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Development Stage Theory and Industrial Growth Patterns

Asian NIEs and Selected Advanced Economies Compared (1980–1995)[1]

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Introduction

In the period 1980–95 East Asia was the fastest growing economic bloc in the world. In particular Asian newly industrializing economies (NIEs) such as Hong Kong, Singapore, South Korea and Taiwan achieved remarkable industrial development. Furthermore major economic policy measures (like import substitution, export promotion, incentives for domestic and foreign investments, subsidisation of technology development, etc.) were (and still are) strongly industry-oriented. High growth performances and active state interventions were also accompanied by various structural changes in the industrial sector (World Bank, 1993; Ozawa, 2001). As a consequence, the changes in industrial emphasis from natural resource- and labour-intensive to high-tech industries were pronounced in Asian NIEs in 1980–95, as their overall economy became more advanced.

Based on development stage theory, originally initiated by Rostow (1960) this study compares the specialisation pattern of Asian NIEs and its change with that of more advanced economies like Japan, West Germany[2] and the US for the period between 1980 and 1995. In contrast to previous studies which were often limited to examining the life-cycle of a few specific industries in different countries or concentrated on the changes in the composition of major export items, this study attempts to identify the definite

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[2] In spite of unification in 1990, this study does not consider the industrial development of the entire German territory but only that of the western part for the period 1980-95. West Germany has traditionally been an advanced industrial nation, whereas the eastern part rapidly transformed its less productive economic structure in the first half of the 1990s.

changes in each country's industrial competitiveness – also triggered by economic and political factors mentioned above – adopting various statistical methods. In order to tackle these issues in an empirical way, UNIDO data on real manufacturing value added (MVA) expressed in 1990 US dollars are applied for the period mentioned above.

Critical Assessment of Existing Theoretical and Empirical Investigations Relevant to Various Industrial Development Stages in Asia

Industrial development as well as the specialisation pattern in Japan, the Four Tigers (Hong Kong, Singapore, South Korea and Taiwan), ASEAN countries and China are generally examined in Asia by adopting a simple (but practical) way of determining where the economy or the life-cycle of leading industries of one country is currently positioned in the past growth-path of a more developed country: "A developing country, in an open economy context, industrialises and goes through industrial upgrading, step by step, by capitalising on the learning opportunities made available through its external relation with the more advanced world" (UNCTAD, 1995, p. 259). In other words, apart from the changes in the life-cycles of dominating industries over time (for example, from a concentration on the labour-intensive textile industry, steel and chemical industries to automobiles, etc.) and, consequently, in the domestic industrial structure of a country in the course of economic growth, such a development stage analysis model also provides in a regional hierarchy framework an explanation for industrial relocation from a developed country to a less-developed one through trade and foreign direct investment in response to a shift in competitiveness (Akamatsu, 1961; Kojima, 1975 and 2000; Kojima and Ozawa, 1985; Ozawa, 1995 and 2001; UNCTAD, 1996; Nam and Nam, 1999).

In combination with two kinds of markets (domestic and export markets) and five types of industries (R&D-intensive and easily imitable high-tech industries, as well as capital-, labour- and natural resource-intensive industries – see Table 1), the stages of industrial (and economic) development can generally be divided into three phases:

- stage 1: natural resource and labour driven,
- stage 2: capital and imported technology driven, and
- stage 3: R&D and innovation driven.

According to this evolutionary approach, each country is on a continuum within one of these three stages, and as it moves forward, it takes on a new series of competitive tasks in the world economy and leaves less sophisticated activities to countries at the lower level of economic development. The natural resource and labour driven stage of economic development includes countries that generate most of their GDP from processing and exporting natural resources and agricultural products. In addition, cheap, manual-skilled labour in these countries hosts a variety of simple mass-production assembly plants. In the second stage, countries are more technologically advanced than countries in the first stage. Domestic and foreign investments are funnelled into plants, taking advantage of economies of scale, using technology transferred from more advanced countries, and producing standardised products with mass labour inputs provided by the local population. In other words, industrial production in the stage driven by capital and imported technology is also, to a large extent, labour-intensive and its success strongly depends on the endowment of the manual and skilled workforce and its absorption capacity for foreign technology. In the third R&D and innovation driven stage, firms are challenged by the increased levels of world competition to innovate new products derived from high levels of technology and know-how. Apart from the well-known impacts of modern R&D infrastructure and high-quality human capital in generating and implementing new technologies in the development of new products (Ranis, 2004), the innovative industrial firms' (institutionalised and therefore long-lasting) networks with research institutions and high-tech business service firms as well as other industrial companies in the context of a national innovation system become crucial for the country's continued economic and industrial growth in the third stage.

However, increasingly, the three development stages can no longer be sharply distinguished as these phases now overlap, due partly to the rapid integration of the world market and the intensive globalisation of business activities of multinationals including trade, foreign direct investment as well as technology transfer (Nam and Nam, 1999; Ozawa, 2001). Moreover, it is likely that the 'innovation-imitation lag' (UNCTAD, 1996, p.80) between advanced countries (like Japan, West Germany and the US) and NIEs has been significantly reduced in the past twenty years, thanks mainly to the greater flexibility and divisibility in production technology and to a rapid accumulation of physical and human capital in NIEs that has enabled them to introduce new technologies embodied in capital goods and has accelerated the learning and catching-up process.

Table 1: Classification of industry types

Types	Industries classified according to International Standard Industrial Classification of All Economic Activities (ISIC)
R&D-intensive high-tech industries	Professional & scientific equipment (385) Non-electrical machinery (382) Transport equipment (384)
Easily imitable high-tech industries	Industrial chemicals (351) Other chemical products (352) Rubber products (355) Electrical machinery (383)
Capital-intensive industries	Food products (311/2) Beverages (313) Tobacco products (314) Textiles (321) Glass & glass products (362) Other non-metal mineral products (369) Other manufacturing industries (390)
Labour-intensive industries	Wearing apparel (322) Leather & fur products (323) Footwear (324) Wood & wood products (331) Furniture & fixtures (332) Paper & paper products (341) Printing & publishing (342) Plastic products (356) Pottery, china & earthenware (361) Metal products (381)
Natural resource-intensive industries	Petroleum refineries (353) Miscellaneous petroleum & coal products (354) Iron & steel (371) Non-ferrous metals (372)

Source: OECD (1992), Industrial Policy in OECD Countries; Annual Review, Paris; Heitger, Schrader and Bode (1992), Die mittel- und osteuropäischen Länder als Unternehmensstandort, Kiel; UNIDO (1996), Industrial Development – Global Report 1995, Oxford; Nam and Nam (1999), Recent Industrial Growth and Specialisation in Selected Asian Countries, Review of Asian and Pacific Studies, No. 18.

Apart from the enhancement in theoretical approaches mentioned above, the development stage model has been widely applied in a large number of empirical studies which attempted to compare the speed, causes and consequences of the economic and industrial growth process of Asian NIEs (and other countries like China, Indonesia and Thailand) in the context of the regional development hierarchy. Extensive work has also been carried out in investigating the major changes in individual industries' comparative advantages in the world market and in identifying the subsequent transformation of industrial structure that accompanies the rapid economic progress in those Asian countries.

In the Chenery-Syrquin framework of development pattern, the convergence (or divergence) in industrial and economic performance has often been measured for Japan, the Four Tigers and other rapidly emerging markets like China and Indonesia in a given period of time (Chenery and Syrquin, 1977; Chenery, 1981; Song, 1992; Heitger, 1993; Kitano, 1994; Maddison, 1995; Nam, 1997). In particular, such multilateral approaches have been applied in Asia in order to predict the future (economic and) industrial growth dynamics required by a follower country in order to reach the leader's current level. Yet this type of study quite often failed to adequately consider the variation of economic and structural basis as well as the difference in development potentials of the individual countries (Nam and Nam, 1999).

Regarding the international transfer of industries in accordance with changes in comparative advantage, Ezaki (1995) observed for NIEs and some ASEAN countries that certain industries like synthetic fibre and steel production follow the pattern of the 'catching-up product cycle' in different development tiers, which begins with import substitution and leads to export expansion through the continuous increase in domestic production exceeding indigenous demand. Yet this type of smooth industrial transmission could not be successfully applied in China, for example, since, due mainly to its potentially huge domestic market, the country's relative dependence on import substitution and exports of the industries mentioned above probably have become far less significant compared to that of domestic demand (Yamazawa and Watanabe, 1988; Ezaki, 1995; Pomfret, 1997).

Assuming that changes in a country's trade structure are closely associated with those in its industrial structure, a number of empirical studies have also been done – based on the revealed comparative advantage (RCA) concept by Balassa (1965) – to identify the changes in international competitiveness of selected industries in different Asian countries over time. Taking the machinery industry as an example, Ezaki (1995) showed that the

competitiveness of ASEAN countries increased rapidly from the lower level in the period 1966–85, while NIEs achieved a higher competitiveness than the world average. On the other hand, Japan became less competitive in the same period of time, which, in turn, implies that the catching-up process had started to take place among ASEAN, NIEs and Japan in the machinery sector since the mid-1960s. In a broader industrial classification, Yamazawa and Watanabe (1988) argued that patterns of changing international competitiveness (measured in terms of RCA values in 1968, 1972 and 1977) among those Asian countries mentioned above were quite different for labour-intensive light industries, and capital-intensive heavy and chemical industries. Such types of RCA analyses have been supplemented by the international comparison of changes in composition of principal exports of manufacturers (Hughes, 1989; Lloyd and Toguchi, 1996). For instance, these studies suggested that exports of some labour- and capital-intensive products (e.g. textiles, wearing apparel, leather products, metal products, etc.) played a key role in the exports of all NIEs in the period 1970–85 but have since lost continuously in significance. Due to the export diversification towards more skill- and technology-intensive (electrical and non-electrical) machinery and transport equipment in NIEs, their trade with the advanced countries has gradually shifted from inter-industry to intra-industry patterns since the mid-1980s.

Lastly, recent studies on the development stage model have also focussed on the linkages of foreign direct investment among Asian countries at different levels of industrialisation. Here the role played by more advanced countries and major economic and location factors underlying the changes in investment flows in this rapidly integrating area have been crucial aspects (Blomqvist, 1995; Grow, 1995; UNCTAD, 1996). According to those studies, massive foreign investments with related technology transfer through foreign firms have allowed China, for example, to achieve much greater industrial diversification with modern capital stock and stimulated a more rapid change in specialisation patterns from labour- to capital-intensive at an earlier development stage (between 1985–95) than was the case in NIEs (in the 1970s and the early 1980s), producing domestic manufacturers and exporters of sophisticated industrial goods including high-tech products and capital goods as well as labour-intensive products at the same time (UNCTAD, 1996).

Statistical Models for the Calculation of Industrial Growth and Specialisation

Apart from the shift-share analysis of principal industries between 1980 and 1995, three simple statistical models are adopted in this study to identify the degree of industrial specialisation and to calculate the growth index of individual branches as well as to measure the extent of development interdependence among industries in the countries investigated. The model for calculating the degree of industrial specialisation was developed by UNIDO and is widely applied in the international comparison of industrial concentration (and diversification) for economies in different development stages.

When $s_i(t)$ shows the share of i-th industry in total manufacturing value added (MVA) of a country in the year t, and ln is the natural logarithm, the degree of specialisation in the year t, $h(t)$, is defined as follows:

$$(1) \quad h(t) = 100\,[1 + \{ \sum_{i=1} s_i(t)\, ln\, s_i(t) \} / h_{max}(t)]$$

where $h_{max}(t) = ln\,(N)$ in the year t, N indicates the total number of industries investigated that are predetermined for the comparative analyses and $N > 1$. If one country has N number of industries and the MVA share of individual industries is equal in the year t, the degree of specialisation for the country is 0 in the same year. If among the total given number of industries N only one industry exists in a country, the value is 100 in the year t (UNIDO, 1996, p.116).

The industrial growth index (IGI) of i-th industry compared to the changes in total MVA between the year t and $t+1$ is defined as follows:

$$(2) \quad IGI_i = ln\,[\{Q_i(t+1) / Q_i(t)\} / \{\sum_{i=1} Q_i(t+1) / \sum_{i=1} Q_i(t)\}]$$

where $Q_i(t)$ is the MVA of i-th industry in the year t and ln is the natural logarithm. When the production of an industry in a country grows at the same rate as the total MVA in a given period of time, the IGI value of the industry amounts to 0. If the industry grows faster than the national MVA, then IGI is positive.

In order to examine the MVA development interdependence among industries in the long run a cross-sectional time-series regression model is applied. The model to be estimated is

$$(3)\quad y_{it} = \alpha + \beta x_{it} + v_i + e_{it}$$

for $i = 1, ..., n$ and, for each i, $t = 1, ..., T$, of which T_i periods are actually observed.

The major purpose of applying the model is to quantify β. In addition $v_i + e_{it}$ is the residual: v_i is characterised as the unit-specific residual while e_{it} is the usual residual.

The fixed-effects model produces estimates by running OLS (Ordinary Least Squares) on

$$(4)\quad \left(y_{it} - \bar{y}_i + \bar{\bar{y}}\right) = \alpha + \left(x_{it} - \bar{x}_i + \bar{\bar{x}}\right)\beta + \left(e_{it} - \bar{e}_i + \bar{\bar{v}}\right) + \bar{\bar{e}}$$

where $\bar{y}_i = \sum_{t=1}^{T_i} y_{it}/T_i$ and similarly $\bar{\bar{y}} = \sum_i \sum_t y_{it}/(nT_i)$

The covariance matrix of the estimators is adjusted for the extra n–1 estimated means, so results are the same as using OLS on equation (4) to estimate v_i directly.[3]

Comparison of Recent Industrial Growth and Structural Change in Asian NIEs and Selected Advanced Economies (1980–1995)

Shift-share Analysis of Leading Industries, Degree of Specialisation and Industrial Growth Index

In the comparison of relative development of total MVA among Asian NIEs in the investigated years, one is immediately impressed by the remarkably dynamic growth of South Korea followed by Singapore and Taiwan (Figure 1). By contrast, Hong Kong's overall economic performance depended more strongly on the growth of the service sector since the beginning of the 1980s: its MVA continued to decline in the 1990s and was below the 1980 level in 1995. This fact indicates that all NIEs did not have a similar

[3] From the estimates $\hat{\alpha}$ and $\hat{\beta}$, estimates u_i of v_i can also be obtained as $u_i = \bar{y}_i - \hat{\alpha} - \bar{x}_i\hat{\beta}$. Reported from the calculated u_i is its standard deviation and its correlation with $\bar{x}_i\hat{\beta}$.

industrial growth pattern between 1980 and 1995.[4] In spite of the mature economic stage and the high level of industrial production, Japan, West Germany and the US were also able to gradually increase total MVA in the investigated period of time (Figure 2). The past industrial growth trend of Japan and West Germany seems to be better correlated than that of Japan (or West Germany) and the US (see, for example, the difference between 1989 and 1993).

The degree of specialisation calculated by UNIDO is designed to give an overview of the concentration of industrial activities and the changes in manufacturing structure of a country within a given period of time. As shown in Table 2, these measures calculated for the countries investigated have changed over time. A continuous concentration in industrial specialisation took place in Singapore, Taiwan and South Korea, while a clear diversification occurred in Hong Kong between 1980 and 1995. In Japan and West Germany, a weak diversification tendency was observed in this period, whereas the US experienced a minor concentration in the same period of time. Furthermore, significant disparities in overall specialisation degrees corresponding to the development stages of individual countries can scarcely be observed. Since 1980, for example, Hong Kong and Singapore had higher degrees than those in the selected advanced economies, whose degrees of specialisation are more or less comparable to those of South Korea and Taiwan.

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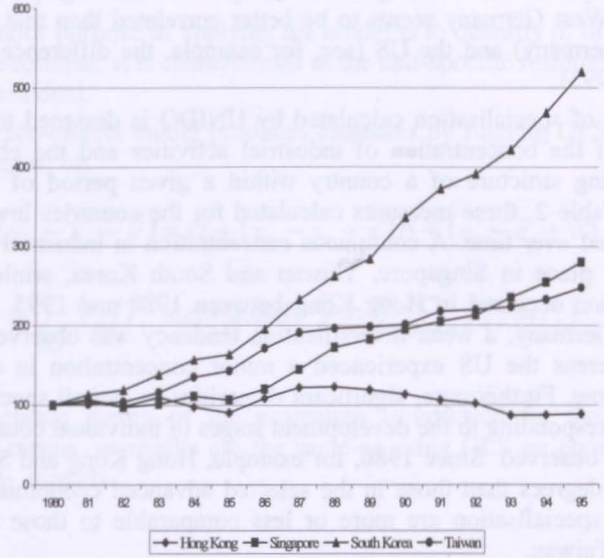
[4] While the similarity in industrial development patterns of Asian NIEs is apparent, well-acknowledged strengths have created pockets of specialisation evident when comparing these countries with one another. In particular, among the Asian Tigers, Hong Kong appears as an exception more than once. Due largely to geopolitical factors, including its long history as a free port, its colonial ties to the United Kingdom and its more-than-average dependence on entrepot trade, Hong Kong's industrial development pattern diverged from that of other Asian NIEs. During the post-war period, Hong Kong began to specialise in light manufacturing. The backbone of the economy, however, remained the textile industry. In the 1960s, a surge of multinational firms, investments centres, and banks chose Hong Kong as their regional headquarters. In the 1970s the importance of the banking, real estate and insurance sectors became even more apparent, as the manufacturing sector's contribution to GDP decreased percentage-wise. By the 1990s, Hong Kong was rapidly developing a strong service-based economy. In particular, Hong Kong does not conform to the general development patterns of the other NIEs in the development of professional and scientific equipment, industrial chemicals and chemical production, food products, beverages and tobacco products, and petroleum refineries. In spite of this, Hong Kong's specialisation in distinct sectors does not render it incomparable with other NIEs on an industry-wide development level.

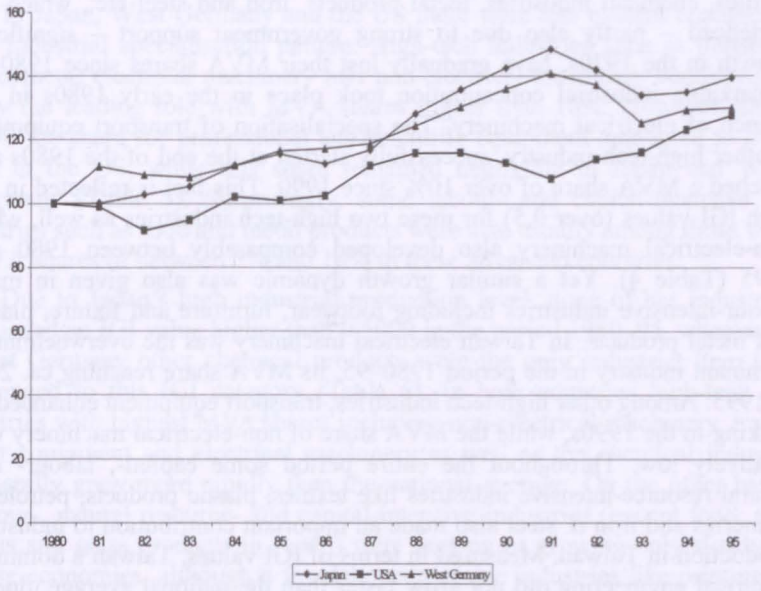
Figure 1: Relative growth of total industrial production in Asian NIEs (1980=100)



Source: UNIDO database; Calculation of the Ifo Institute for Economic Research

Although the changes in the overall degree of specialisation became generally less significant (except in the case of Hong Kong and Singapore), one can easily identify the movements of a country's comparative advantage when the position of leading industries measured in terms of MVA shares is shown. To be sure, an increase of the MVA share of an industry in a given period is due to the fact that this industry has been growing faster than the total MVA in a country. In the following, major findings of empirical analyses carried out on the basis of MVA share analysis and the elaboration of the industrial growth index (IGI) are shown systematically for the selected countries.

Figure 2: Relative growth of total industrial production in selected advanced economies (1980=100)



Source: UNIDO database; Calculation of the Ifo Institute for Economic Research

Table 2: Degree of industrial specialisation in Asian NIEs and selected advanced economies

Country	1980	1985	1990	1995
Hong Kong	24.2	22.6	21.3	19.4
Singapore	19.9	23.2	24.7	28.6
South Korea	9.1	9.5	10.4	11.4
Taiwan	10.0	9.7	10.4	12.9
Japan	11.8	15.1	15.8	15.2
West Germany	12.1	14.7	15.4	15.2
USA	11.9	13.5	12.3	12.8

Source: UNIDO database; Calculation of the Ifo Institute for Economic Research

A relatively clear specialisation towards high-tech industries was most obvious in leading industries in South Korea between 1980 and 1995 (Table 3). Labour-, capital- and natural resource-intensive industries such as textiles, chemical industries, metal products, iron and steel etc., which experienced – partly also due to strong government support – significant growth in the 1970s, have gradually lost their MVA shares since 1980. A remarkable industrial concentration took place in the early 1980s in the branch of electrical machinery. The specialisation of transport equipment, another high-tech industry, successfully started at the end of the 1980s and reached a MVA share of over 10% since 1990. This fact is reflected in the high IGI values (over 0.5) for these two high-tech industries as well, while non-electrical machinery also developed comparably between 1980 and 1995 (Table 4). Yet a similar growth dynamic was also given in many labour-intensive industries including footwear, furniture and fixture, plastic and metal products. In Taiwan electrical machinery was the overwhelmingly dominant industry in the period 1980–95, its MVA share reaching ca. 20% in 1995. Among other high-tech industries, transport equipment enhanced its ranking in the 1990s, while the MVA share of non-electrical machinery was relatively low. Throughout the entire period some capital-, labour- and natural resource-intensive industries like textiles, plastic products, petroleum refineries and iron & steel also made an important contribution to industrial production in Taiwan. Measured in terms of IGI values, Taiwan's dominant electrical engineering did not grow faster than the national average, due in part to its already high share. While all investigated capital- and natural resource-intensive industries were lagging, with negative ICI values in South Korea, some Taiwanese industries including glass and glass products and iron & steel grew relatively faster. Singapore's experience appears to be a combination between that of Korea and Taiwan in the years 1980–95. In particular, electrical machinery remained the most important high-tech industry in Singapore since the beginning of the 1980s, whereas non-electrical machinery and transport equipment gradually gained significance in the course of time. Apart from high-tech industries like non-electrical machinery, industrial chemicals and other chemical products, some capital- and labour-intensive industries such as tobacco, glass and glass products, paper and paper products, printing and publishing, plastic products, metal products, etc. achieved higher IGI values than 0 in Singapore. In spite of the distinctive specialisation toward high-tech industries (e.g. non-electrical machinery and transport equipment as shown by IGI values) and the persisting dominance of electrical machinery expressed in terms of its MVA share, Hong Kong's past industrial performance was found to be rather different from that of other Asian NIEs: wearing apparel and textiles – two typical

capital- and labour-intensive industries – retained their importance between 1980 and 1995. Moreover, a rapid growth of the printing and publishing industry – also capital-intensive – was observed in the same period of time.

In Japan, West Germany and the US there were less evident changes in the industrial specialisation pattern. High-tech industries such as transport equipment, electrical machinery and non-electrical machinery continued to play the leading role with MVA shares higher than 10%. However, since 1990 the share for professional and scientific equipment amounted to over 5% in the US, while this share remained negligible in Japan and West Germany (Table 5). Surprisingly, some labour- and capital-intensive industries such as food and metal products were also usually among those with MVA shares of between 5% and 10% in these advanced countries.

Due to Japan's high industrial production level, none of her industries achieved an IGI value higher than 0.5000 in the period 1980–95, whereas in West Germany other chemical products were the only industrial item that belonged to this IGI category (Table 6). In both countries high-tech industries with highest MVA shares including non-electrical machinery, transport equipment and electrical machinery as well as the chemical industry generally grew more rapidly than the national average. On the other hand, labour-, natural resource- and capital-intensive industries (except food, and glass and glass products in Japan) were lagging or growing only slowly in these economies, although a few labour-intensive industries like printing & publishing, plastic and metal products developed faster than the overall MVA growth. By contrast, the IGI values for the US show somewhat diverging trends: the leading advanced industries like non-electrical machinery, industrial chemicals, electrical machinery, etc. performed below average in the same period of time. Unlike the case in former advanced countries, the IGI value for professional and scientific equipment – the most sophisticated industrial area – was, surprisingly, highest in the US, which led to the rapid increase in the MVA share in the first half of the 1990s, as mentioned above.

Table 3: Industrial specialisation in Asian NIEs measured in % share of manufacturing value added (MVA)

1980	1985	1990	1995
		Hong Kong	
		Industries with higher than 10.0% MVA share	
Wearing apparel; Textiles; Electrical machinery	Wearing apparel; Textiles; Electrical machinery	Wearing apparel; Textiles	Textile; Wearing apparel; Electrical machinery; Printing & publishing
		Industries with MVA shares between 5.0% and 10.0%	
Metal products; Plastic products	Plastic products; Metal products; Printing & publishing	Electrical machinery; Non-electrical machinery; Printing & publishing; Plastic products; Metal products	Non-electrical machinery; Metal products
		Singapore	
		Industries with higher than 10.0% MVA share	
Electrical machinery; Transport equipment	Electrical machinery	Non-electrical machinery; Electrical machinery	Non-electrical machinery; Electrical machinery
		Industries with MVA shares between 5.0% and 10.0%	
Non-electrical machinery; Metal products	Transport equipment; Non-electrical machinery; Petroleum refineries; Metal products; Other chemical products	Transport equipment; Metal products; Petroleum refineries; Other chemical products	Transport equipment; Metal products

Table 3 *continued*

1980	1985	1990	1995
	South Korea		
	Industries with higher than 10.0% MVA share		
Textiles	Electrical machinery; Textiles	Electrical machinery; Transport equipment	Electrical machinery; Transport equipment
	Industries with MVA shares between 5.0% and 10.0%		
Electrical machinery; Food; Iron & steel; Transport equipment; Tobacco; Other chemical products; Industrial chemicals	Transport equipment; Food; Iron & steel	Non-electrical machinery; Textiles; Iron & steel; Food; Metal products	Non-electrical machinery; Textiles; Food; Metal products; Iron & steel
	Taiwan		
	Industries with higher than 10.0% MVA share		
Electrical machinery	Electrical machinery	Electrical machinery	Electrical machinery
	Industries with MVA shares between 5.0% and 10.0%		
Textiles; Petroleum refineries; Food; Industrial chemicals; Transport equipment; Plastic products; Other manufacturing industries; Iron & steel; Wearing apparel	Textiles; Food; Industrial chemicals; Plastic products; Wearing apparel; Petroleum refineries; Other manufacturing industries; Transport equipment; Iron & steel	Transport equipment; Textiles; Plastic products; Metal products; Industrial chemicals; Iron & steel; Food	Metal products; Transport equipment; Petroleum refineries; Textiles; Iron & steel; Plastic products; Non-electrical machinery

Source: UNIDO database; Calculation of the Ifo Institute for Economic Research

Table 4: Industrial growth in Asian NIEs 1980–1995

	Lagging or slowly growing industries with negative IGI values	**Fast growing industries with IGI values between 0.0001 and 0.4999**	**Very rapidly growing industries with IGI values larger than 0.5000**
		Hong Kong	
R&D-intensive high-tech industries	Professional & scientific equipment		Non-electrical machinery; Transport equipment
Easily imitable high-tech industries	Rubber products; Electrical machinery	Industrial chemicals; Other chemical products	
Capital-intensive industries		Beverages; Textiles; Other non-metal mineral products; Other manufacturing industries	Food; Tobacco; Glass & glass products
Labour-intensive industries	Wearing apparel; Leather & fur products; Footwear; Wood & wood products; Furniture & fixtures; Plastic products; Pottery, china & earthenware; Metal products		Paper & paper products; Printing & publishing
Natural resource-intensive industries	Iron & steel	Non-ferrous metals	

Table 4 *continued*

	Lagging or slowly growing industries with negative IGI values	Fast growing industries with IGI values between 0.0001 and 0.4999	Very rapidly growing industries with IGI values larger than 0.5000
		South Korea	
R&D-intensive high-tech industries	Professional & scientific equipment		Non-electrical machinery; Transport equipment
Easily imitable high-tech industries	Industrial chemicals; Other chemical products; Rubber products		Electrical machinery
Capital-intensive industries	Food, Beverages; Tobacco; Textiles; Glass & glass products; Other non-metal mineral products; Other manufacturing industries		
Labour-intensive industries	Wearing apparel; Wood & wood products; Pottery, china & earthenware	Leather & fur products; Paper & paper products; Printing & publishing	Footwear; Furniture & fixtures; Plastic products; Metal products
Natural resource-intensive industries	Petroleum refineries; miscellaneous petroleum & coal products; Iron & steel; Non-ferrous metals		

Table 4 *continued*

	Lagging or slowly growing industries with negative IGI values	Fast growing industries with IGI values between 0.0001 and 0.4999	Very rapidly growing industries with IGI values larger than 0.5000
		Singapore	
R&D-intensive high-tech industries	Transport equipment; Professional & scientific equipment		Non-electrical machinery
Easily imitable high-tech industries	Rubber products	Other chemical products; Electrical machinery	Industrial chemicals
Capital-intensive industries	Food; Beverages; Textiles; Other non-metal mineral products; Other manufacturing equipment	Tobacco; Glass & glass products	
Labour-intensive industries	Wearing apparel; Leather & fur products; Wood & wood products; Furniture & fixtures;	Paper & paper products; Printing & publishing; Plastic products; Pottery, china & earthenware; Metal products	
Natural resource-intensive industries	Petroleum refineries; Miscellaneous petroleum & coal products; Iron & steel	Non-ferrous metals	

Table 4 *continued*

	Lagging or slowly growing industries with negative IGI values	Fast growing industries with IGI values between 0.0001 and 0.4999	Very rapidly growing industries with IGI values larger than 0.5000
		Taiwan	
R&D-intensive high-tech industries	Professional & scientific equipment	Transport equipment	Non-electrical machinery
Easily imitable high-tech industries	Industrial chemicals;	Other chemical products; Rubber products; Electrical machinery	
Capital-intensive industries	Food; Beverages; Tobacco; Textiles; Other manufacturing industries	Glass & glass products; Other non-metal mineral products	
Labour-intensive industries	Wearing apparel; Leather & fur products; Wood & wood products; Furniture & fixtures; Paper & paper products; Printing & publishing	Footwear; Plastic products; Pottery, china & earthenware	Metal products
Natural resource-intensive industries	Miscellaneous petroleum & coal products	Petroleum refineries; Iron & steel; Non-ferrous metals	

Source: UNIDO database; Calculation of the Ifo Institute for Economic Research

Table 5: Industrial specialisation in advanced economies measured in % share of manufacturing value added (MVA)

1980	1985	1990	1995
	Japan		
	Industries with higher than 10.0% MVA share		
Non-electrical machinery; Electrical machinery	Electrical machinery; Non-electrical machinery; Transport equipment	Electrical machinery; Non-electrical machinery; Transport equipment	Electrical machinery; Non-electrical machinery; Transport equipment
	Industries with MVA shares between 5.0% and 10.0%		
Transport equipment; Iron & steel; Food; Metal products; Printing & publishing	Food; Metal products; Iron & steel; Printing & publishing	Food; Metal products; Iron & steel; Printing & publishing; Other chemical products	Food; Metal products; Other chemical products; Printing & publishing;
	West Germany		
	Industries with higher than 10.0% MVA share		
Non-electrical machinery; Transport equipment; Electrical machinery	Non-electrical machinery; Transport equipment; Electrical machinery	Non-electrical machinery; Electrical machinery; Transport equipment;	Electrical machinery; Non-electrical machinery; Transport equipment
	Industries with MVA shares between 5.0% and 10.0%		
Iron & steel; Food; Petroleum refineries; Metal products; Industrial chemicals	Industrial chemicals; Metal products; Other chemical products	Metal products; Industrial chemicals; Other chemical products; Food	Metal products; Other chemical products; Food; Industrial chemicals

Table 5 *continued*

1980	1985	1990	1995
		USA	
		Industries with higher than 10.0% MVA share	
Non-electrical machinery; Transport equipment	Transport equipment; Non-electrical machinery; Electrical machinery	Transport equipment; Non-electrical machinery	Transport equipment; Non-electrical machinery
		Industries with MVA shares between 5.0% and 10.0%	
Electrical machinery; Food; Metal products; Printing & publishing; Industrial chemicals	Food; Printing & publishing; Metal products; Other chemical products	Food; Electrical machinery; Printing & publishing; Other chemical products; Professional & scientific equipment; Industrial chemicals; Metal products	Food; Electrical machinery; Printing & publishing; Other chemical products; Professional & scientific equipment; Metal products

Source: UNIDO database; Calculation of the Ifo Institute for Economic Research

Variation of Correlation Coefficients among Different Types of Industries in Asian NIEs and Advanced Economies

The following empirical analysis aims at examining the simple, theoretical logic of parallel development of dominating industries within the same industrial group at a given economic development stage. A priori one can easily presume that in the selected advanced economies the growth among various R&D-intensive high-tech industries is more strongly correlated than that in Asian NIEs within the period investigated (1980–95). This can be explained by the fact that these developed countries at the mature economic phase have long had a large percentage of such advanced industries so that their industrial structure changed only to a limited extend within the investigated period of time. On the other hand, the catching-up process experienced by NIEs tends to lead to the fast growth of a few high-tech industries, which can, in turn, cause a rather unbalanced specialisation within this industrial field. Moreover, the correlation coefficient between industries belonging to those capital- or labour-intensive industry groups is likely to be higher in Asian NIEs where these industry groups generally triggered off the rapid structural change towards high-tech industries though they still remained powerful in the years between 1980 and 1995. In the selected advanced countries, however, a larger share of capital- and labour-intensive industries was declining or retarding, while a few continued to grow as shown above. Unlike former statistical analyses based on the industrial performance of individual nations, the multiple correlation coefficient among industries is calculated for the entire Asian NIEs and for the whole group of selected advanced economies so that this empirical work can done on the basis of sufficient observations. The number of observations amounts to 64 (i.e. 4 countries multiplied by 16 observed years) for NIEs and 48 (i.e. 3 industrial nations multiplied by 16 observed years) for the selected advanced economies. More precisely, these statistical methods aim at shedding light upon the relationship between specific industries within the same "industrial stage" category. The differences in development patterns are thus exhibited by the divergent multiple regression coefficients.

As hypothesised above, regression coefficients for R&D-intensive high-tech industries are higher for advanced economies than for NIEs. Aside from the non-electrical machinery sector, the coefficients for transport equipment and GDP per capita differed considerably (Table 7).

Within the easily imitable high-tech industries it is generally observed that the regression coefficients for the Asian tigers here demonstrate a weaker link than in the advanced economies. This is the case when comparing the chemical by-product, rubber product, and electrical machinery

industries and GDP per capita with the industrial chemical industry. An exception is made for electrical machinery.

However, the most discernible differences between industrial development patterns for both groups of countries are evinced by the regression coefficients in the capital-intensive and labour-intensive industries. Throughout the period 1980–1995, the links between the capital-intensive industries were stronger in the four Asian tigers than in the advanced economies. However, there are exceptions in the food, tobacco and textile industries, where the relation to the beverage industry is weak.

A similar pattern is also noted for labour-intensive industries, where advanced economies demonstrate a weaker link in the correlation of the production of industrial goods such as footwear, wood, furniture, paper, pottery, and metal. Exceptions to this are wearing apparel, leather and fur products, printing and publishing and GDP per capita. Here the R^2-values in the labour-intensive and capital-intensive industries are also quite high.

The results of regression analyses are somewhat ambivalent for the natural resource-intensive industries, as each country is differently endowed with such resources. The coefficients for petroleum refineries, non-ferrous metals and GDP per capita illustrate a much stronger relationship in the NIEs than in Japan, West Germany and the United States. Only in the miscellaneous petroleum and coal products industries did the advanced economies display stronger links than the Asian tigers.

Although there are a number of exceptions, the majority of observations have yielded results supporting the main hypothesis that specialisation differences in development stages do exist and that Asian tigers are, so to say, "catching up". While these regressions should not be taken as evidence that all industrial patterns in the NIEs contradict those of the advanced economies, there are enough cases, including the regressions shown here, where the coefficients between the two groups of countries differed significantly. In addition, the dissimilarities between coefficients become more obvious when comparing the capital- and labour-intensive industries with the high-tech industries. In conclusion, it appears that the industrial patterns of the NIEs and advanced economies remain quite different in the period of time investigated.

Table 6: Industrial growth in selected advanced countries 1980-1995

	Lagging or slowly growing industries with negative IGI values	**Fast growing industries with IGI values between 0.0001 and 0.4999**	**Very rapidly growing industries with IGI values larger than 0.5000**
		Japan	
R&D-intensive high-tech industries	Professional & scientific equipment	Non-electrical machinery; Transport equipment	
Easily imitable high-tech industries		Industrial chemicals; other chemical products; Rubber products; Electrical machinery	
Capital-intensive industries	Beverages; Tobacco; Textiles; Other non-metal mineral products	Food; Glass & glass products; Other manufacturing industries	
Labour-intensive industries	Wearing apparel; Leather & fur products; Wood & wood products; Furniture & fixtures; Paper & paper products; Pottery, china & earthenware	Printing & publishing; Plastic products; Metal products	
Natural resource-intensive industries	Petroleum refineries; Miscellaneous petroleum & coal products; Iron & steel; Non-ferrous metals		

Table 6 *continued*

	Lagging or slowly growing industries with negative IGI values	Fast growing industries with IGI values between 0.0001 and 0.4999	Very rapidly growing industries with IGI values larger than 0.5000
		West Germany	
R&D-intensive high-tech industries	Professional & scientific equipment	Non-electrical machinery; Transport equipment	
Easily imitable high-tech industries	Rubber products	Industrial chemicals; Electrical machinery	Other chemical products
Capital-intensive industries	Food; Beverages; Tobacco; Textiles; Glass & glass products; Other non-metal mineral products; Other manufacturing industries		
Labour-intensive industries	Wearing apparel; Leather & fur products; Footwear; Wood & wood products; Furniture & fixtures; Printing & publishing; Pottery, china & earthenware	Paper & paper products; Plastic products; Metal products	
Natural resource-intensive industries	Petroleum refineries; Miscellaneous petroleum & coal products; Iron & steel	Non-ferrous metals	

Table 6 *continued*

	Lagging or slowly growing industries with negative IGI values	Fast growing industries with IGI values between 0.0001 and 0.4999	Very rapidly growing industries with IGI values larger than 0.5000
		USA	
R&D-intensive high-tech industries	Non-electrical machinery	Transport equipment	Professional & scientific equipment
Easily imitable high-tech industries	Industrial chemicals; Rubber products; Electrical machinery	Other chemical products	
Capital-intensive industries	Textiles; Glass & glass products; Other non-metal mineral products; Other manufacturing industries	Food; Beverages	Tobacco
Labour-intensive industries	Wearing apparel; Leather & fur products; Footwear; Pottery, china & earthenware; Metal products	Wood & wood products; Furniture & fixtures; Paper & paper products; Printing & publishing	Plastic products
Natural resource-intensive industries	Petroleum refineries; Iron & steel; Non-ferrous metals	Miscellaneous petroleum & coal products	

Source: UNIDO database; Calculation of the Ifo Institute for Economic Research

Table 7: Industrial growth in selected advanced countries 1980-1995

Selected independent variables	**Dependent variables**					
R&D-intensive high-tech industries	Non-electrical machinery	Transport equipment			GDP per capita	R^2
Japan, West Germany & USA						
Scientific equipment	-0.3062 (t=-2.87)	0.4933 (t=-2.57)			1.5555 (t=-1.18)	0.5330
Asian NIEs						
Scientific equipment	0.0569 (t=2.32)	0.0189 (t=1.00)			-0.0037 (t=-0.54)	0.7376
Easily-imitable high-tech industries	Other chemical products	Rubber products	Electrical machinery		GDP per capita	R^2

Table 7 *continued*

Japan, West Germany & USA											
Industrial chemicals	0.2115 (t=1.39)	3.5756 (t=2.59)	-0.2096 (t=-2.67)							1.0897 (t=1.03)	0.6949
Asian NIEs											
Industrial chemicals	-0.0852 (t=-0.49)	-0.2620 (t=-2.20)	0.2368 (t=4.83)							0.0117 (t=0.85)	0.8989
Capital-intensive industries	Food products	Tobacco products	Textiles	Glass & glass products	Other non-metal minerals	Other manu-facturing products				GDP per capita	R^2
Japan, West Germany & USA											
Beverages	0.1326 (t=4.74)	0.1602 (t=3.43)	0.1357 (t=2.35)	0.2019 (t=1.01)	0.0869 (t=1.41)	-0.2476 (t=-2.10)				-0.2626 (t=1.68)	0.8740
Asian NIEs											
Beverages	-0.1932 (t=-3.09)	0.0934 (t=0.91)	0.0691 (t=1.71)	0.2059 (t=0.51)	0.3173 (t=2.86)	0.2889 (t=3.00)				0.0115 (t=0.01)	0.9042
Labour-intensive industries	Wearing apparel	Leather & fur products	Footwear	Wood & wood products	Furniture & fixtures	Paper & paper products	Printing & publishing	Pottery, china & earthenware	Metal products	GDP per capita	R^2

Table 7 *continued*

Japan, West Germany & USA										
Plastic products	0.8054 (t=1.93)	3.7640 (t=2.25)	-8.3009 (t=-4.70)	0.2530 (t=1.49)	-0.0088 (t=-0.02)	-0.3162 (t=-2.64)	0.0460 (t=0.62)	0.7185 (t=0.62)	0.2172 (t=2.59)	1.4490 (t=3.24)	0.9772
Asian NIEs										
Plastic products	0.3745 (t=5.87)	-1.5479 (t=-5.87)	0.7262 (t=3.61)	0.5635 (t=1.50)	0.6601 (t=1.10)	0.5914 (t=2.08)	-0.1371 (t=-1.08)	1.2317 (t=1.02)	0.2602 (t=2.77)	0.0097 (t=0.90)	0.9899
Natural resource-intensive industries	Petroleum refineries	Misc. petroleum & coal products	Non-ferrous metals							GDP per capita	R^2
Japan, West Germany & USA										
Iron & steel	0.1918 (t=0.98)	1.8819 (t=1.39)	1.6466 (t=4.16)							-0.5694 (t=-1.76)	0.4847
Asian NIEs										
Iron & steel	0.2841 (t=4.16)	0.8940 (t=1.13)	4.165 (t=16.50)							-0.0121 (t=-1.04)	0.9706

Notes: (1) The number of observations amounts to 64 (i.e. 4 Asian countries multiplied by 16 observed years) for NIEs and 48 (i.e. 3 industrial nations multiplied by 16 observed years) for the selected advanced economies. (2) Changes in GDP per capita between 1980 and 1995: see Table a1 in Annex. (3) The t-value represents the difference of means of two investigated groups. The t-value will be positive, if the mean of the first group is larger than that of the second, and negative, if the latter is smaller. Source: UNIDO database; Maddison, A. (2001), The World Economy. A Millennial Perspective, OECD Development Centre Studies, Paris; Calculation of the Ifo Institute for Economic Research.

Conclusion

In the framework of a development stage theory this study primarily compares the degrees of specialisation and changes in comparative advantages of four NIEs (Hong Kong, Singapore, South Korea and Taiwan) with those in selected advanced countries, namely Japan, West Germany and the US. For this purpose, data on real manufacturing value added (MVA) expressed in 1990 US dollars are applied for the period of 1980–95. These were the years prior to the unforgettable financial and currency crises in 1997, in which the Asian NIEs investigated achieved a remarkable economic success and rapidly emerged as important competitors of developed countries on the world market. Major findings of this empirical study are:

- Most Asian NIEs experienced more rapid MVA growth (from a lower level) than the selected industrial countries in the investigated years. One can easily postulate that the so-called catching-up process took place in Asian economies. To a certain extent, a strong international relocation of Japanese firms and their production activities abroad made an important contribution to the industrial development in NIEs (see also Kojima, 1995).
- Contrary to the wide-spread presumption, all NIEs did not have a similar industrial growth pattern between 1980 and 1995. For example, Hong Kong's real MVA declined in the beginning of the 1990s and its 1995-level was lower than that in 1980. Measured in terms of industrial specialisation degrees, a gradual manufacturing concentration took place in most Asian NIEs except Hong Kong, where a significant diversification was observed in the same period of time. Yet an obvious difference in such specialisation degrees corresponding to the relevant countries' development stages was hardly seen: the calculated specialisation degrees for advanced economies were comparable to those of South Korea and Taiwan.
- The shift-share analysis of dominant industries and the elaboration of IGI made for the period 1980–95 indicate a clear movement in the individual Asian NIEs towards high-tech industries like electrical machinery, transport equipment and non-electrical machinery. Although a few capital- and labour-intensive industries remained exceptionally powerful, most of these industries generally experienced a slower than average growth and the loss of their MVA share. By contrast, Japan, West Germany and the US evinced less evident changes in the industrial specialisation pattern. The high-tech industries mentioned above played the dominant role for the entire period.

- A further confirmation of development stage theory and its applicability is derived from the measurement of correlation coefficients among various industrial types in Asian NIEs and the selected advanced countries. More precisely, the past growth between the two (R&D-intensive or easily imitable) high-tech industries was in general more strongly correlated in advanced economies, while in NIEs coefficient values were significantly higher between the individual industries classified into capital-, labour- and natural resource-intensive manufacturing groups. Moreover, it would be desirable, with the help of correlation analyses, to reveal the similarities in industrial development between 'today's NIEs' and 'yesterday's advanced countries'. Such empirical analyses require a comparable set of historical data for advanced countries (much) prior to 1980. However, such standardised data are not available from the UNIDO database.

This is not the end of the story. Further research is urgently needed in the same theoretical context in order to adequately integrate several crucial, more recent economic events which will surely challenge Asian NIEs in a new global order and change the pattern of industrial specialisation in these countries drastically within a short period of time. A thorough update of the relevant MVA data set is the crucial prerequisite for this task. In particular, the contagious financial crises in 1997 have raised serious questions about the sustainability of development stage theory in Asia (Kojima, 2000). As a consequence of these economic shocks industrial structure is being further modernized in Asian NIEs. Taking South Korea as an example, producers of labour- and capital-oriented goods were most seriously struck by the crisis, which led to a large number of bankruptcies of firms and job replacements, followed also by the restructuring and down-sizing of some high-tech industries including the automobile and electronic industries in the course of the forced rearrangement of large conglomerates. This also created vicious chain reactions and has had a negative impact on their subsidiaries and other industrial and service firms as well as on the economic structure of the country as a whole (Krugman, 1998; Corsetti, Presenti and Roubini, 1998; Nam, 2000; Kang, 2003). Hong Kong, Taiwan and Singapore did not suffer immediately when the Asian crises occurred. Yet they have increasingly been facing the still-persisting negative spill-overs from the major victims (South Korea, Indonesia, Thailand, etc.) and the global economic consequence of the crises, whereas Japan has been in recession since the mid-1990s (Ozawa, 2001; Jomo, 2003).

China, due to the huge indigenous market potential, its abundant labour and a faster specialisation towards more skill- and knowledge-oriented goods encouraged by massive foreign direct investment, has recently been

able to expand its industrial production and exports of various manufacturing goods ranging from labour- and capital-intensive types like wearing apparel, toys as well as iron and steel to high-tech ones like electrical and also non-electrical machinery. China's aggressive emergence in these segments of the world market has forced Koreans and Taiwanese to move to more R&D-intensive industries and high-order services based on the sophisticated information and communication technology. As a reaction Asian NIEs did their best during the 1990s to exploit comparative advantages in this high-tech area and also achieved great success on the world market for computers and semiconductors including microchips, etc. (Lardy, 2002; Kurnvilla and Erickson, 2002; Bhaskaran, 2003; Ahearne, Fernald, Loungani and Schindler, 2003). However, it should be borne in mind that the price fall of semiconductors world-wide made these countries less immune to the speculative attack that occurred in the initial crisis phase, which significantly increased their trade deficits around the mid-1990s (Wade, 1998; Nam, 2000). More recently, industrial growth in Asian NIEs (including Singapore and Taiwan) has been additionally damaged by the sudden, unexpected decline of the so-called new economy world-wide, which had driven US economic expansion in the last decade and was seen to hold a promising future. Asian NIEs should continue to look for an exit from the current economic dilemma. This can be accomplished only by more intensive product innovation and technological development, outsourcing of less-productive activities as well as rapid progression towards a modern service society – the same strategies that advanced industrial countries have long adopted to safeguard their market positions.

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Statistical Annex

Table a1: Industrial growth index (IGI) between 1980 and 1995 in the investigated countries

		Hong Kong	Singapore	South Korea	Taiwan
311/2	Food products	0.7549	-0.2218	- 0.1883	- 0.2945
313	Beverages	4059	-0.2915	- 0.6838	- 0.1952
314	Tobacco products	1.3397	0.0331	- 1.2036	- 0.6371
321	Textiles	0.0469	-1.7108	- 0.6796	- 0.3557
322	Wearing apparel	-0.5924	-0.9916	- 0.2897	- 0.7679
323	Leather & fur products	-0.6887	-0.4664	0.2762	- 1.8350
324	Footwear	-2.9913	-1.6212	0.8049	0.6914
331	Wood & wood products	-0.8676	-2.3220	- 0.2520	- 1.1097
332	Furniture & fixtures	-1.4907	-0.4461	0.8595	- 0.3223
341	Paper & paper products	0.7587	0.2602	0.0491	- 0.5466
342	Printing & publishing	0.9899	0.3844	0.2464	- 0.0047
351	Industrial chemicals	0.4726	1.0450	- 0.3652	- 0.1753
352	Other chemical products	0.2755	0.3355	- 0.1416	0.7519
353	Petroleum refineries	na	-0.9998	- 0.3012	0.0860
354	Misc. petroleum & coal products	na	-1.1779	- 1.0338	- 0.6669
355	Rubber products	-1.7026	-1.4211	- 1.2407	0.0055
356	Plastic products	-0.8618	0.2816	0.8118	0.0371
361	Pottery, china & earthenware	-0.5722	0.2733	- 0.5131	0.2911
362	Glass & glass products	0.6541	0.2852	- 0.0424	0.0519
369	Other non-metal min. products	0.1937	-0.2544	- 0.0361	0.1517
371	Iron & steel	-0.2297	-1.1647	- 0.0883	0.0856
372	Non-ferrous metals	0.2027	0.0749	- 0.2187	0.2516
381	Metal products	-0.4824	0.2249	0.5059	0.6765

continued

382	Non-electrical machinery	1.2432	1.2116	0.9073	0.5949
383	Electrical machinery	-0.2018	0.0144	0.5865	0.3935
384	Transport equipment	0.5510	-0.5493	0.6163	0.2414
385	Profess. & scientific equipment	-0.1760	-0.0829	- 0.2879	- 0.2188
390	Other manufacturing industries	0.1711	-1.1680	- 0.3727	- 0.8914

		Japan	West Germany	USA
311/2	Food products	0.1160	-0.1581	0.1273
313	Beverages	- 0.2895	-0.0180	0.0818
314	Tobacco products	- 0.5089	-0.0990	0.5963
321	Textiles	- 0.5959	-0.3620	-0.1185
322	Wearing apparel	- 0.1654	-0.6719	-0.3618
323	Leather & fur products	- 0.3752	-0.9150	-0.5830
324	Footwear	- 0.3551	-0.8035	-1.1407
331	Wood & wood products	- 0.6974	-0.1717	0.1420
332	Furniture & fixtures	- 0.2757	-0.2123	0.0209
341	Paper & paper products	- 0.0277	0.2769	0.0073
342	Printing & publishing	0.1197	-0.1422	0.3210
351	Industrial chemicals	0.0663	0.0915	-0.0124
352	Other chemical products	0.2552	0.7205	0.3876
353	Petroleum refineries	- 0.4580	-0.2253	-0.9241
354	Misc. petroleum & coal products	- 0.5989	-1.6133	0.0753
355	Rubber products	0.0666	-0.0640	-0.0130
356	Plastic products	0.3161	0.4472	0.5757
361	Pottery, china & earthenware	- 0.1645	-0.7227	-0.1217
362	Glass & glass products	0.0758	-0.0484	-0.1889
369	Other non-metal min. products	- 0.0813	-0.0757	-0.2850

continued

371	Iron & steel	- 0.5390	-1.2096	-0.5574
372	Non-ferrous metals	- 0.6590	0.3156	-0.4355
381	Metal products	0.1170	0.3356	-0.3064
382	Non-electrical machinery	0.0462	0.0528	-0.2380
383	Electrical machinery	0.2630	0.2136	-0.0340
384	Transport equipment	0.1241	0.0691	0.0960
385	Profess. & scientific equipment	- 0.2924	-0.4186	0.5095
390	Other manufacturing industries	0.0546	-0.2457	-0.1127

Source: UNIDO database; Calculation of the Ifo Institute for Economic Research