa (AFS) which is exporting various commodities and also oil. The high dependence of these regions on commodity exports is in line with McMillan and Rodrik (2011) who also argue that comparative advantages in primary products reduce the scope for productivity improving structural change.

While it is true that these three regions reduced the share of commodities in their export basket between 1980 and 1999, this trend has been reversed in the new millennium[12]). As a consequence the share of commodities was still around 70% in North Africa and West Asia and well over 60% in Other Africa in the period 2005-2009.

Figure 6: North Africa, Other Africa and West Asia: Locked in resource-based export specialisation:



Source: UN Comtrade (WITS download), wiiw-calculations.

[11]) We mention here China's industrial policies as one of the elements that contributed to China's successful development, particularly since the 1990s. Other authors stress the important role of China's favourably low real exchange rate in China's export-led growth model.

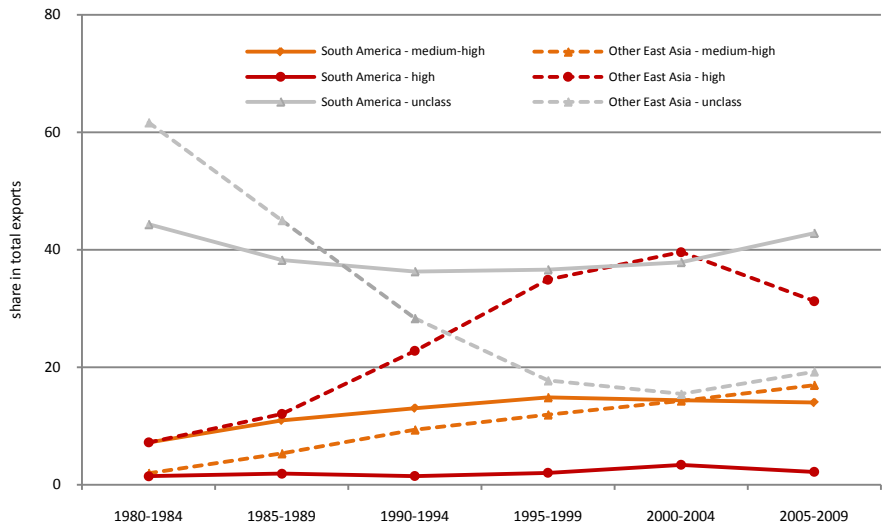
[12]) This trend reversal is related to the price increases of oil and commodities.

The increase in the share of low and medium-low tech exports in the three regions signals to a large degree the build-up of refining capacity within the regions[13]). With the build-up of refining capacity being at the core of the (slight) technological upgrading[14]) until the end of the 1990s, this does not necessarily constitute a strong diversification as it is still closely linked to their natural resource endowments.

Hence, as of 2009 all three regions are locked-in in their resource-based comparative advantages. North Africa and West Asia still serve as global oil suppliers with little integration in the world trade network outside this area. Specialisation in oil and raw materials means that there are fewer opportunities for vertical specialisation and production sharing typically found within manufacturing industries that produce more complex products.

Another rather resource-rich region is South America (AM). In comparison to the African regions and West Asia, South America has a much stronger industrial base. In Figure 7 this can be seen from the fact that already back in the 1980s South American manufacturing exports accounted for roughly 60% of total exports and exports of commodities for about 40%. Figure 7 compares the evolution of the South American region's export structure with that of the Other East Asian region (EAO) which comprises mainly the ASEAN countries except Singapore. As mentioned earlier both regions started with a share in global exports of about 3% in the early 1980s. The initial conditions back in the 1980s in terms of export structures were rather unfavourable in the Other East Asian region compared to South America because it exported predominantly commodities.

Figure 7: Industrialisation and structural upgrading in Other East Asia and South America



Source: UN Comtrade (WITS download), wiiw-calculations.

[13]) If countries invest in petroleum refineries (ISCI 3530) and export refined oil, this is recorded as an export of a medium-low tech industry. A specialisation of this kind with high exports of commodities and a high share of medium-low technologies is for example observable for the Former Soviet Union.

[14]) In West Asia and in Other Africa there may also be a higher degree of non-oil related manufacturing exports because the former include Turkey which has a completely different export structure from the oil-exporting countries in the region and the latter includes South Africa which also has some manufacturing.

Like the High Income Asian region (EAH) which coincides with the Newly Industrialised Countries in Asia (NIC 4 including Hong Kong, Singapore, South Korea and Taiwan) the industrialisation process in Other East Asian countries was strongly supported by government interventions. Malaysia and Thailand were among the first countries in the region to follow the example of Japan and the NICs and moved to trade liberalisation and export promotion policies in the early 1980s (Weiss, 2005).

The pattern of industrialisation in South East Asia is very well summarised by Akamatsu's 'Flying Geese Paradigm'. According to this paradigm, Japan as the leading technological power in the region served as the 'lead-goose', followed by the other countries of the region in the 'wild-geese-flying-pattern'. In this pattern, the follower countries are aligned according to their stage of development. In the Asian case, Japan was followed in the first row by the NICs and in the second row by countries like Malaysia, Thailand, the Phillipines and Indonesia.

The central feature in the flying geese paradigm is that as countries in the front of the formation grow richer (or industries mature) some of their industries move to countries further back because of cost advantages. By this process, countries 'in the back rows' inherit to a great extent the industrial structure of more advanced countries in the region. For example, as the NICs further upgraded their production structures and wages rose, comparative advantages in low-tech industries (e.g. textiles, toys, food processing) were lost and production moved to the countries like Malaysia, Thailand and the Philippines fostering industrialisation there.

From the 1980s onwards the industrialisation process in major ASEAN countries was supported by foreign direct investment (FDI), mainly from Japan and the NICs. At that time Malaysia and Thailand were among the developing countries with the most open and liberal FDI regimes, though important restrictions were still in place, e.g. with respect to ownership limits (Thomsen 1999). The presence of FDI also explains why, apart from low-tech industries, also high-tech industries show a strong upward tendency in the Other East Asian export baskets already in the early phase of industrialisation. We will return to the role of regional trade in Asia further below in the context of the South East Asian technology cluster.

In contrast to the experience in East Asia, technological upgrading in South America was very modest. There is a slight increase in the relative importance of medium-high tech industries but high tech exports account for a very low share of South American exports (presumably mainly Brazilian exports of aeroplanes) and the region also remains strongly dependent on the export of commodities which account for more than 40% of total export as had been the case in the 1980s. It is therefore fair to say that the liberal economic policies that most countries in South America implemented after the debts-crisis of the 1980s - following the prescriptions of the Washington Consensus – did not help much to improve the export structures of the countries in the region. These policies included, next to far-reaching tariff reductions also the liberalisation of the capital account and an absence of active industrial policies.

While Figure 7 suggests little change in the technology content of South American exports, research by Pages (2010) and McMillan and Rodrik (2011) suggest that Latin American (and also African) developing countries have experienced 'negative' structural change in their economies from 1990 to 2005, a period in which all developing countries in their sample became more globalised. 'Negative' structural change in this context means that changes in the production structure had a negative impact on the economy wide productivity. Negative structural change occurs if industries contract, for example due to import competition,

and the labour released from these industries only finds occupations in activities with lower productivity (e.g. informal sector). The opposite is true for South East Asian countries which registered significant positive structural change leading also to the technological upgrading in their export structure as shown in Figure 7.

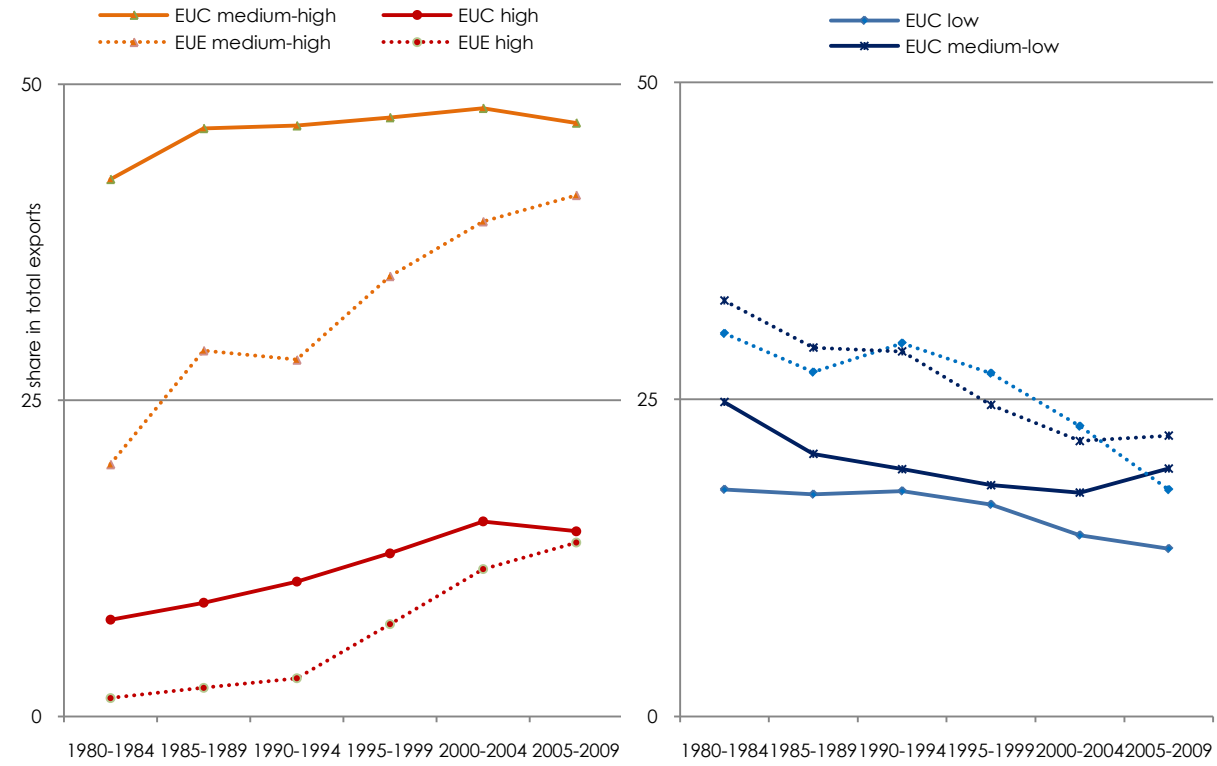
Admittedly, the absence of changes in the export composition does not rule out dynamic export growth. However, the comparison of export growth in South America and Other East Asia between 1980 and 2009 shows that the share in global exports rose by only 2% in South America while Other East Asia's share increased by 55%. Therefore the South America – ASEAN comparison clearly supports the idea that technological upgrading is a key element for long term export success.

We now turn to an example of very important changes in the export structure in Europe, following a historical political change. After the collapse of the Former Soviet Union and the dissolution of the Warsaw Pact and COMECON East Europe turned towards Central Europe, both politically and economically, a process which finally led to the accession of ten Eastern European countries to the EU in 2004 and 2007. The fundamental shifts in production and export structures, however, started much earlier as shown in Figure 8.

From the 1990s onwards, East Europe strongly increased its share of medium-high and high tech exports, from 20% and 1.4% in the period 1980-1984 to 41% and 13.7% respectively in 2004-2009. This means that East Europe's export structure converged to those of Central Europe. The gap in the share of high tech exports between Eastern and Central Europe could be closed and in the case of medium-high tech exports was reduced to 5.7 percentage points. A similar convergence of export structures is observable for low and medium-low tech products. In both Central Europe and East Europe the relative share of these exports declined in relative terms but much more so in East Europe leading to a closing of the gap in the importance of low and medium-low technology exports. This convergence of export structures is in line with the findings in Francois – Wörz (2011) who report that the New EU-Member states (NMS-10) were those with the greatest structural change during the period 1995-2007 despite a very unfavourable initial export structure[15]).

[15]) Unfavourable initial condition in the context of the decomposition analysis undertaken by Francois – Wörz (2011) means that the NMS-10 were mainly specialised in products which experienced rather low rates of global export growth between 1995 and 2007.

Figure 8: Convergence of export structures within Europe



Source: UN Comtrade (WITS download), wiiw-calculations.EUC=Central Europe, EUE=East Europe.

A series of factors contributed to this rapid catch-up process of East Europe, including among others, a high level of education, geographic proximity to Central Europe and strong historical ties and in several countries a long-standing industrial tradition dating back to the pre-Communist era. All these factors eased the emergence of regional production sharing between Central Europe and East Europe which is one of the main explanatory factors why the export structures of Eastern and Western Europe became very similar rather quickly. Hence, as opposed to the situation of global oil suppliers, here there were positive feed backs between upgrading of export structures and reinforcement of regional trade[16]).

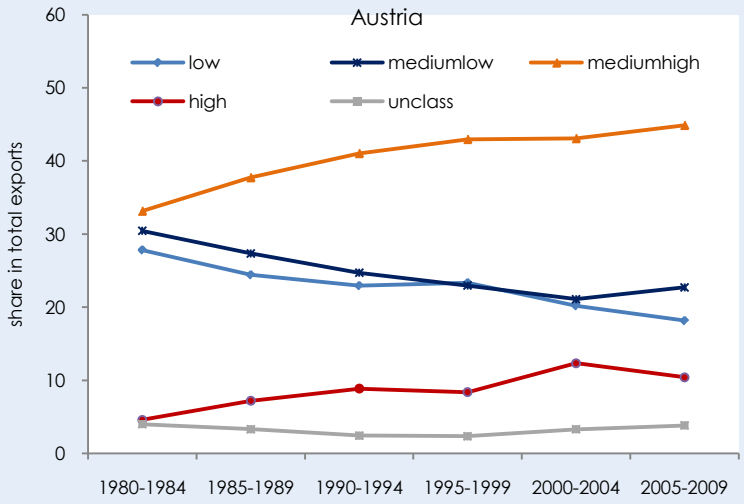
There are parallels in the process of technological upgrading between Eastern Europe and East Asian countries inasfar as both benefited strongly from regional trade and foreign direct investment by more advanced partners within the region and both followed an outward-looking, export-led growth strategy. At the same time, the two regions also embarked on very distinct development paths because government support and industrial policy played a much smaller role in East Europe than in South East Asia. Moreover East Europe had a much more radical approach towards opening the capital account.

[16]) The share of intra-regional trade is particularly high in East Europe with more than 80% of its exports destined for Europe in the period 2005-2009.

Box 1: Focus Austria - Export Specialisation in medium-high tech industries intensified

Austria's export structure is similar to that of the other Central European countries (Germany, France, Switzerland, Belgium-Luxembourg and the Netherlands). Figure B.1. shows the relative importance of exports of low, medium-low, medium-high and high tech industries in Austria from 1980-1984 to 2005-2009.

Figure B.1 Austria's export structure by technology content



Source: UN Comtrade (WITS download), wiiw-calculations.

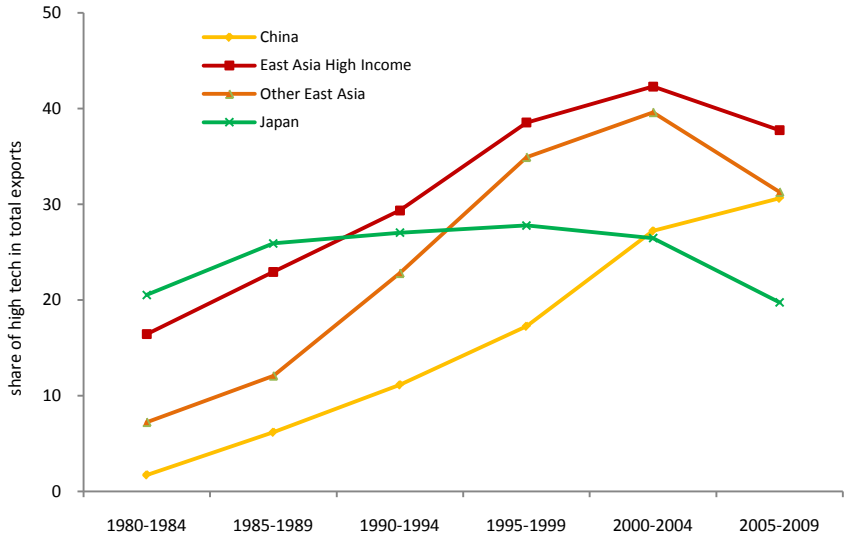
At the core of Austria's industrial export base are medium-high tech industries which include Austria's three leading export industries: the machinery and equipment industry, the automotive industry and chemicals (except for the pharmaceuticals industry which is classified as a high tech industry). The share of medium-high tech exports increased from 33% in 1980-1984 to 45% in 2005-2009. The share of high tech products also increased by 5.8 percentage points but with a share of 10.4% in 2005-2009 it was still considerably lower than in Central Europe as a whole (where it stood at 14.6%). In contrast, the relative importance of low and medium-low tech industries declined. Hence, over the past 30 years Austria registered a structural upgrading from low and medium-low tech industries to high and medium-high tech industries and its specialisation in medium-high tech exports intensified.

We now shortly return to the developments in South East Asia and China, the most dynamic regions of the past two decades. The countries of the East Asian High Income region (EAH), i.e the Asian NICs, started to move into manufacturing already in the 1960s strongly supported by national industrial policies[17]) and a favourable real exchange rate. These industrial policies varied considerably across countries and included a wide array of measures such as tariff free imports of raw materials and other inputs for targeted industries, infant industry tariffs, export subsidies, cheap trade finance, selectively open FDI regimes designed to attract inward FDI in targeted industries but coupled with ownership restrictions in firms and for land purchases. The ASEAN countries (Other South East Asia) turned to outward-orientated trade policies in the 1980s, flanked by a similar mix of industrial policies implemented in the NICs. As was shown, initially these policies led to an increase in the share of low tech industries, a trend that lasted until the first half of the 1990s (compare Table 1 above). At the same time, however,

[17]) The positive contribution of the activtist industrial policies in the NICs and later in ASEAN countries and China is hardly disputed anymore and has even been recognised by the World Bank (1993).

the share of high tech exports also increased already in the 1980s[18]). Figure 9 highlights the rapid increase in high tech exports for China, the South East Asia High Income region, Other South East Asia and Japan from 1980 to 2009.

Figure 9: South-East and East Asian Electronics Cluster: Share of high tech industry exports in total exports & the wider regions global market share



Source: UN Comtrade (WITS download), wiiw-calculations.

China, which was clearly a laterunner in the region, also experienced a remarkable structural change, boosting its relative share of high tech exports from almost nil at the beginning of the 1980s to about 30% in the period 2005-2009. Note, however, that this 30% share is overstated by the fact that trade – and particularly intra-regional trade - in high-tech industries involves a lot of trade in intermediates goods so that goods (or parts thereof) cross borders several times before a final product is exported. The actual value added created at each stage can be rather small. For China, the share of high tech industries in total manufacturing value added is estimated to be around 13% (Chandrasekhar – Ghosh, 2011). This is obviously much lower than the 30% share we find in the (gross) export structure. Nevertheless the trend over time is very similar when looking at value added data which confirms the structural upgrading.

As pointed out above, the importance of high tech exports in South East and East Asia is mainly due to the region's specialisation in the electronic industry, a development that was initiated by Japan's export structure which in the 1980s had been already highly geared towards high tech and medium-high tech products. Note also that the share of high tech exports in Japan's exports has decreased by about 8 percentage points between 1995-1999 and 2004-2009 and was flat before. This development reflects the fact that Japanese companies made (and still make) use of low-cost destinations in Asia to perform labour-intensive tasks in the production of electronics. This vertical specialisation, i.e. specialisation in particular steps in the production process *within* an industry also explains the rather quick increase in high tech exports in China and Other East Asia in their early phase of industrialisation.

[18]) Other South East Asia non-manufacturing exports still accounted for 20% of the total which is to a large degree due to Indonesia' oil and other commodity exports.

The success of the South East and East Asian electronics cluster is reflected by the fact that the share of global high tech exports of the wider South East and East Asian region increased substantially over the last three decades – from about 30% in the period 1980-1984 to 50% in the period 2005-2009. In the case of South East and East Asia it is particularly obvious that the specialisation in complex high tech manufacturing industries is closely linked to vertical specialisation which is predominantly regional in scope. The intensive trade in intermediates resulting from the regional production sharing leads to very high market shares in high tech industries for South East and East Asia. The fact that products are re-exported several times and at each production stage (which may be labour-intensive though performed in high-tech industries) only little value added is created, have to be taken into account when relating market shares in high tech exports to the technological capacity.

The importance of vertical specialisation in high tech manufacturing within the region is confirmed by data on trade in parts and components – a common proxy for the degree of vertical specialisation. South East and East Asian regions have comparatively high shares of parts and components in both their imports and exports. Moreover, the share of parts and components trade is highest in intra-regional trade of the wider South East and East Asian region[19]).

Figure 10 illustrates that on average the share of technology driven exports reflects very well a country's R&D capacity as proxied by gross expenditure on research and development (GERD) in percent of GDP[20]). In other words, the relative importance of technology-driven exports increases with the R&D-GDP ratio.

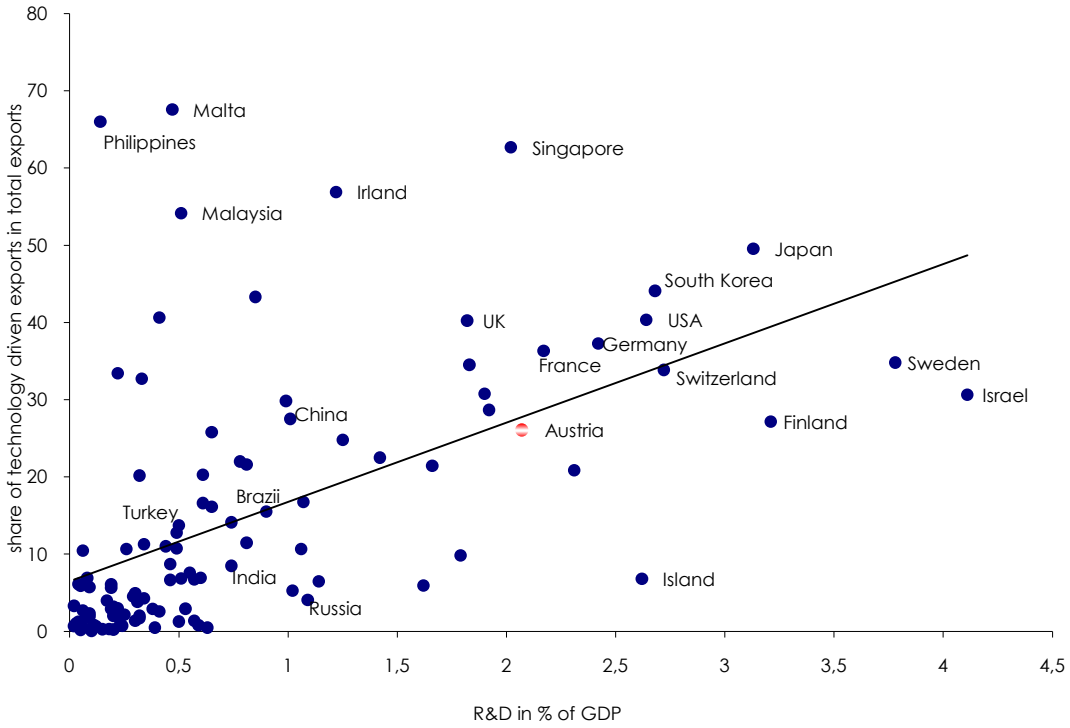
This positive relationship is not surprising and it shows that for most countries a change of the export structure towards technology intensive exports generally reflects higher R&D intensity (higher R&D-GDP ratios). But figure 10 also shows that there are some outliers. For example, Israel has relatively little high tech exports given its very high R&D-GDP ratio of over 4%, which is partly due to Israel's strong agro-industrial R&D focus. On the other hand, the vertical specialisation within the Asian electronics cluster implies that for some South East Asian countries – such as the Phillipines and Malaysia but also Singapore – the (very high shares of) technology-driven exports overstate the countries' R&D capacities because they perform a lot of labour-intensive taks within the production process of high tech goods. With an average R&D-GDP ratio of 2% and a share of approximately 26% of technology driven exports, Austria's exports reflect rather well its R&D efforts.

[19]) The analysis of parts and components trade reveals some information on the position of the regions within the regional production network. For example, 32% of Japan's total exports represent parts and components – a much higher relative share compared to its imports (parts and components trade: 19.8%). This signals that Japan is still the major provider of technology in the South East and East Asian production networks because in many cases the production of specialised inputs requires more skills and is technologically more demanding than the final assembling of these inputs to a final product. This supports the claim made above that Japan's initial specialisation was key for the creation of the Asian production networks (Flying-Geese-Paradigm'). China is situated in the opposite position within the production network, with parts and components accounting for 30.6% of its imports, compared to 23% on the export side. This is complemented by a high share of consumption goods (i.e. final goods) in its exports.

[20]) In order to avoid too great reliance on OECD's technology classification we use here another classification developed by Peneder (2003). This classification distinguishes between mainstream, labour intensive, capital intensive, marketing driven, technology driven manufacturing industries.

Figure 10: Relationship between R&D expenditures and Technology Driven Exports

Average 1996-2007



Source: UNIDO, UN Comtrade (WITS download), wiiw-calculations. Technology-driven exports according to the classification of Peneder (2003).

As was shown above, the integration of more regions between 1980 and 2009 into the world trading system led to losses in the global market shares of the traditional trading powers (Central Europe, US, Japan). For European policy makers, Europe's rather low share of high tech exports in its total exports and consequently a relatively low global export market share in high technology exports is reason for constant concern. The European Commission, for example, laments that in Europe innovative small and medium size firms do not grow sufficiently in order to become large R&D investing companies (European Commisison, 2011). As a consequence, the EU's industrial structure may not be sufficiently geared towards leading-edge, fast growing industries. In contrast to other high-income regions, the global market shares in high tech exports of Central Europe and North Europe are lower than their global market shares in total exports. Central Europe's global market share was 20.8% in the period 2005-2009 while its export market share in high tech industries stood at 17.6%[21]). However, Central Europe's export market share in high tech industries declined only slightly between the 1980s and the period 2005-2009. The loss of market shares was much larger for the US and Japan.

At this tage it should should be noted that from a European perspective, the decline in the market share of products exported by medium-high tech industries (-8.7 percentage points between 1980-1984 and 2005-2009) is more relevant for competitiveness and employment than the 5.2 percentage point loss in the high tech segment, as it concerns the majority of European main export industries. Moreover, according to the Innovation Union Competitiveness Report 2011 (European Commission, 2011) medium-high tech industries account for al-

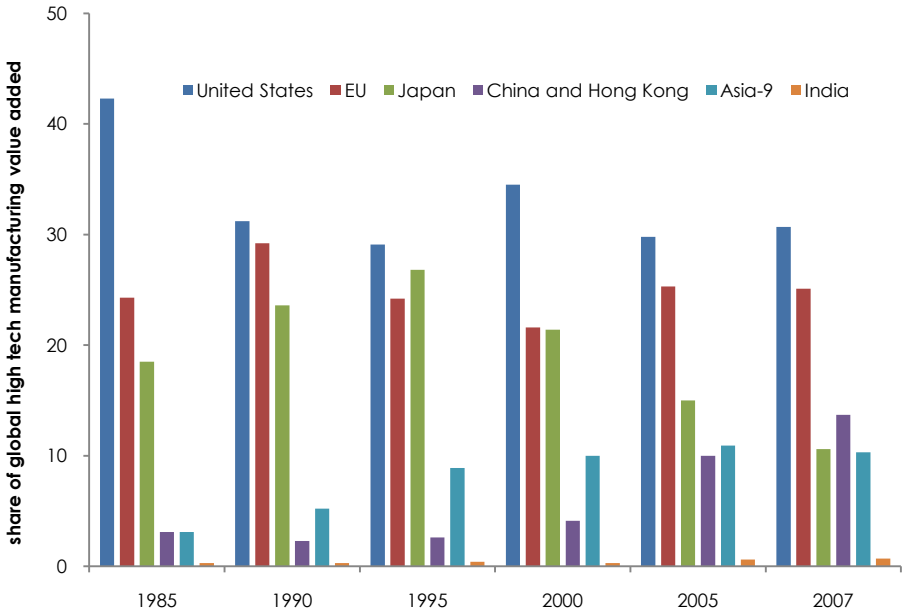
[21]) The export market shares in high technology industries of the European regions add up to 32%.

most half (48%) of European R&D businesses expenditures. This may indicate that medium-high tech industries offer sufficient opportunities for European companies to remain competitive (despite high wage costs) by differentiating and upgrading their products.

Given the distorting effects of vertical integration on the relative positions in high technology trade, it is useful to take a look at value added data in global manufacturing. Figure 11 shows the shares in world industrial value added which we took from Chandrasekhar and Ghosh (2011). The value added consideration may gives a clearer picture of where global manufacturing in actually taking place. Obviously, these figures include value added created by foreign subsidiaries firms that create value added in their respective host economy. The drawback of this approach is that we do not have this kind of data readily available for all regions.

Figure 11 indicates that, in value added terms, the United States are still dominhigh tech industries with a value added share of more than 30%.

Figure 11: Global market shares of manufacturing value added, selected regions



Source: Chandrasekhar and Ghosh (2011).

In line with what we observe in the export data, the share of the EU in global high tech exports remained rather constant at about 25% from 1985-2007. In contrast, the market shares of the USA and of Japan declined rather strongly over the past 20 years, also in value added terms. From Figure 11 it is also obvious that the structural upgrading in South East and East Asia and particularly in China is not entirely driven by double-counting of trade flows due to trade in intermediates. China managed to increase its value added share in global high tech manufactures from a mere 3.1% in 1985 to 13.7% in 2007. Taking the wider South East Asian region together, the combined value added share in high tech manufacturing was about 35% in 2007.

Finally, the assertion that the EU is not primarily specialised in high tech manufacturing (but medium-high tech exports) is also confirmed by the value added data. While the EU ac-

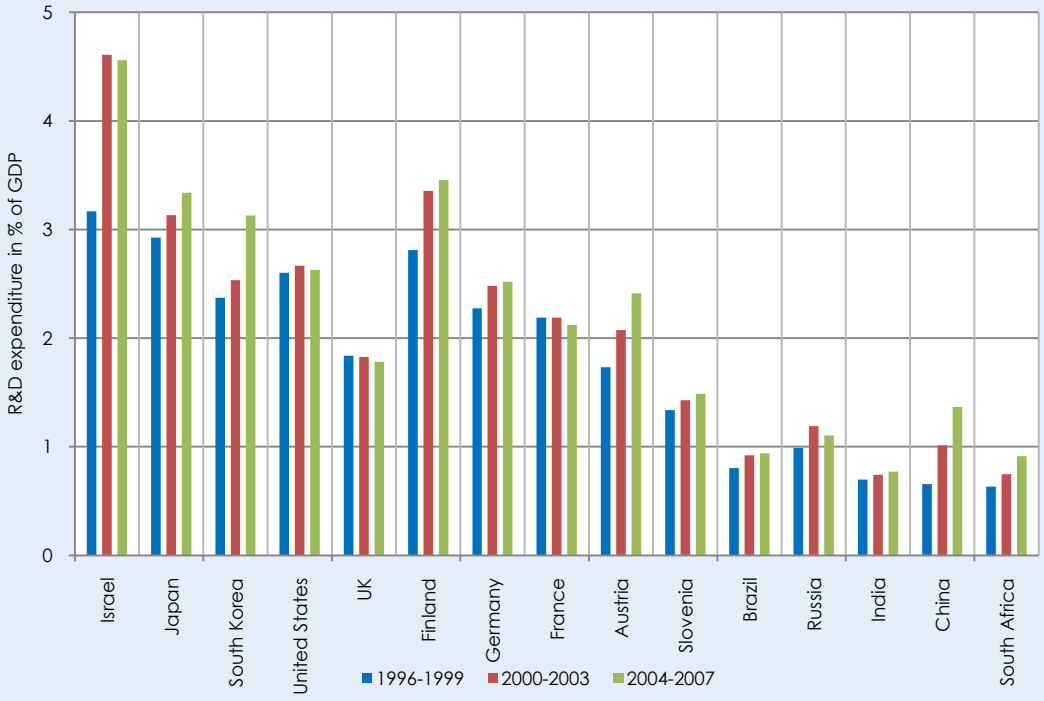
counts for 28.8% of global manufacturing value added, less than the respective share for high tech industries.

Finally, it should be noted that despite the broader participation of regions in global trade of technologically advanced manufactures, some low and middle income regions, including the whole of Africa, West Asia, the Commonwealth of Independent States, Other South Asia and also India, remain technologically marginalised with market shares close to zero in high tech exports and very low export market shares in medium-high tech industries[22]).

Box 2: Focus Austria - R&D expenditures in an international comparison

Austria has increased its R&D expenditures markedly since the 1990s reflecting its successful 'catching-up' process in this domaine (Schibany and Jörg, 2005). While Austrian gross expenditure on R&D (GERD) in percent of GDP is still far below that of European benchmark countries such as Finland it is more or less at par with that of Germany (Figure B.2).

Figure B.2 R&D expenditures (in % of GDP) in Austria and selected countries



Source: UN Comtrade (WITS download), wiiw-calculations.

Typically a country's R&D-GDP-ratio is rather persistent, changing only slowly over time. This is particularly true for mature industrialised countries as can be seen in the United States, the United Kingdom or France. This makes the growth of the R&D expenditures (as a percentage of GDP) in Austria from 1.7% in 1996-1999 to 2.4% in 2004-2007 all the more remarkable. Up to 2005 the increase in R&D expenditures was mainly due to higher investment in R&D by the business sector, to a large extent financed by company cash flows (Schibany and Jörg, 2005). In more recent years, however, the relative share of public R&D expenditure rose and during the crisis public R&D expenditure increased anticyclically, compensating for reduced R&D investment in the private sector (European Commission, 2011).

[22]) Russia and South Africa do have some R&D capacities as reflected in R&D-GDP ratios of 1% or more. However, they seem unable to translate these R&D efforts into internationally competitive technology intensive industries.

The substantial increases in R&D expenditures (which were far above the European average over the last decade) pushed Austria closer to its 3% target rate which – based on the current annual trend – will be reached by 2012. By 2020 Austria could be at the world forefront with a value similar to that of Finland, Japan or South Korea according to recent projections (European Commission, 2011). Despite these very positive developments in the Austrian innovation system, some shortcomings still prevail such as the large concentration of business R&D expenditures in a few large corporations (Schibany and Jörg, 2005).
In a broader international comparison the R&D intensity of EU-countries (with the important exeption of Northern Europe) is still below that of the US, Japan and South Korea. R&D intensities are also on the rise in emerging markets, most notably in China which doubled its R&D expenditures (as a percentage of GDP) since the mid-1990s to 1.4% in the period 2004-2007. The European Commission also noted that in terms of R&D personnel China has taken the world lead in 2008 with 1.6 million researchers, followed by the EU (1.5 million) and the United States (1.4 million)(European Commission, 2011).

4. Policy Implications and Conclusions

One of the main results that emerged from looking at the trends in international trade over the past thirty years is that globalisation has obviously led to a much broader participation in international trade. These geographically more inclusive trade links include deeper forms of economic integration such as international production sharing. The developments went hand in hand with a marked technological upgrading in the production and export structures of regions in South East and East Asia and in Eastern Europe. To some extent the technological upgrading in South East and East Asia shown is this paper may be overstated because of vertical integration process in which China and some ASEAN countries specialise in labour-intentive parts of the production process of high technology goods. Nevertheless, the fact that these countries are integrated in international production networks testifies a certain level of managerial and technological capacities which are needed to participate in such networks. Moreover, the development of R&D capacities, particularly in China, is an indication that technological upgrading has been taken place, even though not to the extent as suggested by export data.

Structural upgrading seems to be linked to gains in global export market shares. Therefore China and the emerging regions that we identified in this paper can be considered as the main beneficiaries from the latest wave of globalisation that had started around the mid-1980s and intensified strongly during the 1990ies. In contrast to technologically marginalised regions, the integration of these new players, i.e. China and the emerging regions, into global and regional trade networks was not limited to labour intensive, low tech industries and commodities but also translated into gains in export market shares in high tech and medium-high tech industries.

Despite the new competition from emerging regions high income regions, including Central Europe, Northern Europe and the UK, also gained from globalisation due to the opening of new markets and in recent years growing demand from emerging markets has become a major pillar for export growth. Moreover, the export structure of European high income regions also moved towards more technology intensive industries where opportunities to remain competitive through innovation and product differentiation are higher. Moreover, in many

regions of the world, including Eastern Europe and China, multinational firms from the 'traditional' industrialised regions contribute strongly to the export success of the emerging regions by setting up foreign subsidiaries in these markets. Therefore the majority of world regions have clearly benefited from a more open trade and investment environment.

It must be stressed, however, that the process of technological upgrading which is observable in export data for emerging regions is by no means a necessary and universally valid consequence of globalisation. Rather, the path of export specialisation is undetermined: Trade integration may either intensify existing comparative advantages and specialisation – as in the case of Other South Asia and to a large extent also South America – or induce radical structural change and as a consequence shift from commodities and low tech industries to industries with higher technology contents[24]). The path of export specialisation is undetermined because the comparative advantages themselves, which to a large extent shape the patterns of export specialisation, are endogenous and evolve over time.

One policy implication of this interpretation of the trade developments over the past 30 years is that countries (and regions) are well advised to actively try to seize the opportunities offered by international trade[25]). The most successful regions relied strongly on international trade and export-led growth strategies. Obviously, an export-led growth strategy is more likely to be successful in an open trade environment. However, trade liberalisation alone is not a sufficient condition for reaping the gains from trade. In particular, at the beginning of an industrialisation process, the opening of the economy to world markets and global competition typically have to be supported by active and interventionist trade and industrial policies, potentially – as Ha-Joon Chang put it – defying existing comparative advantages.

This nuanced view of international trade is derived from the historical experience of countries since the 19th century on the one hand and a dynamic consideration of the effects from trade on the other. We start with the second point.

Conventional trade theories based on comparative advantages (be they focused on resource endowments or technology differences) predict universal and unambiguous gains from trade. This result is based on efficiency gains that trading partners can reap by specialising in and exporting goods they produce at relatively lower costs than their trading partner(s). The resulting policy conclusion is that free trade is the optimal trade policy and governments should refrain from intervening in this specialisation process by imposing tariffs or handing out subsidies to domestic firms. This logic is at the core of the Washington Consensus which recommends all countries to open up to international trade as much and as quickly as possible and to dispense with selective industrial policies that interfere with the resource allocation in markets.

This static view of free trade – which predicts and recommends the re-inforcement of currently existing comparative advantages – is at odds with the universial strive of countries for industrialisation, structural upgrading and for shifting the export basket towards new, more complex and 'sophisticated' products within industries. As we have tried to show, countries do this for good reasons. This contradiction between the policy prescription of the Washing-

[24]) Certainly, globalisation may also induce a technological downgrading if countries lose their existing industries which may not (yet) be competitive globally. For the time span under consideration we do not detect such a development in any of the 19 regions. This does not rule out the possibility that individual countries suffered from such an unfavourable shift in their production and export.

[25]) Here we want to stress the potential merits from *trade* openness but refrain from discussing the highly controversial issue of opening the capital account.

ton Consensus and the desire for structural change is founded in the neglect of the dynamic effects that may arise from trade and specialisation and an overestimation of the allocative efficiency of markets. There is no doubt about the relevance of comparative advantages for shaping trade pattern at *any point in time*. However, instead of treating comparative advantages as a constant feature of an economy, they are endogenous and are subject to considerable change over time. In particular they can be forged by economic policy. Indeed, successful countries are not those that simply tried to exploit current comparative advantages but those that actively tried to shift their production structures towards new areas which are more complex, more technology intensive and typically higher price-cost mark-ups. Differences in the potential to charge mark-ups over production costs across industries (due to the potential of learning effects, economies of scale in production,…) imply that it matters in which industries a country specialises – in particular it may matter for its long term growth rate. Dynamic trade models that incorporate more than one sector and increasing returns in manufacturing clearly show that free trade and resulting patterns of specialisation may hurt a country's growth process (e.g. Lucas, 1990) and that the timing of opening up to free trade is crucial (Matsuyama, 1992). Acknowledging such differences across sectors and industries and putting the emphasis on growth effects from trade rather than (once-off) efficiency gains from trade lead to very different policy recommendations than those prescribed by the Washington Consensus (absence of government intervention and full fledged liberalisation).

From a policy perspective, the idea that specialisation patterns affect economic growth and that comparative advantages (at least to some extent) are endogenous and can be shaped, make *active* trade and industrial policies more attractive compared to a purely static consideration of the effects of trade[26]).

Turning to the second point that form our nuanced view of free trade – historical experiences - we believe that all developed countries followed a development strategy that is much more in line with a dynamic view of trade than with the ideas enshrined in the Washington Consensus. If economic history can serve as a guide, the appropriate policy mix for developing countries should consist of a blend of selective and temporary tariff protection and public support to install and develop an international competitive manufacturing sector. Exactly this type of policies were pursued by nowadays developed countries – the US in the course of the 19th century and several Central European nations during the late 19th and early 20th centuries – to develop capacities in the leading edge industries of the time (Reinhart, 2007). Basically, all emerging and newly industrialised countries in South East Asia used a mix of partial protectionism and export subsidies in industries deemed strategically important (Chang, 2007). The recent success of China, the NICs and other East Asian countries with targeted industrial policies which we highlighted in this paper had to be acknowledged, at least partially, even by the World Bank already two decades ago (World Bank, 1993). Basically the only region that mastered a spectacular technological upgrading[27]) without notable active and targeted industrial policies is Eastern Europe. The experience of Eastern Europe is indeed remarkable. It can be interpreted as evidence that – unlike the Asian experience – structural upgrading is feasible by relying primarily on deep economic integration with more advanced regional partners, in this case the EU. The transformation process that took place in Eastern Europe

[26]) In a static view of the world in which export patterns emerge as natural consequence of *existing* comparative advantages and all industries are structurally identical free trade emerges as the optimal policy.

[27]) The catch-up process started after the 'transitional recession' of the early 1990s.

strongly relied on the influx of foreign capital and, linked to that, the import of new technologies. Hence, in the case of Eastern Europe foreign capital did not support the catching-up process (as it was the case in most Asian countries) but was the main driver of the process. Historically, however, the experience of Eastern Europe that may be characterised as a successful catching-up process based on a far-reaching liberalisation of the economy from the very beginning and deep regional integration is a rare event. It should also be noted that the initial position of Eastern Europe was different from that of many other emerging economies as the region had an 'a history of industrialisation' and an excellent educational system. So the task of structural change was different inasfar as the challenge was to initate an industrialisation process from scratch but to turn existing industries into profitable operations and in many cases the specialised workforce required for this was available.

Both trade and industrial policies are powerful tools to induce structural change and technological upgrading leading to new export specialisations, though some countries or regions may choose a different development path. Therefore it seems to be important that all countries and regions can maintain the required policy space to conduct the type of trade and industrial policy that fits best their stage of development.

For high income regions such as Central Europe (but also for North Europe and West Europe, i.e. the UK) active industrial policy is more and more conducted in the form of R&D policies[28]). As pointed out by Van Pottelsberghe, the EU's current R&D policies, including direct subsidies and tax breaks, is an implicit industrial policy aimed at altering the EU member states' industrial structures (Van Pottelsberghe, 2008). Moreover, foresight studies typically see it as a shortcoming of European science and technology policy that it is less focussed than in the US or Japan and suggest a new 'airbus strategy' which allows the EU to develop the technological lead in a key economic field (European Commission, 2006).

Active R&D policies receive strong support from modern trade and growth theories which stress the fundamental role of ideas and technologies for growth and development. The distinguishing factor between ideas and any other product (or production factor) that calls for policy intervention is its non-rival nature[29]). This means that ideas can be used (or consumed) by more than one person at the same time and repeatedly. Non-rival goods tend to be underprovisioned in a market economy, which delivers the theoretical rational for public support of ideas generating processes, i.e. research and development. Hence, consensus has emerged that R&D subsidies and other forms of public support for R&D are appropriate industrial policy tools for developed countries. Hence, at least in the analysis of R&D and innovations mainstream economics now stress dynamic effects. Otherwise, subsidies for R&D and patent protection which both raise the incentives for firms to invest in R&D (which may turn into successful innovations) would not emerge as policy recommendation. In a purely static view, patent protection is harmful because it allows the innovating firm to earn monopoly profits to the detriment of consumers.

Active R&D policies may be very helpful for industrialised countries to keep the technological leadership and remain competitive vis-à-vis emerging markets which benefit from lower wage costs. According to the same logic, low income regions that have not built up a solid

[28]) This is not to say that developed countries do not employ convential industrial policies – and as the crisis of 2008/2009 has shown to a greater extent if need arises.

[29]) For a nice overview oft he role of ideas for an economy see Jones and Romer (2010).

industrial base yet – and as was shown by the data there are several such regions – would need industrial policies that help them moving their production structures into manufacturing industries.

While the recent track record of low income countries – outside South East and East Asia – with respect to industrial policy does not look particularly good, the conclusion cannot be that these countries should simply all renounce on policies aimed at fostering structural change. Fortunately, more recently the tide – at least in the academic arena, not necessarily the policy arena - has shifted somewhat in favour of selective governments interventions. For example, Lin and Monga (2010) recommend that governments in low income industries should not act overambitiously and rather target industries that are close to their countries' current comparative advantages which they call *latent* comparative advantages. These authors also recommend that countries should use pick 'model countries' that are significantly but not too far ahead in the development process and use them as "economic compass" for selecting potential industries to be targeted[30]). These may be relevant for countries that lack the advantage of having a regional technology leader in the region (as South East Asia and Eastern Europe had) and therefore cannot rely on the upgrading-mechanism described in the flying-geese-model or the deep regionalism path chosen by Eastern Europe.

The comparison between R&D policies and conventional industrial policies, we believe, is a very valid one and it is a strong argument in favour of *temporary* protection and subsidies for nascent industries – in cases where low income countries think they need such measures to master the challenges of global competition in an early phase of industrialisation. After all, infant industry protection and subsidies are not so different from patent protection and R&D subsidies which are nowadays more commonly accepted. The ultimate rationales for temporary protection are incentives and some form of increasing returns to scale. The existence of increasing returns in manufacturing industries (producing differentiated goods), now standard components in modern trade and growth models, are hardly disputed. Increasing returns to scale imply that new industries are not internationally competitive from the start because firms have not moved up the learning curve yet and the scale of production is still small. Hence, temporary protection and subsidies may increase incentive for private investments by first-mover firms in industrial activities that may ultimately become profitable and induce market entry by a larger number of firms. First-mover firms bear the risk of failure and in case of success will see its profits decline by subsequent entry of follower firms. Therefore entries into new industries are deterred (Aghion, 2009). Very much like R&D subsidies and patent protection raises incentives for firms to invest in R&D (which may turn into successful innovations), investment subsidies and temporary protection raise incentives for first-mover firms to invest in new industries.

Unfortunately, current WTO rules do not provide a waiver for industrial subsidies in low income countries as in the case of R&D subsidies. Moreover, international patent law regulations tend to be strengthened while infant industry tariffs for low income countries are not much of an issue anymore.

The challenge of successful industrialisation, including the emergence of competitive export industries, is in some sense easier nowadays than it was in the past but at the same time it is

[30]) As a rough guide the authors recommend that the GDP per capita of the compass country should not exceed that of the country in question by more than 100%.

also more difficult. It is easier because trade and foreign direct investment eases the transfer of knowledge and technologies and may also add to the industrial capacity of host countries. It is more difficult because the current global trade regime – manifested in the WTO rules – considerably reduces the policy space of developing countries to implement the kind of policies that in the past proofed successful in fostering industrialisation and technological upgrading. We refer here both to the General Agreement on Tariffs and Trade (GATT) and the Agreement on Subsidies and Countervailing Measures ('WTO-subsidies code')[31]).

Hence, we restate that the international trade rules should be designed in a way that gives *all* countries the policy space they require to implement adequate industrial policies. This could assist low-income countries in their industrialisation and catch-up process potentially leading to an international trading system in which more countries benefit from trade. After all, thanks to technological progress and a generally open trade environment the opportunities for catching-up and the chances to create a more inclusive global trading system have never been as great as they are now – it may however require some rebalancing of current WTO rules.

[31]) For example, while the WTO subsidies code explicitely allows for R&D subsidies for firms of up to 75% of the cost of industrial research (Article 8), subsidies for first-mover firms in latent comparative advantage industries would come into conflict with the specificity criterion and be prohibited ('actionnable').

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Author:
Roman Stöllinger, wiiw stoellinger@wiiw.ac.at

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Contact:
FIW-project office
c/o WIFO
P.O. Box 91
A-1103 Vienna
Telefon: +43 1 798 26 01 - 333
Email: fiw-pb@fiw.at
Website: http://www.fiw.at/
Webseite: http://www.fiw.at/

Appendix

Appendix 1 – Definition of World Regions

Code	Region Name	Bloc
AFN	North Africa	
DZ	Algeria	AFN
EG	Egypt	AFN
LY	Libyan Arab Jamahiriya	AFN
MA	Morocco	AFN
SD	Sudan	AFN
TN	Tunisia	AFN
AFS	Other Africa	
AFO1)	Other Africa	AFS
AFS	Africa small LDCs	AFS
AO	Angola	AFS
BF	Burkina Faso	AFS
BI	Burundi	AFS
BJ	Benin	AFS
CD	Democratic Republic of the Congo	AFS
CF	Central African Republic	AFS
CG	Congo	AFS
CI	Cote d'Ivoire	AFS
CM	Cameroon	AFS
ET	Ethiopia	AFS
GH	Ghana	AFS
GN	Guinea	AFS
KE	Kenya	AFS
LR	Liberia	AFS
MG	Madagascar	AFS
ML	Mali	AFS
MR	Mauritania	AFS
MW	Malawi	AFS
MZ	Mozambique	AFS
NE	Niger	AFS
NG	Nigeria	AFS
RW	Rwanda	AFS
SL	Sierra Leone	AFS
SN	Senegal	AFS
SO	Somalia	AFS
TD	Chad	AFS
TG	Togo	AFS
TZ	United Republic of Tanzania	AFS
UG	Uganda	AFS
ZA	South Africa	AFS
ZM	Zambia	AFS
ZW	Zimbabwe	AFS

Code	Region Name	Bloc
ACX	Central America	
AMO2)	Other America	ACX
CR	Costa Rica	ACX
CU	Cuba	ACX
DO	Dominican Republic	ACX
GT	Guatemala	ACX
HN	Honduras	ACX
HAT	Haiti	ACX
JM	Jamaica	ACX
MX	Mexico	ACX
NI	Nicaragua	ACX
PA	Panama	ACX
SV	El Salvador	ACX
AM	South America	
AR	Argentina	AM
BO	Bolivia	AM
BR	Brazil	AM
CL	Chile	AM
CO	Colombia	AM
EC	Ecuador	AM
PE	Peru	AM
PY	Paraguay	AM
UY	Uruguay	AM
VE	Venezuela	AM
IN	India	
IN	India	IN
ASO	Other South Asia	
AF	Afghanistan	ASO
ASL3)	Other South Asia	ASO
BD	Bangladesh	ASO
LK	Sri Lanka	ASO
NP	Nepal	ASO
PK	Pakistan	ASO
CI	Commonwealth of Independent	
SU	Former Soviet Union	CI

Appendix 1 – Definition of World Regions (continued)

Code	Region Name	Bloc
JA	Japan	
JP	Japan	JA
CN	China	
CNM	China inc Macao	CN
EAH	East Asia High Income	
HK	Hong Kong SAR of China	EAH
KR	Republic of Korea	EAH
SG	Singapore	EAH
TW	Taiwan	EAH
EAO	Other East Asia	
ID	Indonesia	EAO
KH	Cambodia	EAO
KP	Democratic Peoples Rep of Korea	EAO
LA	Lao Peoples Democratic Republic	EAO
MM	Myanmar	EAO
MN	Mongolia	EAO
MY	Malaysia	EAO
OCO4)	Other Oceania	EAO
PG	Papua New Guinea	EAO
PH	Philippines	EAO
TH	Thailand	EAO
VN	Vietnam	EAO
WA	West Asia	
AE	United Arab Emirates	WA
BH	Bahrain	WA
IQ	Iraq	WA
IR	Iran (Islamic Republic of)	WA
JO	Jordan	WA
KW	Kuwait	WA
LB	Lebanon	WA
MEO5)	Other Middle East	WA
OM	Oman	WA
SA	Saudi Arabia	WA
SY	Syrian Arab Republic	WA
TR	Turkey	WA
YE	Republic of Yemen	WA

Code	Region Name	Bloc
EUC	Central Europe	
AT	Austria	EUC
BEL	Belgium-Luxembourg	EUC
CH	Switzerland	EUC
DE	Germany	EUC
FR	France	EUC
NL	Netherlands	EUC
EUE	East Europe	
AL	Albania	EUE
BG	Bulgaria	EUE
CS	Former Czechoslovakia	EUE
HU	Hungary	EUE
PL	Poland	EUE
RO	Romania	EUE
YU	Former Yugoslavia	EUE
EUN	North Europe	
DK	Denmark	EUN
FI	Finland	EUN
NO	Norway	EUN
SE	Sweden	EUN
EUS	South Europe	
ES	Spain	EUS
OEU 6)	Other Europe	EUS
GR	Greece	EUS
IE	Ireland	EUS
IT	Italy	EUS
PT	Portugal	EUS
EUW	West Europe	
GB	United Kingdom	EUW
OD	Other Developed	
AU	Australia	OD
CA	Canada	OD
IL	Israel	OD
NZ	New Zealand	OD
US	USA	
US	United States	US

1) AFO includes: Botswana, Cape Verde, Gabon, Mauritius, Seychelles.

2) AMO includes: Antigua and Barbuda, Barbados, Bermuda, Bahamas, Belize, Dominica, Falkland Islands (Malvinas), Grenada, Guyana, Anguilla, Saint

3) ASL includes: Bhutan, Maldives.

4) OCO includes: Cook Islands, Fiji, Kiribati, New Caledonia, Nauru, French Polynesia, Solomon Islands, Tonga, Tuvalu, British Virgin Islands, Vanuatu, Sa-

5) MEO includes: Qatar, Occupied Palestinian Territory.

6) includes: Andorra, Cyprus, Iceland, Liechtenstein, Malta.

Appendix 2 – Industry classifiction according to global technological intensity

Industry	ISIC codes
High technology	
Pharmaceuticals	3522
Computer, office machinery	3825
Electronics-communications	3832
Aerospace	3845
Medium-high technology	
Scientific Instruments	385
Motor vehicles	3843
Electrical machinery	383 (except 3832)
Chemicals	351, 352, 3522
Other transport equipment	3842, 3844,3849
Non-electrical machinery	382 (except 3825)
Medium-high technology	
Rubber and plastic products	355,356
Shipbuilding	3841
Other manufacturing	39
Non-ferrous metals	372
Non-metallic mineral products	36
Fabricated metal products	381
Petroleum refining	351, 354
Ferrous metals	371
Medium-high technology	
Paper printing	34
Textiles and clothing	32
Food, beverages and tobacco	31
Wood and furniture	33

Source: Hatzichronoglou (1997)