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Competitive Industrial Performance Report 2012/2013

The Industrial Competitiveness of Nations

Looking back, forging ahead

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

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CIP Index Tenth Anniversary

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna 2013

Foreword

In today's world of global competition and trade, industrialized economies are striving to retain their lead in technology and innovation, emerging economies are seeking to catch up while less developed economies are initiating measures to promote industrialization and structural change. In this context, benchmarking national industrial performance is crucial for many economies, irrespective of their level of development.

UNIDO has a longstanding tradition in benchmarking country-level industrial performance. The Competitive Industrial Performance (CIP) index was first published in the Industrial Development Report 2002/2003. Since then, the CIP index has undergone several revisions to include additional dimensions of industrial performance. The CIP index in its current form is the result of a one-year validation process conducted by UNIDO with the support of international experts.

The CIP index is a composite index that measures 'the ability of countries to produce and export manufactured goods competitively' (IDR 2002/2003), using several individual indicators to proxy various dimensions of industrial performance. Compared to other composite indices, the distinctive features of the CIP index include a focus on industrial competitiveness and manufacturing development, a division between performance and its drivers as well as the exclusive use of quantitative and transparent data.

This publication discusses the concept of competitiveness and industrial performance and provides a theoretical foundation and justification for the CIP index, ten years after its first publication. The results of the benchmarking exercise are analysed by country, region and over time, building on the CIP index as well as the individual indicators of industrial performance. Finally, a sensitivity analysis is performed to assess the robustness of the CIP index to variations of assumptions made in its construction.

The content of this publication can serve as a reference point for initiating a dialogue with Member States on issues related to industrial performance and industrial policy priorities, while advocating the benefits of industrial development as a solution to global challenges such as poverty reduction, migration or political unrest. It can also facilitate monitoring of the long-term impact of UNIDO's technical cooperation projects by providing baseline data as well as evidence of progress towards higher industrial performance by Member States.

We trust that this publication will be useful to development practitioners engaged in policy advice and technical cooperation, and to policymakers in the field of industrial development.

Kandeh K. Yumkella
Director General, UNIDO

Acknowledgments

The *Competitive Industrial Performance Report 2012/2013* was prepared by a UNIDO Statistics Unit team of experts under the supervision and coordination of Amadou Boly, Project Manager. Antonio Andreoni prepared Chapters one to five; Kris Boudt prepared the statistical appendix in collaboration with David Ardia. The CIP index data was compiled from UNIDO statistical databases and UN Comtrade.

The team expresses its sincere thanks to Wilfried Luetkenhorst, former Managing Director for his overall leadership and support during the preparation of this publication, to Ludovico Alcorta, Director, and Shyam Upadhyaya, Chief Statistician, for their technical guidance.

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Much insight was gained from an Expert Group Meeting on benchmarking industrial performance, which took place in March 2012 at UNIDO Headquarters in Vienna, Austria. The participants to the EGM included several scholars, specifically Ha-Joon Chang (University of Cambridge), Michael Landesmann (Vienna Institute for International Economic Studies), Eoin O'Sullivan (Institute for Manufacturing, University of Cambridge), Michael Peneder (Austrian Institute of Economic Research), and experts from sister international organizations: Carola Fabi (FAO), Roberto Crotti (World Economic Forum), Jesus Felipe (Asian Development Bank), Gyorgy Gyomai (OECD), Yumiko Mochizuki (UNCTAD), William Prince (World Bank) and Michaela Saisana (Joint Research Centre, European Commission). The discussions and comments made by the participants greatly contributed to the validation of the CIP index and to its current format.

Special thanks go to Niki Rodousakis for editing the report and to Monika Marchich-Obleser for providing administrative support to the project.

Executive Summary

The proliferation of reports and academic policy debates addressing competitiveness and competitive industrial performance clearly shows that governments are increasingly concerned with these issues as well as with understanding their structural drivers. The growing use of benchmarking exercises and competitiveness indices responds to governments' clear need to assess their economies' relative competitiveness at each point in time and over time. Competitiveness is a concept that is widely used but difficult to define explicitly. The UNIDO Competitive Industrial Performance Report adopts a tractable meso-concept of competitiveness, namely *industrial competitiveness*. Accordingly, industrial competitiveness is defined as *the capacity of countries to increase their presence in international and domestic markets whilst developing industrial sectors and activities with higher value added and technological content.*

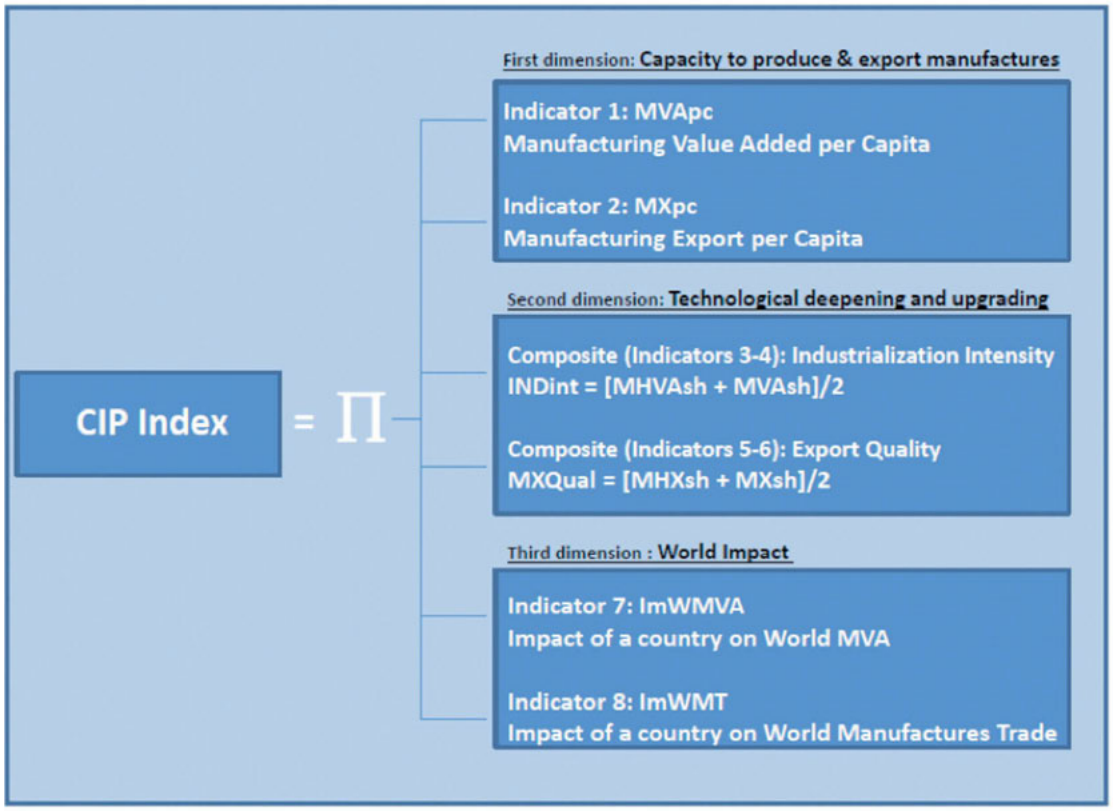
Given the particular emphasis assigned to manufacturing industries, the UNIDO Competitive Industrial Performance Report and its main diagnostic tool – the Competitive Industrial Performance (CIP) index – is a unique response to the current renewed worldwide interest in manufacturing industries as the main engine of economic growth. The Competitive Industrial Performance Report stands as the most comprehensive global comparative analysis of industrial competitiveness, including 135 countries in the world 2010 industrial competitiveness ranking. Modern manufacturing systems consist of complex interdependencies, often across a range of industries which contribute a variety of components, materials, production subsystems, and production-related services. The competitive industrial performance benchmarking analysis offers a first snapshot of these intricacies at the country level, providing a visualization of global trends and the current industrial competitiveness of nations.

The Competitive Industrial Performance index

Ten years after its initial inclusion in UNIDO's Industrial Development Report 2002/3 *Competing Through Innovation and Learning,* the Competitive Industrial Performance (CIP) index has become the main diagnostic tool adopted by UNIDO for benchmarking and measuring the *industrial competitiveness of nations.* The first UNIDO Competitive Industrial Performance Report presents a new Competitive Industrial Performance (CIP) index through which governments can benchmark and track countries' relative competitive industrial performance over time. The CIP index can also be used as a diagnostic tool for designing policies and assessing policies' effectiveness. Despite being a composite index, the CIP index gives governments the possibility to look at countries' relative performance over time in the various sub-indicators composing the index. Thus, countries can be compared across a plurality of sub-indicators capturing their industrial structure, technological and export performance.

The CIP index now consists of eight sub-indicators grouped along three dimensions of industrial competitiveness. The first dimension relates to countries' capacity to produce and export manufactures and is captured by their Manufacturing Value Added per capita (MVApc) and their Manufactured Exports per capita (MXpc). The second dimension covers countries' level of technological deepening and upgrading. To proxy for this complex dimension, two composite sub-indicators – industrialization intensity and export quality – have been constructed. The degree of industrialization intensity is computed as a linear aggregation of the Medium- and High-tech manufacturing Value Added share in total Manufacturing Value Added (MHVAsh) and the Manufacturing Value Added share in total GDP (MVAsh). Countries' export quality is obtained as a linear aggregation of the Medium- and High-tech manufactured Exports share in total manufactured exports (MHXsh) and the Manufactured Exports share in total exports (MXsh). Finally, the third dimension of competitiveness entails countries' impact on world manufacturing, both in terms of their value added share in World Manufacturing Value Added (ImWMVA) and in World Manufactures

Trade (ImWMT). The CIP index is a composite index obtained through a geometric aggregation of these six sub-indicators to which equal weights have been assigned. The following table summarizes the configuration of the CIP index.



In contrast to other competitiveness indices currently available, the CIP index provides a unique cross-country industrial performance benchmarking and ranking based on quantitative indicators and a select number of industrial performance indicators. Rankings are provided at the global and regional levels, as well as by adopting different country groupings for 135 countries in 2010. This offers governments the possibility to compare their country's competitive industrial performance with relevant comparators, that is, not only with countries from the same region but also with countries at the same stage of economic or industrial development across the globe. Countries' industrial competitiveness can be assessed over time using the UNIDO Competitive Industrial Performance index. Such a longitudinal analysis allows governments to track the trajectories countries have followed to attain their current position and to identify the winners and losers in world competitive industrial performance rankings. Governments are also provided with a tool to track patterns of change in countries' industrial structure, technological developments of the manufacturing sector, gains or losses in their share of world manufacturing value added and share of manufactured exports. Finally, dynamic indicators such as annual growth rate can be computed to reveal the speed at which countries' structural economic variables have been changing.

The 2010 industrial competitiveness of nations

The world ranking reveals a pronounced yet familiar pattern (Table 1)[1]. Among the most industrially competitive nations in the world, we find high income industrialized countries, as well as China ranked seventh. The top five positions are occupied by Japan, Germany, the United States, the Republic of Korea and China, Taiwan Province. While the first three countries have held top positions in the ranking since 1990, the two latter economies placed fourteenth and tenth, respectively, in 1990. Together, the top five economies account for nearly half of the share of world manufacturing value added and one-third of world manufactures trade. The United States alone accounts for half of the top five's total world manufacturing value added, while Germany accounts for one-third of the top five's world manufactures trade total. Although these economies are all highly industrialized, the manufactured export per capita indicator reveals both the distinct export orientation of these economies and the distinct pull of their own internal demand. The small 'city state' of Singapore is not included in the top five, although the country displays the world's highest manufacturing value added per capita and the highest manufactured exports per capita.

The first low-income economy in the top quintile is China. Given its population size and stage of development, China is the country with the lowest manufacturing value added per capita and manufactured exports per capita in the top quintile of the world ranking, but ranks second in terms of world manufacturing value added share behind the United States, followed by Japan in third position. Over the last 15 years, China's share in world manufactures trade has increased by 11 percent on account of its export-led development model. The manufacturing industry is the main sector of China's economy, accounting for 35 percent of overall GDP. China's performance in medium-tech industries is quite remarkable, despite the country's stage of development. Other low-income economies in the top quintile include Malaysia, Mexico and Thailand.

The rest of the top quintile is occupied by high income European industrial countries (with few exceptions), a number of emerging economies and Canada. Overall, countries in the top quintile of the ranking account for 83 percent of world manufacturing value added and of world manufactures trade.

Economies ranked in the upper middle quintile include industrial powers primarily from Asia and Latin America. This quintile comprises some of the most populated countries in the world, including (ranked by population size) India, Indonesia, Brazil, the Russian Federation, Philippines, Viet Nam, Turkey and South Africa. Australia and some oil net exporters are in this quintile as well. The lower middle range as well as the bottom of the ranking mostly includes low income or relatively small economies, with the exception of Iran (Islamic Republic of), Pakistan, Bangladesh and Nigeria. Most African economies occupy the bottom quintile of the ranking, the only exceptions being South Africa, Egypt, Tunisia, Morocco and Mauritius. The four BRICS economies in the upper middle quintile are ranked in the following order: Brazil, the Russian Federation, South Africa and India. Taken together, they account for almost half of the manufacturing value added share of the entire upper middle quintile and one-third of the manufactures trade share of the entire upper middle quintile. Despite the tremendous differences between Brazil, the Russian Federation and South Africa, they have comparable figures in terms of manufacturing value added per capita, while India – given its population size – reports the highest share in world manufacturing value added combined with the lowest manufacturing value added per capita. Among the emerging industrial economies, Viet Nam ranked 54 in 2010 and hence entered the upper middle quintile (the country ranked 72 in 2000).

[1] The analysis of the world ranking was performed by quintiles of the world ranking. The top, upper middle, middle, lower middle and bottom quintiles of the rankings are identified by different colours. The descriptive statistics detailed in the table are the mean, median and standard deviation. The possibility of comparing the mean and the median is particularly important when one or more countries perform very differently from the others (outliers). In this case, the mean will be biased, while the median provides the average value in the countries' distribution. Finally, the standard deviation describes the distribution of the economies' performances.This information is particularly relevant if we aim to understand the extent to which economies' performances differ in the quintiles and groups.

Economies occupying the middle quintile of the CIP ranking are again very heterogeneous. With the exception of four large and highly populated countries, namely Iran (Islamic Republic of), Egypt, Pakistan and Bangladesh, the remaining countries are mainly small economies from South and Central Asia, Latin America and Africa. Overall, the average manufacturing value added per capita and manufactured exports per capita of the economies in the middle quintile are half of the shares registered in the upper middle group. The lower two quintiles of the CIP ranking include the least industrialized economies in the world. Taken together, they account for about 0.6 percent of world manufacturing value added and 0.7 percent of world manufactures trade. The majority of these countries are from the African continent. The largest country in the lower middle quintile in terms of population size is Nigeria with a population of roughly 160 million. Nigeria and Algeria are among the main exporters of oil and natural gas in the world. The manufactured export share indicator, which is below (almost half) the average share of the lower middle quintile, characterizes their manufactured exports structure.

CIP ranking 2010	CIP index 2010	Country	MVApc	MXpc	MHVAsh %	MVAsh %	MHXsh %	MXsh %	ImWMVA %	ImWMT %
1	0.5409	Japan	7993.99	5521.02	53.70	20.39	79.75	91.62	14.126	6.532
2	0.5176	Germany	4666.91	13397.43	56.76	18.57	72.34	86.81	5.317	10.219
3	0.4822	United States of America	5522.09	2736.13	51.52	14.85	64.74	76.76	24.036	7.974
4	0.4044	Republic of Korea	4782.7	9280.33	53.41	29.09	75.85	96.85	3.220	4.183
5	0.3649	China, Taiwan Province	6153.1	10825.16	61.88	29.87	72.40	96.01	1.968	2.318
6	0.3456	Singapore	8198.27	35709.08	73.41	24.47	68.99	89.76	0.521	1.519
7	0.3293	China	820.018	1123.62	40.70	34.16	60.52	96.25	15.329	14.063
8	0.3118	Switzerland	7168.38	23651.56	34.91	18.44	69.67	91.49	0.750	1.657
9	0.3114	Belgium	3793.78	34137.53	42.28	14.99	54.95	87.38	0.552	3.326
10	0.3095	France	2885.09	7237.36	45.41	12.16	65.77	88.42	2.494	4.189
11	0.2945	Italy	2847.72	6935.05	39.33	14.94	53.93	91.62	2.325	3.791
12	0.2896	Netherlands	3324.63	22081.02	40.07	12.48	55.01	73.97	0.759	3.374
13	0.2850	Sweden	6559.37	15375.64	46.96	20.04	57.69	89.70	0.838	1.316
14	0.2782	United Kingdom	3162.34	5247.64	41.99	11.44	63.22	79.54	2.691	2.989
15	0.2695	Ireland	6506.68	23959.50	64.07	23.11	53.84	91.65	0.407	1.004
16	0.2436	Austria	4869.48	14926.31	41.74	18.43	59.97	86.97	0.569	1.167
17	0.2345	Canada	3077.73	6667.54	37.35	11.88	55.72	62.14	1.437	2.084
18	0.2220	Finland	6795.27	12001.19	45.36	24.72	48.98	91.10	0.500	0.592
19	0.1979	Spain	1896.88	4571.87	34.28	12.01	57.40	83.74	1.183	1.910
20	0.1931	Czech Republic	2148.21	11816.28	44.62	28.15	67.94	90.99	0.302	1.113
21	0.1834	Malaysia	1426.92	5930.92	41.76	27.10	63.49	83.30	0.551	1.533
22	0.1776	Mexico	1007.93	2166.16	38.45	15.99	78.71	80.09	1.538	2.212
23	0.1712	Thailand	1053.66	2517.15	46.16	36.61	61.82	83.93	0.949	1.518
24	0.1705	Denmark	3887.02	12839.14	30.51	12.46	51.88	72.81	0.294	0.651
25	0.1696	Poland	1489.98	3639.62	35.35	22.51	58.14	87.83	0.781	1.277
26	0.1647	Israel	3235.62	7728.48	55.61	13.83	55.79	96.21	0.325	0.520
27	0.1562	Slovakia	2303.72	11125.34	43.32	27.43	66.26	93.80	0.172	0.556
28	0.1438	Australia	2660.73	4520.90	23.01	10.10	20.00	46.72	0.786	0.894
29	0.1402	Hungary	1210.31	8291.96	53.47	21.08	77.99	87.04	0.166	0.763
30	0.1283	Turkey	1012.73	1286.70	30.04	20.23	42.47	87.72	1.088	0.926
31	0.1196	Norway	3766.78	7396.27	24.09	9.17	52.21	27.09	0.249	0.328
32	0.1152	Slovenia	2716.24	11094.26	45.52	20.89	62.96	90.83	0.075	0.206

CIP ranking 2010	CIP index 2010	Country	MVApc	MXpc	MHVAsh %	MVAsh %	MHXsh %	MXsh %	ImWMVA %	ImWMT %
33	0.1128	Brazil	622.099	667.55	34.97	13.51	36.30	67.30	1.712	1.230
34	0.1043	Portugal	1503.64	4098.30	22.36	12.90	40.53	90.17	0.223	0.407
35	0.1012	Argentina	1749.37	877.58	25.84	16.41	45.05	52.43	0.986	0.331
36	0.0976	Russian Federation	503.997	1028.70	23.14	17.07	24.37	36.08	0.978	1.337
37	0.0940	Saudi Arabia	1157.32	2020.66	41.12	11.77	35.54	21.71	0.423	0.494
38	0.0823	Indonesia	302.264	395.68	37.81	26.40	29.05	60.09	1.002	0.878
39	0.0794	Kuwait	2224.27	6899.25	18.09	10.34	13.45	40.93	0.094	0.231
40	0.0774	Belarus	907.294	2361.97	18.76	32.95	39.01	89.22	0.120	0.208
41	0.0772	South Africa	567.274	991.15	21.24	14.93	45.66	68.32	0.387	0.452
42	0.0761	Luxembourg	3737.35	24557.20	4.97	6.59	38.04	85.76	0.025	0.110
43	0.0747	India	120.185	153.83	37.27	15.04	28.24	85.16	2.028	1.738
44	0.0726	Philippines	296.026	516.61	45.31	21.34	79.66	93.30	0.381	0.445
45	0.0721	Chile	972.374	1943.12	18.92	15.37	11.76	46.96	0.230	0.308
46	0.0675	Romania	341.552	2111.40	33.88	13.06	54.69	90.36	0.100	0.413
47	0.0674	Lithuania	964.003	5343.24	18.46	18.35	37.83	85.63	0.044	0.165
48	0.0673	New Zealand	1986.1	3213.92	13.86	12.83	21.34	46.36	0.118	0.128
49	0.0653	Greece	1289.68	1429.10	17.17	9.10	37.19	73.69	0.200	0.148
50	0.0603	Croatia	999.359	2356.28	31.77	16.19	49.46	90.42	0.063	0.099
51	0.0603	Venezuela (Bolivarian Republic of)	895.462	750.42	34.28	16.50	8.11	32.55	0.360	0.202
52	0.0583	Estonia	978.874	8360.44	25.66	15.47	42.28	86.22	0.018	0.102
53	0.0564	Ukraine	213.571	974.35	20.78	20.25	43.25	85.57	0.133	0.408
54	0.0540	Viet Nam	176.135	551.02	20.26	25.47	27.99	69.30	0.221	0.464
55	0.0523	Iran (Islamic Republic of)	361.2	378.50	40.70	16.44	23.91	33.55	0.371	0.260
56	0.0506	Costa Rica	1034.84	1420.96	16.58	20.07	58.94	73.29	0.067	0.061
57	0.0488	Qatar	1988.82	8817.29	17.44	2.78	28.15	15.88	0.024	0.086
58	0.0476	Tunisia	490.97	1272.14	9.32	17.36	45.02	82.59	0.072	0.126
59	0.0460	Bulgaria	398.788	1958.22	25.57	15.52	35.40	70.99	0.041	0.135
60	0.0460	Trinidad and Tobago	868.108	5480.32	39.38	8.39	17.70	73.95	0.016	0.068
61	0.0452	Malta	1257.27	8406.84	44.92	11.30	56.16	93.04	0.007	0.032
62	0.0450	Egypt	361.72	206.49	22.30	17.54	25.88	62.37	0.398	0.152
63	0.0437	Peru	448.575	623.75	14.49	14.01	5.21	51.19	0.179	0.167
64	0.0401	Colombia	405.257	268.72	20.71	12.95	35.97	32.60	0.268	0.119
65	0.0382	Iceland	4007.83	4001.09	14.18	11.41	45.58	26.82	0.017	0.011
66	0.0374	Morocco	239.737	425.92	21.61	12.93	38.26	77.64	0.107	0.128
67	0.0373	China, Hong Kong SAR	478.412	1093.80	32.58	1.41	53.74	54.84	0.049	0.075
68	0.0367	Latvia	480.598	3190.16	20.77	9.61	35.18	80.85	0.015	0.066
69	0.0361	Oman	941.115	1857.99	16.75	8.24	42.71	16.27	0.036	0.048
70	0.0347	Kazakhstan	346.39	767.39	6.84	13.48	39.96	21.13	0.076	0.112
71	0.0331	El Salvador	513.158	564.29	19.13	22.85	14.86	89.57	0.051	0.037
72	0.0328	Jordan	401.311	728.98	24.91	17.03	47.30	79.24	0.036	0.044
73	0.0326	Uruguay	1342.83	626.46	13.40	14.54	22.62	39.11	0.063	0.024
74	0.0315	Pakistan	116.878	99.77	24.57	17.52	9.95	82.40	0.280	0.160
75	0.0303	Lebanon	625.022	726.84	19.95	9.22	46.81	72.22	0.037	0.028
76	0.0262	Serbia	146.024	771.86	20.05	15.97	32.82	78.21	0.020	0.071
77	0.0256	Guatemala	223.879	408.98	16.25	12.03	20.33	69.50	0.045	0.054
78	0.0254	Bangladesh	86.7396	75.99	20.20	17.37	4.34	91.74	0.200	0.118
79	0.0240	Mauritius	803.997	1103.53	2.98	15.63	2.93	95.59	0.014	0.013
80	0.0235	Sri Lanka	190.646	297.35	12.11	13.81	9.48	70.10	0.052	0.054

CIP ranking 2010	CIP index 2010	Country	MVApc	MXpc	MHVAsh %	MVAsh %	MHXsh %	MXsh %	ImWMVA %	ImWMT %
81	0.0233	Syrian Arab Republic	206.128	232.41	21.52	14.37	22.69	43.87	0.061	0.046
82	0.0220	Algeria	142.336	414.71	11.28	6.39	0.46	25.75	0.070	0.136
83	0.0219	Bosnia and Herzegovina	210.547	885.83	29.17	10.14	23.00	72.69	0.011	0.032
84	0.0214	The f. Yugosl. Rep of Macedonia	388.821	835.51	14.60	17.69	18.08	63.35	0.011	0.019
85	0.0212	Swaziland	496.923	883.78	0.01	30.97	28.96	92.86	0.008	0.010
86	0.0206	Botswana	184.335	2252.13	21.59	4.28	4.84	93.70	0.005	0.041
87	0.0199	Ecuador	247.952	269.86	8.04	13.66	23.04	21.25	0.047	0.034
88	0.0186	Cyprus	918.488	640.88	12.32	6.58	60.43	75.21	0.011	0.005
89	0.0166	Côte d'Ivoire	99.0589	182.50	14.99	17.40	32.54	36.16	0.028	0.034
90	0.0160	Cambodia	100.73	239.29	0.26	19.82	7.94	65.17	0.021	0.034
91	0.0159	Honduras	279.673	143.70	7.16	19.89	27.79	40.40	0.029	0.012
92	0.0153	Bolivia (Plurinational State of)	167.064	276.34	5.05	13.69	3.28	39.80	0.023	0.026
93	0.0152	Jamaica	260.663	418.83	18.77	7.10	5.51	92.58	0.010	0.011
94	0.0144	Albania	214.538	359.49	14.36	11.34	15.42	75.26	0.010	0.011
95	0.0143	Nigeria	24.5856	113.87	33.44	4.51	7.47	20.82	0.054	0.167
96	0.0127	Georgia	136.05	229.35	21.39	10.44	49.18	76.73	0.008	0.009
97	0.0121	Cameroon	140.167	64.71	11.01	19.70	11.45	32.80	0.038	0.012
98	0.0113	Armenia	203.595	201.12	5.81	14.83	24.80	69.20	0.008	0.006
99	0.0111	Paraguay	193.78	146.10	12.87	11.96	13.18	20.82	0.017	0.009
100	0.0108	Congo	67.2177	601.98	2.42	5.32	83.42	34.91	0.004	0.022
101	0.0100	Senegal	56.2691	115.95	17.66	10.74	14.05	71.42	0.010	0.014
102	0.0100	Kenya	46.7688	62.12	4.08	10.01	24.93	48.85	0.026	0.023
103	0.0095	Gabon	201.059	712.75	5.39	4.44	10.09	18.23	0.004	0.011
104	0.0095	Barbados	296.422	725.68	38.11	3.48	39.18	91.11	0.001	0.002
105	0.0088	Fiji	252.964	374.42	5.54	11.56	9.92	56.90	0.003	0.003
106	0.0085	United Republic of Tanzania	45.6784	43.72	1.18	10.02	13.58	48.54	0.028	0.018
107	0.0083	Azerbaijan	70.7655	257.54	6.34	2.89	17.23	10.49	0.008	0.021
108	0.0081	Suriname	307.66	693.60	11.64	9.88	9.38	15.93	0.002	0.003
109	0.0079	Mongolia	60.3637	451.58	5.30	7.67	1.91	62.93	0.002	0.012
110	0.0078	Panama	347.045	66.05	6.13	5.71	15.00	32.66	0.017	0.002
111	0.0077	Zambia	44.2736	111.49	21.08	10.01	14.33	19.55	0.008	0.013
112	0.0075	China, Macao SAR	832.347	264.97	3.55	2.25	7.06	43.47	0.006	0.001
113	0.0065	Belize	475.506	285.02	18.46	11.90	0.06	30.89	0.002	0.001
114	0.0062	Republic of Moldova	53.3502	155.36	5.55	9.32	13.09	61.57	0.003	0.005
115	0.0058	Tajikistan	84.8618	15.50	2.40	30.42	66.30	13.82	0.008	0.002
116	0.0055	Madagascar	28.4274	31.86	3.28	12.16	4.26	72.03	0.008	0.006
117	0.0045	Kyrgyzstan	42.4413	60.19	4.36	11.49	19.95	25.50	0.003	0.003
118	0.0043	Ghana	26.3711	26.25	0.80	7.45	24.99	12.49	0.009	0.006
119	0.0043	Nepal	18.1747	21.54	1.89	6.76	20.73	77.22	0.008	0.006
120	0.0040	Uganda	25.2921	11.78	11.07	6.82	15.16	34.83	0.012	0.004
121	0.0038	Yemen	33.192	23.94	3.89	5.65	6.12	9.45	0.011	0.005
122	0.0034	Mozambique	47.6064	7.61	10.74	11.86	9.28	7.84	0.015	0.002
123	0.0034	Saint Lucia	227.549	253.34	7.83	4.59	30.00	61.64	0.001	0.000
124	0.0032	Cape Verde	147.13	48.69	27.10	8.83	0.02	59.26	0.001	0.000
125	0.0031	Malawi	17.2107	19.57	12.51	9.48	14.64	27.64	0.004	0.003
126	0.0030	Sudan	37.3428	6.63	8.47	6.62	4.76	2.96	0.021	0.003
127	0.0030	Haiti	36.2575	6.19	5.26	9.87	3.80	82.97	0.005	0.001
128	0.0027	Niger	9.2339	20.65	24.77	5.26	12.86	67.44	0.002	0.003

CIP ranking 2010	CIP index 2010	Country	MVApc	MXpc	MHVAsh %	MVAsh %	MHXsh %	MXsh %	ImWMVA %	ImWMT %
129	0.0022	Rwanda	21.7544	8.78	6.66	6.42	7.64	46.38	0.003	0.001
130	0.0019	Ethiopia	9.2491	2.51	9.41	4.61	31.91	9.84	0.011	0.002
131	0.0011	Central African Republic	15.2243	6.08	9.25	6.63	8.29	31.07	0.001	0.000
132	0.0006	Burundi	7.4443	1.95	1.54	7.36	23.95	15.73	0.001	0.000
133	0.0000	Eritrea	7.2731	0.47	7.05	5.59	14.67	34.57	0.001	0.000
133	0.0000	Gambia	15.5917	7.47	3.90	4.64	11.13	39.40	0.000	0.000
133	0.0000	Iraq	5.1947	3.71	24.68	0.68	25.12	0.27	0.002	0.001

The 2010 regional industrial competitiveness ranking

The regional distribution of the CIP ranking allows us to better focus our attention on the relative competitiveness of nations in specific geographic areas. This is of particular interest for countries seeking to benchmark their 'local' industrial competitiveness and, in particular, to identify comparable countries in their regional area or continent and to benchmark their performance against the regional average performance.

Sixteen European countries occupy the top quintile of the CIP world ranking, followed by 13 economies positioned in the upper middle quintile. This latter group of countries includes the Russian Federation and a number of transition economies, some of which are new members of the European Union. The Russian Federation is positioned in the middle of the regional ranking followed primarily by transition economies such as Belarus, Romania, Croatia, Ukraine, Bulgaria, Serbia and Bosnia and Herzegovina. Taken as a whole, Europe accounts for 22.4 percent of world manufacturing value added and 44 percent of world manufactures trade.

The United States is the third most industrially competitive nation in the world CIP ranking and ranks first in the North America regional ranking, followed by Canada. In the Latin America and Caribbean region, the top five industrially competitive countries are Mexico, Brazil, Argentina, Chile and Venezuela (Bolivarian Republic of). Taken together, Brazil, Mexico and Argentina account for 4.2 percent of world manufacturing value added and 3.7 percent of world manufactures trade.

The East Asia and Pacific region hosts half of the top ten most industrially competitive economies in the world, namely Japan, the Republic of Korea, China, Taiwan Province, Singapore and China. Overall, the region's top five economies account for 35 percent of world manufacturing value added and 28 of world manufactures trade. India is the top performer in the South and Central Asia region followed by Iran (Islamic Republic of), Kazakhstan, Pakistan and Bangladesh.

The top five performers in the Middle East and North Africa region are very diverse countries, including the highly industrialized Israel and emerging Turkey, followed by three 'oil dependent economies', Saudi Arabia, Kuwait and Qatar. In the world industrial landscape, the entire sub-Saharan Africa region accounts for less than 1 percent of both world manufacturing value added and world manufactures trade. The top performer, South Africa, accounts for half of these world market shares alone. Mauritius is the second most industrially competitive country in the region, while Nigeria and Algeria are the main oil net exporters.

Conclusion

The possibility for governments to realize specific macro policy goals hinges on their capacity to understand, monitor and benchmark their industrial competitive performances and, hence, on their capacity and readiness to influence countries' structural trajectories and underlying production and technological capabilities dynamics.

The CIP index has been an extremely useful tool for UNIDO in moving from analyses of performance to policy recommendations, as well as in providing countries with a set of industrial diagnostic tools. The CIP index fulfils three main functions:

(i) a focusing device for problems identification. Benchmarks are needed because it is difficult to assess national industrial performance on the basis of a *priori* norms. By comparing countries' relative performance, it is possible to identify relative strengths and absolute weaknesses, which calls for appropriate and selective policy interventions. Wherever competitive performance can be improved, benchmarking is a useful tool.

(ii) an awareness raising tool for deepening countries' appreciation of the main dimensions of industrial competitiveness, that is, their capacity to produce and export competitively, their technological deepening and upgrading and finally, their impact on global manufacturing production and exports.

(iii) a policy tool for policy ownership. Given its non-normative character, the CIP index provides policymakers with information on the structural features of different economic systems. The CIP index does not make any implicit normative assumptions or prescriptions at the institutional level and leaves countries full ownership of their development model.

Industrial competitiveness benchmarks at the national level, such as the CIP index, should be seen as preliminary indicators of countries' relative industrial competitive performance. Despite being a necessary tool, the CIP index is not sufficient for industrial policy design. In fact, in order to design an integrated set of selective industrial policies operating at different levels of the economic system, an industrial competitiveness analysis based on the CIP index will have to be complemented by detailed country and activity analyses.

Benchmarking can be conducted at more disaggregated levels such as sector, industries, production tasks, enterprises, institutions, government or government departments. Moreover, it can focus on more or less specific aspects, such as capital and labour costs, infrastructure, technology, innovation, skills or the environment. The opportunity of relying on a multiple informational space and of analysing the relationship between inputs, outputs and mediating factors into a consistent causal structure are fundamental starting points for the design of industrial policies.

The industrial competitiveness analysis based on the CIP index provides the overall framework within which these analyses can be systematically developed and interdependences among policy measures can be uncovered.

List of Acronyms

AGR	Annual Growth Rates
BRICS	Brazil, Russian Federation, India, China, South Africa
CECIMO	European Association of the Machine Tool Industries
CIP	Competitive Industrial Performance
EFTA	European Free Trade Association
EOS	Executive Opinion Survey
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GCI	Global Competitiveness Index
HOS	Heckscher Ohlin Samuelson
ICT	Information and Communication Technology
IDR	Industrial Development Report
IMD	Institute of Management Development
ImWMT	Impact of a country on World Manufactures Trade
ImWMVA	Impact of a country on World Manufacturing Value Added
INDint	Industrialization intensity
ISIC	International Standard Industrial Classification of All Economic Activities
LDC	Least Developed Country
MHT	Medium- and High-Technology
MHVAsh	Share of Medium- and High-tech Manufacturing Value Added share in total manufacturing value added
MHXsh	Medium- and High-tech manufactured Exports share in total manufactured exports
MIT	Massachusetts Institute of Technology
MVA	Manufacturing Value Added
MVApc	Manufacturing Value Added per capita
MVAsh	Manufacturing Value Added share in total GDP
MXpc	Manufactured Exports per capita
MXQual	Manufactured Exports Quality
MXsh	Manufactured Exports share in total exports
OECD	Organisation for Economic Co-operation and Development
PDF	Probability Distribution Function
RCA	Revealed Comparative Advantage
R&D	Research and Development
SITC	Standard International Trade Classification
UNIDO	United Nations Industrial Development Organization
WCS	World Competitiveness Scoreboard
WEF	World Economic Forum
WMT	World Manufactured Exports
WMVA	World Manufacturing Value Added

Content

List of Tables

List of Figures

Introduction

The last two decades have witnessed a proliferation of reports and indices, as well as academic and policy debates addressing national competitiveness and issues related to competitive industrial performance. This indicates that governments are increasingly keen on benchmarking their countries' competitiveness as well as understanding its structural drivers. Policymakers from industrialized economies are seeking to retain their technological lead and to enter into new high-wage activities. On the other hand, middle-income economies are striving to catch up with advanced countries in terms of technological and production capabilities and to stay ahead of lower wage entrants. Finally, least developed countries are struggling to climb the technological ladder to trigger the process of structural change by diversifying into new export activities. Hence, all economies, regardless of their stage of development, aim to boost their competitiveness, especially of their manufacturing industries, to ultimately increase their country's welfare[1] (Lall, 2001b; Fagerberg et al., 2007).

The *UNIDO Industrial Development Reports* (IDRs) – in particular the main benchmarking tool, the Competitive Industrial Performance (CIP) index – have been providing governments in developing countries with an analytical framework and industrial diagnostics to better understand the evolving nature of industrial systems, to increase government awareness of industrial policies and to provide a foundation for their design and evaluation. The possibility of benchmarking and tracking countries' performance in a comparative way over time is an important source for policymaking. The CIP index is also a relevant diagnostic tool for designing policies and questioning their effectiveness. Despite being a composite index, the CIP index offers governments the possibility to compare how countries perform over time in the various sub-indicators which make up the index (modular character). Thus, economies can be compared across a plurality of sub-indicators capturing their industrial structures and their technological and export performance.

The United Nations Industrial Development Organization's (UNIDO) IDRs and their industrial diagnostics have also distinctly contributed to academic and policy debates in at least three critical ways. First, through their characteristic focus on learning processes in manufacturing and thus on technological capabilities as the ultimate determinant of competitive industrial performance and structural change dynamics. Secondly, UNIDO's IDRs include a cross-country industrial performance benchmarking based on quantitative and a limited number of industrial performance indicators instead of relying on broad concepts of national competitiveness captured by a combination of 'hard' and 'soft' data. Finally, more recently, IDRs have played a key role in addressing the problem of sustainable industrial competitiveness and energy efficiency (UNIDO, 2010b, 2011).

Ten years after its initial publication, the Competitive Industrial Performance (CIP) index has become the main diagnostic tool used by UNIDO to benchmark and measure the *industrial competitiveness of nations.* Since the IDR 2002/3, UNIDO's competitive industrial performance analysis has adopted a pragmatic position in the debate on the usefulness and methodological problems related to the adoption of composite indices (Lall, 2001b; OECD, 2003; Grupp and Mogee, 2004; Munda and Nardo, 2005; OECD, 2008; Hoyland et al., 2009; Ravallion, 2010; Andreoni, 2011a). By relying on relatively few indicators and on 'hard' output data only, the CIP index rankings are complemented by disaggregated information on the underlying scope and trends of each individual indicator. In its current form, the CIP index also allows capturing and comparing countries' *structural competitiveness trajectories* over time. The present CIP report consists of four chapters and a statistical appendix.

[1] Reinert (1995) and Chang (2002) document the significance of competitiveness issues in public policy for at least 500 years. See the list of references for a comprehensive list of reports and special journal issues on these themes.

Chapter 1 unravels the main issues at the centre of the debate on competitiveness. The main approaches adopted by international organizations are briefly reviewed and compared. Thereby, we demonstrate how different approaches to competitiveness yield different empirical results, that is, different diagnostics whose explanatory power is intrinsically biased. Comparisons of different economies' rankings can be obtained by adopting different competitiveness diagnostics, which allows us to illustrate the value added of the CIP index and its specific character. The CIP index today is a unique tool for assessing the industrial competitiveness of nations and is based on hard data, placing particular emphasis on manufacturing industries.

Chapter 2 presents the theoretical framework the CIP index is based upon. The CIP index is a diagnostic tool encapsulating three fundamental concepts with strong theoretical foundations: first, the notion that being competitive in manufacturing plays a key role. Albeit in different forms, manufacturing industries remain the main engine of economies' industrial competitiveness. Secondly, that becoming competitive implies conscious technological, organizational and institutional efforts. Learning and innovation in manufacturing industries and thus building technological capabilities are the fundamental drivers of development. Finally, structural economic dynamics reflect and account for an economy's change in industrial competitiveness over time. Thus, in order to understand (and guide) countries' development trajectories, it is necessary to look at the transformation of their production structures at the sectoral and intersectoral level.

Chapter 3 takes a retrospective look at the CIP index since its initial inclusion in the UNIDO Industrial Development Report 2002/3 *Competing Through Innovation and Learning*. Competitiveness indices are transforming continuously. In fact, they have to be adapted and revised according to the changing features of the phenomena they want to capture. The chapter retraces the different phases during which the CIP index has been revised, updated and validated over the last decade.

Chapter 4 provides a comprehensive analysis of the world industrial competitiveness ranking. The CIP index was computed in 2010 for 135 countries. The benchmarking exercise allows us to identify the relative industrial competitiveness of nations and to rank them accordingly. The analysis of the world ranking was performed by quintiles of the world ranking. The world industrial competitiveness ranking reveals a general pattern that meets our expecations: industrialized economies congregate near the top, transition and emerging industrial economies are found in the middle of the ranking, while least developed countries lie at the lower middle and lower end of the world ranking. The modular character of the CIP index allows us to decompose the effects of the different sub-indicators and to highlight national differences in selected structural economic variables such as manufacturing value added or manufactured exports per capita. The world industrial competitiveness analysis for 2010 is thus complemented by the ranking of the top 20 performers in the three sub-dimensions of industrial competitiveness.

Chapter 4 also presents the regional industrial competitiveness ranking for 2010. Here, economies have been grouped into world regions and ranked according to their industrial competitiveness. Because countries do not only want to compare their industrial competitiveness with that of their neighbours, but also with that of economies at the same stage of economic or industrial development, two sets of comparators were introduced. Economies were grouped according to their income level (taken as a proxy of economic development) and their level of industrial development using UNIDO's classification. Within each group of comparators, countries were then ranked according to their level of industrial competitiveness.

The world industrial competitiveness ranking provides a snapshot of the world industrial landscape for 2010, but it does not reveal the trajectories that economies have followed to reach their respective positions in the ranking. Chapter 5 presents the results of a longitudinal analysis of world industrial competitiveness. The CIP index was recalculated for all countries for which data were available over the last two decades (1990s – 2000s). Furthermore, dynamic indicators were computed to illustrate countries' structural trajectories and the speed of change in structural economic variables. The longitudinal analysis of the world industrial competitiveness was conducted in intervals of five years for individual economies and in intervals of ten years for regional, income and industrial development groups.

Over the last two decades, the world industrial landscape has been reshaped by the emergence of new strong economies, very often referred to as the BRICS (Brazil, Russian Federation, India, China and South Africa). While these countries have been climbing the world industrial competitiveness ranking and catching up with mature industrialized economies, least developed countries (LDCs) have been lagging behind. The last part of Chapter 5 presents several country case studies based on the disaggregated industrial diagnostics underlying the CIP index, focusing on the BRICS countries.

The increasing use of benchmarking exercises and industrial diagnostic tools corresponds to governments' strong need to assess their country's relative industrial competitiveness. The informative power of these analyses is reinforced by three main factors. The first factor is the transparency of the industrial diagnostic tool, which is modular and based on a robust analytical framework and computing methodology. Secondly, country comparisons are meaningful to the extent that their relative performance is assessed against appropriate comparators. Finally, the industrial competitiveness analysis depends on governments' awareness of the limits of the adopted tools as well as their use in the appropriate problem context. The report concludes with an outline of the CIP index for governments' use in industrial policy design and monitoring processes.

1. Making Sense of Competitiveness and Competitive Industrial Performance





Competitiveness is a concept that is widely used but difficult to define explicitly. While there is broad consensus about defining competitiveness at the firm level, there is an ongoing debate about the usefulness of this concept when applied to countries. This is why an analysis of the CIP index needs to first clearly define competitiveness and related concepts such as "comparative advantage" or "competitive industrial performance", as well as their differences and main characteristics, e.g. macro- vs meso-micro, static vs dynamic, outcome-based vs process-based and one-dimensional vs multidimensional (Cantwell, 2005; Siggel, 2006; Aiginger, 2006; Andreoni, 2011a).

1.1 The competitiveness debate: Boxing the compass

The concept of competitiveness is rooted in business school literature and has been widely applied in the analysis of companies' strategic behaviour in the marketplace. Companies compete with each other for access to resources and the acquisition of market shares. They also adopt competitiveness strategies to increase their profitability and overall performance. Numerous attempts to apply the concept of competitiveness in the analysis of country performances, often without a coherent analytical framework, have given this concept an ambiguous character and exposed its proponents to strong opposition[2]. For example, the common use of trade deficit and surplus to measure countries' competitiveness might be ambiguous. In fact, a country's trade deficit may depend on a weakness of its tradable goods sector (typically manufacturing), but may also be the result of a large inflow of foreign investments, the latter being a sign of competitive strength. On the other hand, a trade surplus might be a misleading indicator as it may either result from a strong export sector or from low levels of national economic activity.

In response to this ambiguous concept of competitiveness, some economists have used a broader definition, linking competitiveness to those structural factors that are responsible for any given economic system's medium- and long-term performance (Krugman, 1996; Fagerberg, 1996 and 2002; Lall, 2001a and 2001b; Aiginger, 2006; De Grauwe, 2010). For example, Laura Tyson (1992:1) defines competitiveness as "the ability to produce goods and services that meet the test of international competition, while our citizens enjoy a standard of living that is both rising and sustainable". This definition implies that an economy needs to produce tradable goods that are in sufficient demand in the domestic and international markets in order to be competitive. Such goods allow countries to maintain their trade in balance without resorting to currency depreciation or operating below full capacity utilization (Howes and Singh, 2000).

Broader definitions of competitiveness such as that reported above have been extremely controversial. According to Paul Krugman, "competitiveness is a meaningless word when applied to national economies. And the obsession with competitiveness is both wrong and dangerous" (Krugman, 1994:44). The logic behind this argument is twofold. Firstly, while companies play a competitive zero-sum game in the marketplace, nations engage in a non-zero sum game in the international market[3]. This means that according to the principle of comparative advantage, every economy should benefit from taking part in the international market[4]. The concept of comparative advantage contends that even countries with no absolute international cost advantage in any industry may benefit from international trade simply by specializing in those industries in which their performance is least poor. Thus, according to Krugman, competitiveness is "only a poetic

[2] Definitions of competitiveness, also referred to as 'competitive advantage', which have been proposed over the last 30 years are summarized by Aiginger (2006:166) and in a technical table by Siggel (2006:144).

[3] In particular, Krugman stresses how "while competitiveness problems could arise in principle, as a practical, empirical matter, the major nations of the world are not to any significant degree in economic competition with each other" (Krugman 1994:35).

[4] Krugman's critical anti-competitiveness argument is based on a particular application of the comparative advantage concept. This application can be found in standard neoclassical HOS trade models, and was later enriched by the new trade theory.

way of saying productivity that has nothing to do with any actual conflict between countries"[5] (Krugman, 1996:18).

Secondly, in a general equilibrium setting, the rise or decline of 'specific' activities is not relevant as long as there is an optimal allocation of resources. In fact, the decline of certain industries might well be the result of a normal process of the reallocation of resources from specific activities to others, from old to new areas of comparative advantage. Thus, defining competitiveness as a 'macroeconomic attribute' is nonsense and economies' focus on competitive gaps in particular production activities is misleading and dangerous.

As a number of scholars have noted (Kaldor, 1978; Fagerberg, 1996; Howes and Singh, 2000; Lall, 2001a), Paul Krugman's critique emphasizes the fact that using competitiveness as a macro-concept directly challenges the neoclassical edifice and opens up the possibility of implementing selective policies for boosting national competitiveness. In fact, the idea according to which free trade optimizes resource allocations (through the equilibrating adjustments of exchange rates) depends on several strong and often unrealistic assumptions. These include perfect competition with efficient markets, homogenous products, no learning costs in technology acquisition, no technological lags and leads and no externalities or increasing returns. As soon as market failures, structural constraints and non-price competitiveness factors are included in the analysis, a valid case for using the concept of competitiveness can be made.[6]

A country's possibility to boost its 'competitive advantage' is, of course, strictly connected (although distinct in form) to its 'comparative advantage'.[7] As restated in a recent debate between Ha-Joon Chang and Justin Lin, increasing competitiveness and industrial performance may result from two different dynamic patterns: the former based on a comparative advantage following strategy, the latter on a comparative advantage defying strategy. Advocates of the former suggest that "the optimal industrial structure is endogenous to the country's endowment structure – in terms of its relative abundance of labour and skills, capital and natural resources" (Chang and Lin, 2009:3). Thus, Justin Lin concludes that countries' competitive advantage results from the effective exploitation of comparative advantage at each stage of development. In contrast, Ha-Joon Chang maintains that countries must depart from their comparative advantage and purposefully pursue technological capabilities building and production capacity expansion policies. This is the only way to upgrade a country's industrial structure and increase its competitive industrial performance. In other words, this latter approach only views comparative advantage as a 'base line' in the process of industrial upgrading. How far countries should depart from this base line remains an open issue, the solution being very much context and historically dependent (Chang, Andreoni and Kuan, 2013).

More recently, we have witnessed the emergence of a broader consensus on a general definition of competitiveness understood as the ability of a country or location to create welfare. The existence of a link between competitiveness and a country's welfare has been highlighted in such seminal contributions as Fagerberg (1988:355) in which competitiveness is defined as "the ability of a country to realise central

[5] However, as Reinert (1995:26) notes '[w]e can observe that high relative or absolute productivity levels do not necessarily lead to competitiveness. […] Being the most efficient in the wrong activities – the opposite of national competitiveness – lead to negative development".

[6] Schumpeter (1943:84) was among the first to stress how the true nature of capitalist competition is not price competition, but competition "from the new commodity, the new technology, the new source of supply, the new type of organisation – competition which commands a decisive cost or quality advantage and which strikes not at the margins of the profits and the outputs of the existing firms but at their foundations as their very lives". See also Nelson and Winter, 1982; Dosi, 1988; Fagerberg et al., 2007.

[7] Siggel (2006) analyses the problems connected to the use of the concept of comparative advantage in a context where n goods are traded. It is important to note that the measurement of comparative advantage requires the use of monetary costs at equilibrium prices. Interestingly, Siggel shows why the RCA (revealed comparative advantage) is actually more of an indicator of competitiveness than comparative advantage. Advancements in new growth theory are also discussed, such as the inclusion into the traditional HOS trade model of economies of scale as sources of comparative advantage.

economic policy goals, especially growth in income and employment, without running into balance of payment difficulties". The same notion also appears in the definition provided by the OECD (1992:237) according to which competitiveness is "the degree to which, under free trade and fair market conditions, a country can produce goods and services which meet the test of foreign competition while simultaneously maintaining and expanding the real income of its people" (Cantwell, 2005; Siggel, 2006; Aiginger, 2006; Andreoni, 2011a).

The nature of the relationship between a country's competitiveness and its welfare is anything but simple. Indeed, ongoing transformations that occur within and across a country continuously challenge its competitiveness, which creates tensions because the country is required to deal with both internal (welfare) and external constraints in a sustainable manner. This latter dimension was highlighted in the OECD project on 'Framework Conditions for Industrial Competitiveness' (Hatzichronoglou, 1996), and fully articulated by Aiginger (1998:164) as follows: "Competitiveness of a nation is the ability to (i) sell enough products and services (to fulfill an external constraint); (ii) at factor incomes in line with the (current and changing) aspiration level of the country; and (iii) at macro-conditions of the economic, environmental, social system seen as satisfactory by the people."

Although a consensus is slowly emerging in the competitiveness debate, the differences among the main approaches still remain substantial as the following brief introduction illustrates:

- *The Real Exchange Rate Approach*

According to the real exchange rate approach, the level of competitiveness of a given economy has to be defined and measured by considering one specific dimension, namely the relative real exchange rate (RER) movements between countries. Specifically, a country becomes 'less competitive' as a result of an appreciation of its real exchange rate relative to its main competitors. Consequently, a country will run "a persistent (and unwelcome) current account deficit which would in due course require adjustment, usually via a mixture of deflation and depreciation" (Boltho, 1996:2).[8] This approach was introduced by the International Monetary Fund and solely relies on monetary factors of competitiveness. Thus, although this approach is very useful in short run analyses, it does not provide any information about changes in structural drivers of competitiveness.

- *The National Competitiveness Approach*

The national competitiveness approach defines competitiveness as "the set of institutions, policies and factors that determine the level of productivity of one country" (WEF) and, in turn, its sustainable level of prosperity.[9] The operationalization of this concept is mainly attributable to the work of the World Economic Forum (WEF), the Institute of Management Development (IMD) and, to a certain extent, to the Doing Business Reports of the World Bank. Here, competitiveness is understood as a multi-dimensional concept including a large number of static and dynamic macroeconomic attributes.

This approach focuses on the 'process assessment of competitiveness', that is, on understanding how the above-mentioned interacting economic and non-economic attributes determine the 'ability' or 'readiness' of countries to compete. Expressions such as 'business environment' and 'investment climate' also capture

[8] See also Lipschitz and McDonald, 1991.

[9] See also Porter, 1990; Sala-i-Martin in De Grauwe, ed., 2010.

the same ex-ante concept of a given country's 'potential competitiveness' (World Bank, 2010). As a result of the fact that competitiveness is defined according to a certain set of institutions, policies and factors, which are ex ante assumed to be 'right', this approach tends to propose a normative concept of competitiveness and is highly deterministic.[10]

• *The Engineering Approach*

The engineering approach regards competitiveness as an emergent property resulting from the ability of a country's firms to imitate, adopt, shape and create technical and organizational 'best practices' in their activities. Hence, according to this approach, competitiveness is ultimately reflected in the capacity "to maximise productivity and factor incomes (wages and profits) on a sustained basis" (Hatzichronoglou, 1996:19). Studies adopting this approach such as the Made in America Report by the MIT Commission on Productivity also rely on foreign trade indicators to monitor firms' individual and aggregate competitive performance.

• *The Structural Competitiveness Approach*

The structural competitiveness approach (also referred to by Sanjaya Lall as the manufacturing competitiveness approach) shares some of the premises underlying the engineering approach, but differs from it and the national competitiveness approach in that it is based on a narrower and more tractable meso-concept of competitiveness, that is, industrial competitiveness. Accordingly, industrial competitiveness is defined as "the capacity of countries to increase their presence in international and domestic markets whilst developing industrial sectors and activities with higher value added and technological content" (UNIDO 2002). Thus, "competitiveness in industrial activities means developing relative efficiency along with sustainable growth" (Lall 2001a:6).

This implies that increasing industrial competitiveness requires a shift away from static sources of cost advantage to a focus on the diversification of industrial activities (moving up the technological ladder). This concept of industrial competitiveness has a multidimensional character and may be applied both in 'ex-ante' and 'ex-post' analyses, depending on whether we are interested in the 'process assessment' or 'outcome assessment' of the industrial competitiveness of nations. Specifically, this approach may focus both on the particular set of 'structural drivers' of industrial competitiveness (i.e. process) and on the resulting competitive industrial performance of countries (i.e. outcome). The measurement of industrial competitiveness tends to rely on observable realities. Moreover, the concept maintains a 'stochastic' character, that is, it conceives of the possibility of a plurality of industrial upgrading patterns (Lall, 2001a).

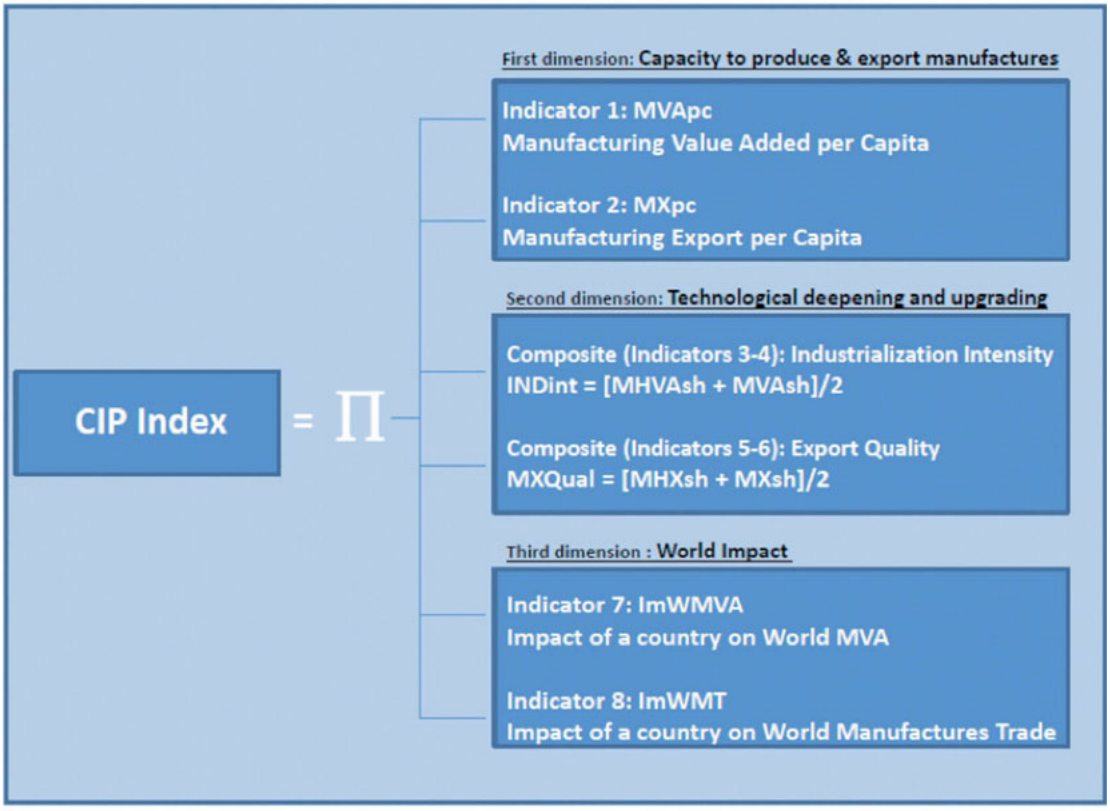
The first operationalization of this approach can be found in the UNIDO IDR 2002/3 with the development of a specific 'outcome assessment' tool (the CIP index) with a battery of *industrial capabilities indicators* to capture structural drivers (see Chapter 3). As the CIP index is an indicator of industrial performance, it can only be used for cross-country 'outcome assessments' of manufacturing competitiveness at regular intervals. In other words, it informs us about competitive industrial performance in select years, and by comparing countries' effective annual industrial performance, the index allows the assessment of countries' industrial progress over time. However, the CIP index is not designed to capture industrial potential.

[10] Qualitative indices are certainly useful, but there are problems when they are used as normative statements as the case of Finland, for example, illustrates. According to mainstream indices of institutional development and national competitiveness, Finland's position in international rankings would have been very low in the 1960s given its relative closure to international markets, companies' ownership control and massive presence of state-owned enterprises (the same story can be told for Republic of Korea or even the United States in a different historical era). This once again underlines that there is no unique or 'right' way of becoming competitive (Andreoni, 2012).

1.2 The distinctive features of the CIP index

Within the field of competitiveness benchmarking, the CIP index emerges as a simple, yet powerful and transparent tool for ranking countries according to their industrial competitiveness. There are eight sub-indicators in total which make up the CIP index in its current form (two pairs are aggregated in two composite indicators called *industrialization intensity and export quality*). As summarized in Table 1, these eight sub-indicators are organized along three dimensions and are aggregated using a non-linear aggregation technique and equal weights.

Table 1: The CIP index



Indicators composing the new CIP index:
Indicator 1: MVApc: Manufacturing Value Added per capita
Indicator 2: MXpc: Manufactured Exports per capita
Indicator 3: MHVAsh: Medium- and High-tech Manufacturing Value Added share in in total manufacturing value added
Indicator 4: MVAsh: Manufacturing Value Added share in total GDP
Indicator 5: MHXsh: Medium- and High-tech manufactured Exports share in total manufactured exports
Indicator 6: MXsh: Manufactured Exports share in total exports
Indicator 7: ImWMVA: Impact of a country on World Manufacturing Value Added
Indicator 8: ImWMT: Impact of a country on World Manufactures Trade

Five major distinctive features of the CIP index can be identified. These will be thoroughly discussed in the following chapters of the report with a focus on the theoretical roots and evolution of the CIP index.

Industrial competitiveness and manufacturing development

The CIP index builds on a meso-concept of competitiveness which assigns particular emphasis to countries' manufacturing development. Accordingly, industrial competitiveness is defined as the *capacity of countries to increase their presence in international and domestic markets whilst developing industrial sectors and activities with higher value added and technological content.* At the very fundamental level, becoming industrially competitive is nothing more than learning to industrialize and to continuously transform the economy's industrial structure (Lall, 1987). As Luigi Pasinetti points out, "The primary sources of international gains is international learning (not international trade), where firms in one country are challenged by lower-priced products from abroad. They will either learn how to cut down costs or close down. Some of them, at best, may learn and survive. Furthermore, when a new product is invented in one country, the very first thing that all other countries will try to do is to learn how to make the product themselves" (Pasinetti, 1981:259). Countries can learn from international markets and become more industrially competitive if they develop their technological capabilities, expand their production capacity and invest in their infra-structure. Thus, increasing industrial competitiveness requires selective policy interventions through which comparative advantages are exploited while new competitive advantages are created (Chang, 1994, 2009; Lall, 2001; Cimoli, Dosi and Stiglitz, 2009; Chang, Andreoni and Kuan, 2013).

A separation between structural economic variables and institutional conditions

The CIP index embraces a structural competitiveness approach according to which diagnostic tools should focus on capturing structural economic variables. The fact that countries' institutional features are not measured within this approach does not imply that their relevance is being underestimated. Instead, by maintaining a separation between the assessment of structural economic variables (such as countries' sectoral composition), on the one hand, and institutional features (such as labour market regulations), on the other, the CIP index does not close the gap of institutional possibilities. In other words, as Sanjaya Lall pointed out, "there are many roads to heaven as well as many heavens" (Lall, 2004:7). The CIP index does not make any implicit normative assumptions or prescriptions at the institutional level. On the contrary, many of the sub-indicators adopted in the WEF and IMD competitiveness ranking tend to align to a certain vision of market functioning and market-friendly institutional settings (Lall, 2001a).

A focus on countries' performance rather than their potential

The CIP index is a performance (or 'outcome') indicator, while the World Competitiveness Scoreboard (WCS) produced by the IMD and the new Global Competitiveness Index (GCI) produced by the WEF are potential (or 'process') indicators. Thus, the CIP index consists of output indicators only; by contrast, WEF and IMD focus on the 'key drivers' and 'key factors', respectively, that determine countries' competitiveness (similarly, the World Bank's *Doing Business Report* attempts to capture the 'business climate' that influences countries' competitiveness). Thus, while the CIP index directly measures actual industrial performance, the WCS and the new GCI (indirectly) capture overall output given certain potentialities in the inputs (the World Bank's Doing Business Reports also use input indicators and assume that a positive correlation exists between them and economic performance).

An exclusive focus on quantitative data, transparency and modularity

The CIP index only uses quantitative and transparent indicators. Although this does not mean that the index is free of value or qualitative judgements (which have been used to construct the technological classification or the aggregation technique), WEF and IMD use a mix of quantitative and qualitative indicators. Perception-based indicators are extremely problematic for inter-country comparisons as responses are likely to reflect the contextual differences and cognitive schemes shaping respondents' business perceptions. This problem is exacerbated by the fact that qualitative and quantitative data are conflated in an overly composite indicator.[11] By contrast, the CIP index maintains a strong modular character and as such is suitable for disaggregated analysis.

A focus on medium-long term country transformations

Given its focus on industrial competitiveness and structural economic variables, the CIP index provides country rankings that tend to remain relatively stable over short periods of time. The reason for this is that processes of technological learning are cumulative and take time. The effects of learning are only reflected in industrial statistics and structural economic variables in the medium-long term and can be captured through detailed longitudinal studies, in particular by tracking changes of key dimensions over time. In this respect, the CIP index in its current form allows us to observe not only the absolute level of key indicators at any particular point in time, but also their rate of change. Perception-based indicators, on the contrary, tend to be extremely variable and may affect country rankings drastically, even for short time intervals. The overall reliability of the competitiveness assessment is thus negatively affected.

1.3 Competitiveness is in the eye of the beholder

The different approaches to competitiveness discussed above produce different diagnostics for cross-country competitiveness benchmarking. The two main competitors of the CIP index in the field of competitiveness benchmarking are the new GCI produced by the WEF and the WCS by the IMD. These two institutions, WEF and IMD, used to jointly publish a competitiveness index in the World Competitiveness Report. Following the decision to go their separate ways in 1996, WEF places relatively greater emphasis on 'soft' data while IMD focuses on 'hard' data. While the WEF's competitiveness analysis is widely cited in policy and academic debates, the IMD's ranking is more widely used in business schools.

World Economic Forum: The New Global Competitiveness Index

Competitiveness indices promoted by the WEF have been widely publicized by mass media, although some scholars have stressed the lack of transparency of the benchmarking exercise and have expressed some doubts about the competitiveness rankings produced (Lall, 2001b; Godin, 2004). The WEF embraces what we call here the national competitiveness approach. Since 2005, countries' national competitiveness has been assessed through a composite index called Global Competitiveness Index (GCI). This index underwent a major revision in the WEF 2008/9 Report. The majority of the individual indicators used in the various editions of the WEF Global Competitiveness Reports have been incorporated into the current GCI. How these sub-indicators are combined has drastically changed due to the adoption of a new 'hierarchical model' for the assessment of competitiveness and more rigorous statistical methodologies.

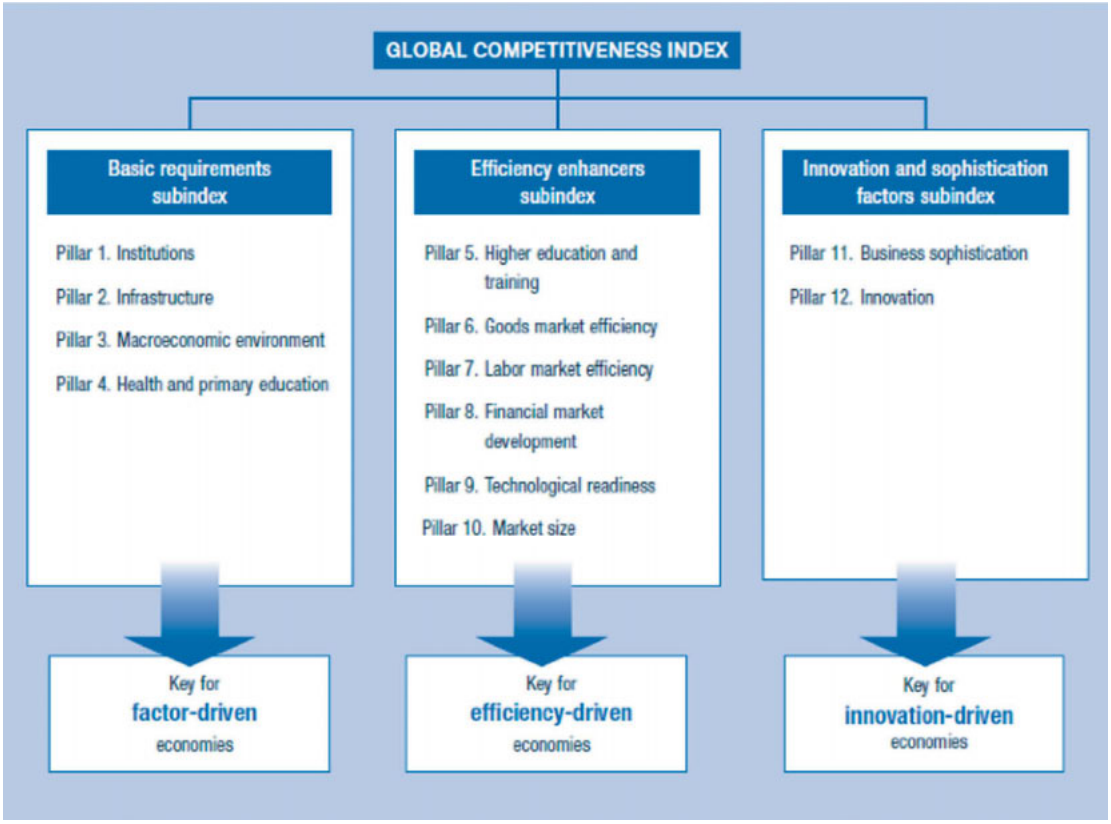
To capture the *institutions, policies and factors* responsible for the overall level of productivity of a given

[11] For a discussion on these issues, see Andreoni, 2011a.

country (i.e. its competitiveness), the WEF uses a '12 pillars' schema (see Table 2). Each of these pillars captures one distinct determinant of national competitiveness and consists of sub-categories. For each of these sub-categories, a list of sub-indicators mixing qualitative and quantitative data, as well as input and output variables are considered. All these sub-indicators are included in the final composite index (GCI) in accordance with the pillar they belong to.[12]

The relevance of each determinant is dependent on the country's stage of development and is reflected in the weight of each pillar in the composite index. In the WEF classification, countries are divided into three categories based on *stage of development:* factor-driven, efficiency-driven and innovation-driven. The distinction is made based on GDP (gross domestic product) per capita and whether a country's exports are factor-driven.[13] Thus, it is assumed that countries need to focus on different sub-groups of pillars according to their stage of development.

Table 2: The World Economic Forum's 12 pillars of competitiveness



Source: WEF, 2012:8.

[12] As some indicators traverse different pillars, the methodology adopted assigned half-weights to avoid double counting.

[13] Exports are factor-driven when the share of exports of mineral goods in total exports is higher than 70 percent.

Institute for Management Development: World Competitiveness Scoreboard

The IMD World Competitiveness Scoreboard (WCS) has been published without interruption since 1989. It aims to rank and analyse "how nations and enterprises manage the totality of their competences to achieve increased prosperity" (IMD, 2011:480). The analysis is carried out at the national level, because national environments shape the ability of firms to compete both domestically and internationally. To determine the overall competitiveness of nations, the WCS 2012 utilizes 4 competitiveness input factors, 20 sub-factors and 329 criteria. Among the criteria, 247 criteria (quantitative data: 131 and perception data: 116) are taken into consideration to determine the overall competitiveness ranking, while 82 criteria are used as background information (Table 3). Irrespective of the number of individual factors they include, each of the 20 sub-factors is given a weight of 5 percent in the composite indicator through which the scoreboard is produced.

Table 3: The IMD competitiveness factors

Economic Performance	(78 criteria)	Macro-economic evaluation of the domestic economy: Domestic Economy, International Trade, International Investment, Employment and Prices.
Government Efficiency	(71 criteria)	Extent to which government policies are conducive to competitiveness: Public Finance, Fiscal Policy, Institutional Framework, Business Legislation and Societal Framework.
Business Efficiency	(68 criteria)	Extent to which the national environment encourages enterprises to perform in an innovative, profitable and responsible manner: Productivity and Efficiency, Labor Market, Finance, Management Practices and Attitudes and Values.
Infrastructure	(114 criteria)	Extent to which basic, technological, scientific and human resources meet the needs of business: Basic Infrastructure, Technological Infrastructure, Scientific Infrastructure, Health and Environment and Education.

Source: IMD, 2011:480.

The individual measures consist both of hard and soft data. The latter is perception-based information about countries' competitiveness in areas such as management practices and labour relations. The perceptions of the business community are collected through an Executive Opinion Survey (EOS) conducted every year in each of the ranked economies. Differently from the WEF and UNIDO ranking, the IMD covers only 59 countries.

Countries' movements across competitiveness rankings

What makes these benchmarking exercises particularly relevant in the current policy debate is that governments include them in their goal statement, very often without realizing that the different composite indices by which these rankings are constructed cannot provide a neutral account of competitiveness. This is because the construction of a composite index relies on a sequence of subjective choices about the relevant dimensions to be included in the index, the focus on input or output measures, their proportional

relationships and weights. The more dimensions such as institutional and structural aspects and macroeconomic conditions are included, the lower the transparency of the final composite index. Institutional aspects are intrinsically qualitative features whose assessment depends on subjective and perception-based evaluations. Some structural aspects of economies, such as the technological complexity of their production base, rely on some form of technological classification of sectors.

According to the concept of competitiveness and empirics adopted, three completely different global scenarios emerge. Notably, given the particular emphasis the CIP index assigns to the manufacturing sector, countries specializing in agriculture, resource-based manufacturing (including mining) or in services perform much better in the WEF and IMD rankings than in the CIP index ranking. By contrast, newly industrialized countries do comparatively better in UNIDO's CIP index ranking because they are experiencing processes of industrial upgrading. Table 4 shows the high degree of diversity in the assessment of world competitiveness rankings on account of the three major differences pointed out above and the underlying distinctions in understanding competitiveness.

Table 4: Countries' movements across competitiveness rankings

UNIDO 2012/13	Country	WEF 2012/13	Ranking difference UNIDO-WEF	IMD 2012/13	Ranking difference UNIDO-IMD	Ranking difference WEF-IMD
1	Japan	10	-9	27	-26	-17
2	Germany	6	-4	9	-7	-3
3	United States of America	7	-4	2	1	5
4	Republic of Korea	19	-15	22	-18	-3
5	China, Taiwan Province	13	-8	7	-2	6
6	Singapore	2	4	4	2	-2
7	China	29	-22	23	-16	6
8	Switzerland	1	7	3	5	-2
9	Belgium	17	-8	25	-16	-8
10	France	21	-11	29	-19	-8
11	Italy	42	-31	40	-29	2
12	Netherlands	5	7	11	1	-6
13	Sweden	4	9	5	8	-1
14	United Kingdom	8	6	18	-4	-10
15	Ireland	27	-12	20	-5	7
16	Austria	16	0	21	-5	-5
17	Canada	14	3	6	11	8
18	Finland	3	15	17	1	-14
19	Spain	36	-17	39	-20	-3
20	Czech Republic	39	-19	33	-13	6
21	Malaysia	25	-4	14	7	11
22	Mexico	53	-31	37	-15	16
23	Thailand	38	-15	30	-7	8
24	Denmark	12	12	13	11	-1
25	Poland	41	-16	34	-9	7
26	Israel	26	0	19	7	7

UNIDO 2012/13	Country	WEF 2012/13	Ranking difference UNIDO-WEF	IMD 2012/13	Ranking difference UNIDO-IMD	Ranking difference WEF-IMD
27	Slovakia	71	-44	47	-20	24
28	Australia	20	8	15	13	5
29	Hungary	60	-31	45	-16	15
30	Turkey	43	-13	38	-8	5
31	Norway	15	16	8	23	7
32	Slovenia	56	-24	51	-19	5
33	Brazil	48	-15	46	-13	2
34	Portugal	49	-15	41	-7	8
35	Argentina	94	-59	55	-20	39
36	Russian Federation	67	-31	48	-12	19
37	Saudi Arabia	18	19	NA		
38	Indonesia	50	-12	42	-4	8
39	Kuwait	37	2	NA		
40	Belarus	NA		NA		
41	South Africa	52	-11	50	-9	2
42	Luxembourg	22	20	12	30	10
43	India	59	-16	35	8	24
44	Philippines	65	-21	43	1	22
45	Chile	33	12	28	17	5
46	Romania	78	-32	53	-7	25
47	Lithuania	45	2	36	11	9
48	New Zealand	23	25	24	24	-1
49	Greece	81	-32	58	-9	23
50	Croatia	96	-46	57	-7	39
51	Venezuela (Bolivarian Republic of)	126	-75	59	-8	67
52	Estonia	34	18	31	21	3
53	Ukraine	73	-20	NA		
54	Viet Nam	75	-21	NA		
55	Iran (Islamic Republic of)	66	-11	NA		
56	Costa Rica	57	-1	NA		
57	Qatar	11	46	10	47	1
58	Tunisia	NA		NA		
59	Bulgaria	62	-3	54	5	8
60	Trinidad and Tobago	84	-24	NA		
61	Malta	47	14	NA		
62	Egypt	107	-45	NA		
63	Peru	61	2	44	19	17
64	Colombia	69	-5	52	12	17
65	Iceland	30	35	26	39	4
66	Morocco	70	-4	NA		
67	China, Hong Kong SAR	9	58	1	66	8
68	Latvia	55	13	NA		
69	Oman	32	37	NA		
70	Kazakhstan	51	19	NA		

UNIDO 2012/13	Country	WEF 2012/13	Ranking difference UNIDO-WEF	IMD 2012/13	Ranking difference UNIDO-IMD	Ranking difference WEF-IMD
71	El Salvador	101	-30	NA		
72	Jordan	64	8	49	23	15
73	Uruguay	74	-1	NA		
74	Pakistan	124	-50	NA		
75	Lebanon	91	-16	NA		
76	Serbia	95	-19	NA		
77	Guatemala	83	-6	NA		
78	Bangladesh	118	-40	NA		
79	Mauritius	54	25	NA		
80	Sri Lanka	68	12	NA		
81	Syrian Arab Republic	NA		NA		
82	Algeria	110	-28	NA		
83	Bosnia and Herzegovina	88	-5	NA		
84	The f. Yugosl. Rep of Macedonia	80	4	NA		
85	Swaziland	135	-50	NA		
86	Botswana	79	7	NA		
87	Ecuador	86	1	NA		
88	Cyprus	58	30	NA		
89	Côte d'Ivoire	131	-42	NA		
90	Cambodia	85	5	NA		
91	Honduras	90	1	NA		
92	Bolivia (Plurinational State of)	104	-12	NA		
93	Jamaica	97	-4	NA		
94	Albania	89	5	NA		
95	Nigeria	115	-20	NA		
96	Georgia	77	19	NA		
97	Cameroon	112	-15	NA		
98	Armenia	82	16	NA		
99	Paraguay	116	-17	NA		
100	Congo	NA		NA		
101	Senegal	117	-16	NA		
102	Kenya	106	-4	NA		
103	Gabon	99	4	NA		
104	Barbados	44	60	NA		
105	Fiji	NA		NA		
106	United Republic of Tanzania	120	-14	NA		
107	Azerbaijan	46	61	NA		
108	Suriname	114	-6	NA		
109	Mongolia	93	16	NA		
110	Panama	40	70	NA		
111	Zambia	102	9	NA		
112	China, Macao SAR	NA		NA		
113	Belize	NA		NA		
114	Republic of Moldova	87	27	NA		

UNIDO 2012/13	Country	WEF 2012/13	Ranking difference UNIDO-WEF	IMD 2012/13	Ranking difference UNIDO-IMD	Ranking difference WEF-IMD
115	Tajikistan	100	15	NA		
116	Madagascar	130	-14	NA		
117	Kyrgyzstan	127	-10	NA		
118	Ghana	103	15	NA		
119	Nepal	125	-6	NA		
120	Uganda	123	-3	NA		
121	Yemen	140	-19	NA		
122	Mozambique	138	-16	NA		
123	Saint Lucia	NA		NA		
124	Cape Verde	122	2	NA		
125	Malawi	129	-4	NA		
126	Sudan	NA		NA		
127	Haiti	142	-15	NA		
128	Niger	NA		NA		
129	Rwanda	63	66	NA		
130	Ethiopia	121	9	NA		
131	Central African Republic	NA		NA		
132	Burundi	144	-12	NA		
133	Eritrea	NA		NA		
133	Gambia	98	35	NA		
133	Iraq	NA		NA		

The World Economic Forum also includes the following countries: 24 United Arab Emirates; 28 Brunei; 31 Puerto Rico; 35 Barein; 76 Seychelles; 92 Namibia; 105 Dominican Republic; 108 Nicaragua; 109 Guyana; 111 Liberia; 113 Lybia; 119 Benin; 128 Mali; 132 Zimbabwe; 133 Burkina Faso; 134 Mauritania; 136 Timor-Leste; 137 Lesoto; 139 Chad; 141 Guinea; 143 Sierra Leone.

Source: UNIDO Report 2012/13; WEF Report 2012/3; IMD Report 2012/3.

2. Theoretical Foundations of the CIP Index





Despite the multiplicity of competitiveness indices in the literature, little is known about their economics (Lall, 2000). How do they relate to theories of development and the broader political economy debate? How rigorously are the variables chosen? Answering such questions is necessary in order for competitive indices to fully establish themselves as reliable indicators of relative competitive performance and useful tools for policy advice.

Over the last three decades, the political economy debate abandoned its focus on manufacturing as the main engine of technological dynamism and the source of wealth of nations. However, recent years have witnessed a renewed interest in manufacturing production. This has led analysts to declare and welcome a global 'manufacturing renaissance' emerging in different contexts with multiple focuses, observable in many white papers and research studies which have been re-examining the significance of manufacturing since 2000. Deindustrialization, loss of strategic manufacturing industries, increasing trade imbalances, decreasing technological dynamism and industrial competitiveness have been major concerns in advanced economies. Meanwhile, governments in developing countries have begun questioning the sustainability of a development model that is overly focused on natural resource extraction. Other governments, particularly of middle income countries, have been concerned about emerging strong economies capturing global market shares and dominating the global technological race to the detriment of smaller players (UNIDO, 2009).

In developed countries, the 'financial freefall' of 2008-2009 further fuelled governments' concern about the overall impact on their economies of an increasingly rapid process of de-industrialization. Since the onset of the crisis, there has been a substantial loss of jobs and a global redistribution of manufacturing production with overwhelming effects on social welfare (Andreoni and Upadhyaya, 2013). Even middle income countries in the catch-up phase have witnessed a relative deceleration of their economies as a result of the contraction in global demand. Consequently, many governments have had to step in to rescue distressed manufacturing firms and to protect national champions, as well as to expand the money supply to counterbalance the credit crunch. The restructuring of the automotive industry and the subsequent efforts by various governments aimed at keeping production at home are striking examples of this renewed scope for public action.

This renewed interest in and concern for manufacturing production opens the door for a profound reconsideration of the *pro-services vision*. According to this vision, the role of manufacturing is destined to lose relevance as economies progress. Moreover, for economies that currently find themselves in the 'catch-up phase', industrialization is not an obligatory rung on the ladder of development, since they can follow a service-led process of economic growth instead. This pro-services vision has dominated the political economy debate for nearly three decades, pushing out and excluding the proponents of public support for manufacturing development, given its 'symbiotic' relationship with the service industries, in particular production-related services.

The competitive industrial performance analysis performed by UNIDO embraces a *pro-manufacturing vision* whereby development is understood as "a process that links micro learning dynamics, economy-wide accumulation of technological capabilities and industrial development" (Cimoli, Dosi and Stiglitz, 2009:543). Modern manufacturing systems consist of complex interdependencies, often across a range of industries, which contribute a variety of components, materials, production sub-systems and production-related services. The CIP index and the competitive industrial performance analysis offer a first snapshot of these complexities at the country level, providing a visualization of global trends and the current industrial competitiveness of nations.

2.1 Development as industrialization

Does the wealth of nations, that is, their socio-economic development and technological power, mainly result from superior capacities in manufacturing (i.e. *making* commodities) or from pursuing other activities (i.e. providing services)? Furthermore, do different *sectors* and/or *production* tasks performed within each sector contribute to economic growth in specific ways or is the effect identical for all sectors and activities? Finally, to what extent can a sustained process of economic growth rely on the increasing relative expansion of the service sector?

During the second half of the twentieth century, the political economy debate addressing these questions has witnessed two major turning points. Until the late 1970s, the debate was dominated by people working in the field of classical economics who supported what we call here a *pro-manufacturing vision*. In the subsequent two decades of the twentieth century (1980s – 2000), a *pro-services vision* came to dominate and remained prevalent in the academic and policy debate until the recent financial crisis.

These two opposite visions emerged in (and thus partially reflect) two different phases of the global process of structural change and manufacturing development that commenced after World War II. To better understand the context of the industry versus services debate, a snapshot of countries' manufacturing development trajectories over the last half of the twentieth century will be provided.

2.1.1 Manufacturing development: Some long-term stylized facts, 1950 - 2005

Eighteenth-century Great Britain was the first country that underwent a process of manufacturing development. Only in the early nineteenth-century (after Great Britain had already achieved significant increases in productivity) did European countries such as Belgium, Switzerland and France, followed by the United States, enter their own different paths of manufacturing development. Subsequently, other latecomers (most notably Germany, Russia and Japan) joined the group of industrializing nations, while the developing world (both former colonies and non-colonies) remained oriented towards primary production (Gerschenkron, 1962; Maddison, 2007). This situation basically remained unchanged until World War II (with the exception of Argentina, Brazil and South Africa). This group took the opportunity to initiate its own manufacturing development process through import substitution because of the contraction of world trade during the Great Depression (1930s). After World War II, more countries began to enter the 'catch-up phase' thanks to the increasing advantages of backwardness, the greater opportunities for technology transfer and the industrial policies implemented by developing states. This allowed them to enter the global manufacturing development race (Wade, 1990; Chang, 1994, 2002; Amsden, 2001, 2007; Chang, Andreoni and Kuan, 2013).

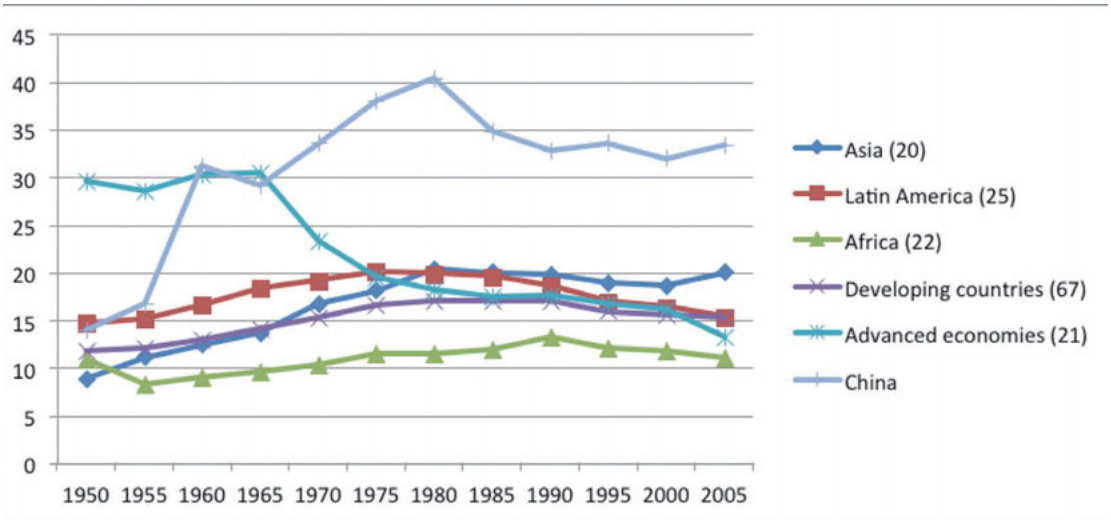
At first glance, three sets of stylized facts emerge as characteristic features of the last half of the twentieth century. Let us start from the most apparent stylized fact: a global process of structural change and quantitative redistribution of manufacturing across countries. With regard to the former, when the manufacturing development process became a major global phenomenon in 1950, manufacturing constituted around 30 percent of GDP in advanced economies while that figure amounted to around 12 percent in developing countries (see Table 5 and Figure 1). The industrial sector taken as a whole (including manufacturing) accounted for 20 percent of GDP, while agriculture as well as services made up 40 percent of GDP in developing countries.

Among the economies in the 'catch-up phase', Latin America remained the most industrialized region until 1975, when the manufacturing sector started contracting to the point that, in 2005, the share of manufacturing in GDP had reverted to 1950s levels and Latin American countries reduced their share in world manufacturing value added. The development path followed by manufacturing industries in Africa was,

on average, almost flat, reaching its peak in 1990 and decreasing again to 11 percent (i.e. a return to figures seen in 1950). In contrast, manufacturing in many Asian economies continued to increase throughout the last half of the century with an impressive acceleration from 1965 to 1980. Finally, the manufacturing share in the most advanced economies started decreasing in the late 1960s, from 30 percent to 18 percent on average in less than a decade (Maddison, 2007; Szirmai, 2012).

During the second half of the last century, several East Asian economies experienced a sustained catching up process responsible for the quantitative redistribution of world manufacturing value added share and world manufactures trade. By 2010, the three most successful economies in East Asia, namely China, the Republic of Korea and China, Taiwan Province taken together accounted for one fifth of world manufacturing value added share and world manufactures trade.

Figure 1: Worldwide manufacturing development paths (changes in the shares of manufacturing in GDP at current prices per country groups over the period 1950 – 2005)



Source: Based on Szirmai, 2012.

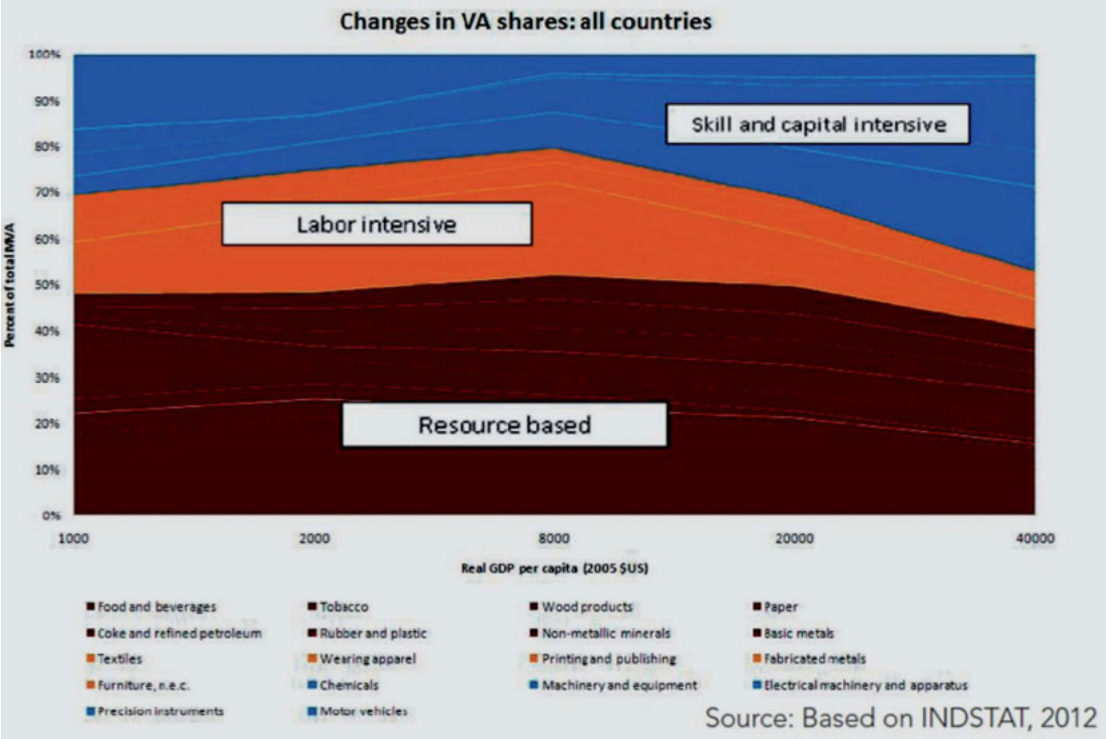
The *quantitative redistribution* of manufacturing, from advanced economies to a number of fast growing countries, has also been accompanied by a *qualitative transformation* within countries' manufacturing sectors. At different stages of development (measured in real GDP per capita, US dollars 2005), a country's manufacturing sector is composed of different shares of resource-based, labour intensive and skill/capital intensive industries. A set of empirical regularities has been observed (see Figure 2):

- Up to US$ 2.000, a country's manufacturing sector tends to be composed of almost 50 percent resource-based industries, 20 percent labour intensive industries and 30 percent skill/capital intensive industries;

- Between US$ 2.000 and US$ 8.000, the ratio of labour intensive and skill/capital intensive industries tends to invert, while resource-based manufacturing industries remain unchanged;

- Finally, from US$ 8.000 onwards, there is a tendency for resource-based industries to become less prevalent while there is an increase in skill/capital intensive industries (such as machinery production, automotive or chemicals) and a strong reduction in labour intensive industries (such as textiles and apparel).

Figure 2: Qualitative transformations in the manufacturing sector (changes in the composition of total MVA for large economies)



Source: UNIDO, 2012a.

The third feature (as shown in Table 5) is that the degree of variance among manufacturing development paths is very high, with countries from the same regions or income groups experiencing completely different forms of industrialization. For example, the group of today's advanced economies includes two different groups of countries. On the one hand are those such as Germany and Japan that have maintained a strong manufacturing base and, on the other, there are those such as the United States and United Kingdom that have increasingly relied on services. The manufacturing development trajectories of large world economies such as China and India or Brazil are also very different. Table 5 provides information on the share of manufacturing in GDP at current prices over the period 1950 – 2005 for 90 countries.

Table 5: Worldwide manufacturing development, 1950 – 2005 (shares of manufacturing in GDP at current prices, 90 countries)

	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005
Bangladesh[a]	7.2	9.8	5.3	5.4	5.8	7.0	13.8	14.2	13.1	15.3	15.2	16.5
Cambodia			8.5	8.4					8.6	9.1	16.0	17.8
China	14.1	16.8	31.3	29.2	33.7	38.1	40.5	34.9	32.9	33.7	32.1	33.5
Hong Kong, China							22.8	21.3	16.7	7.7	5.4	3.4
India	10.4	12.0	14.1	14.7	14.2	15.8	16.7	16.5	16.7	17.9	15.6	16.0
Indonesia	7.4	9.8	9.2	8.4	10.3	9.8	13.0	16.0	20.7	24.1	27.7	27.7
Iran, Islamic Rep.			9.5	8.7	10.1	7.3	7.8	7.2	11.8	11.9	13.2	11.8
Iraq	6.1	7.0	9.6	8.9							0.9	
Jordan			6.2	11.9	11.3	8.9	12.7	11.5	14.9	15.1	15.7	18.2
Lebanon	6.4			13.3						15.0	13.7	14.1
Malaysia		11.2	8.1	9.5	12.4	17.6	21.6	19.3	24.2	26.4	32.6	29.8
Pakistan[b]	7.2	9.8	12.1	14.5	16.1	16.7	15.9	15.9	17.4	16.3	14.7	18.6
Philippines	8.5	13.1	20.3	19.5	24.9	25.7	25.7	25.2	24.8	23.0	22.2	23.3
Republic of Korea	8.8	11.3	10.4	13.5	17.8	21.6	24.4	27.3	27.3	27.6	29.4	28.4
Sri Lanka	4.2	5.9	15.4	16.8	16.7	20.1	17.7	14.7	14.8	15.7	16.8	14.8
Syrian Arab Republic	7.2	8.3	9.0	8.3						6.4	5.9	8.5
Taiwan	15.0	15.8	19.1	22.6	29.6	31.5	36.2	36.9	32.7	26.5	24.6	22.1
Thailand	12.0	13.8	12.5	14.2	15.9	18.7	21.5	21.9	27.2	29.9	33.6	34.8
Turkey	10.7	12.4	13.2	15.3	15.8	16.3	17.3	18.8	22.7	23.4	20.0	21.8
Vietnam[c]			11.5	20.0				20.5	12.3	15.0	18.6	20.6
Argentina	23.4	30.4	32.2	33.8	31.5	38.2	29.5	29.6	26.8	18.4	17.5	23.2
Barbados		12.7	8.0		7.9	10.3	11.9	10.6	10.1	10.1	6.4	7.1
Belize							23.9	16.7	13.1	10.9	10.9	9.1
Bolivia		13.2	13.4	14.1	14.1	12.9	14.4	17.3	18.5	19.0	15.3	14.0
Brazil	18.7	20.4	29.6	26.2	29.3	30.3	33.5	33.7	26.5	18.6	17.2	18.4
Chile	17.1	19.3	24.9	26.1	25.9	20.4	21.5	16.2	19.6	18.1	19.5	15.7
Colombia	12.9	14.9	16.5	19.7	21.2	23.7	23.9	22.0	20.6	15.9	15.8	16.4
Costa Rica	10.3	11.4	16.2	16.6	18.2	20.4	18.6	25.1	22.6	21.8	25.3	21.8
Dominican Republic	15.9	15.0	17.5	15.6	18.5	20.9	15.3	12.3	18.0	18.2	16.8	15.1
Ecuador	15.7	15.0	15.6	18.5	17.6	16.4	19.5	19.1	19.2	14.0	13.6	8.9
El Salvador			15.6	18.9	20.2	20.0	16.5	17.8	22.1	23.1	24.7	22.9
Guatemala	12.0	12.2	12.8	14.1	15.8	15.1	16.6	15.8	15.1	14.1	13.2	18.7
Guyana	15.2	13.5	10.4	13.1	12.1	14.7	12.1	13.9	10.3	11.4	8.2	7.7
Honduras	8.6	8.7	12.5	12.4	13.8	15.7	15.0	14.5	16.3	17.8	22.7	20.9
Jamaica	11.3	13.4	13.6	15.0					17.2	16.0	13.7	13.6
Mexico	17.2	18.1	15.3	19.5	23.2	22.4	22.3	24.0	20.8	20.8	20.3	17.8
Nicaragua				20.2								
Panama	11.3	9.8	12.8	15.3			11.0	12.3	9.7	9.1	10.1	8.0
Paraguay	19.5	14.6	16.7	15.5	16.7	15.6	16.0	14.2	16.8	15.9	15.5	12.4
Peru	14.5	15.4	20.2	17.1	19.8	20.0	20.0	25.2	17.8	16.8	15.8	16.3
Puerto Rico	16.3	20.7	21.9	23.0	23.6	28.9	36.8	39.0	39.6	41.9	38.3	
Suriname		11.2	12.5	14.9		20.7	18.6	13.2	10.3	13.7	9.0	19.1
Trinidad and Tobago	13.2	12.5	12.5	13.2				8.7	14.0	8.6	7.3	6.5
Uruguay		19.4	21.2	24.4			25.4	29.4	28.0	19.7	16.9	22.5
Venezuela, RB	10.9	11.7	10.7	16.6	16.1	15.7	16.0	18.9	14.9	15.1	19.8	17.9
Botswana				11.6	5.9	7.2	5.1	5.4	5.1	5.5	4.4	3.7
Congo, Dem. Rep.	9.4	6.7		6.3	8.9		15.2	10.5	11.3	7.1	4.8	6.6
Cote d'Ivoire			7.5	9.1	10.3	9.4	12.8	14.6	20.9	15.0	21.7	19.3
Egypt, Arab Rep.	8.3		13.7			17.4	12.2	13.5	17.8	17.4	19.4	17.3
Eritrea									8.2	9.0	11.2	6.8
Ethiopia[d]			6.0	6.7				4.3	4.8	4.8	5.5	4.8
Ghana			5.1	9.8	11.4	13.9	7.8	11.5	9.8	9.3	9.0	8.7
Kenya	10.8	9.6	9.4	11.5	12.0	12.0	12.8	11.7	11.7	9.9	11.6	11.7
Libya			10.7	2.8	2.1	2.3	2.0	4.5	6.5			

Table 5 (continued): Worldwide manufacturing development, 1950 – 2005 (shares of manufacturing in GDP at current prices, 90 countries)

	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005
Malawi		4.8	5.4	6.9	11.3	13.1	13.7	14.5	19.5	15.8	12.9	13.9
Mauritius	23.1	20.1	16.8	15.3		15.6	15.7	20.0	24.7	22.8	23.7	20.2
Morocco	14.7	11.5	13.4	15.7	16.2	17.1	16.9	18.4	19.0	19.0	17.4	17.2
Nigeria	1.8	3.0	3.8	5.4	3.7	5.0	8.4	8.7	5.5	5.4	3.7	4.6
Sierra Leone		0.0	6.0	6.1	6.3	5.5	5.3	5.7	4.6	9.3	3.5	3.7
South Africa	16.4	18.8	20.1	22.9	22.8	22.7	21.6	21.8	23.6	21.2	19.0	18.6
Sudan		4.4	4.7	6.1	7.8	6.9	7.5	8.6	8.8	9.2	8.6	6.8
Tanzania[e]	3.4	2.8	2.9	9.2			12.3		9.3	7.2	7.5	6.8
Togo			7.7	5.9	10.0	7.0	7.8	6.7	9.9	9.9	8.4	10.1
Tunisia		9.9		8.1	8.4	9.1	11.8	15.1	16.9	19.0	18.2	17.4
Uganda		7.9	8.5	8.4	9.2	6.3	4.3	5.8	5.7	6.8	9.8	9.3
Zambia		3.4	4.0	7.9	12.1	17.5	19.2	20.6	26.5	11.7	11.4	11.5
Zimbabwe/South Rhodesia		14.4	16.0	18.7	17.8	19.3	17.7	17.7	21.6	19.6	15.8	13.5
Cyprus	11.7	11.5	12.7	12.0		14.3	17.5	15.6	14.2	12.1		
Malta		8.2	16.1	19.3	21.8	30.5	33.1	29.5	27.0			
Australia	27.1	28.0	28.5	28.4	23.3	22.0	19.0	17.0	14.5	14.6	12.7	11.0
Austria	33.8	33.9	32.1	34.3	28.4	25.0	23.7	22.5	21.4	19.3	20.3	19.4
Belgium	30.1	28.9	29.5	30.7	30.4	24.6	22.6	22.4	21.9	20.2	19.3	17.1
Canada	28.6	27.9	23.3	26.3	25.9	22.2	18.8	17.9	16.9	18.4	19.2	16.5
Denmark	27.7	27.0	29.3	29.3	22.6	19.4	18.9	18.8	17.4	17.1	16.2	14.2
Finland	27.8	26.9	26.8	25.5	25.1	25.8	27.5	24.9	22.6	25.3	26.2	23.1
France	38.3	35.9	36.6	34.8	25.6	25.5	25.5	23.1	22.3	20.1	16.0	13.0
Germany, federal rep.	41.1	40.8	42.2	41.1	35.6	34.6	33.6	32.6	31.7	26.2	0.0	0.0
Germany, United										22.6	22.9	23.2
Ireland	13.5	26.1	28.4	31.5	32.6	30.4	0.0	0.0	0.0	0.0	0.0	0.0
Israel	19.3	22.5	24.0	24.0	23.2	22.0	16.4	20.0	18.5	16.9	17.9	14.5
Italy	31.1	27.1	27.2	27.7	27.6	27.5	28.9	25.2	23.3	22.2	21.0	18.2
Japan	24.8	25.9	32.0	31.1	32.9	27.4	26.6	26.8	25.5	22.5	21.3	21.0
Luxembourg	34.1	42.2	44.8	40.9	0.0	0.0	0.0	0.0	0.0	13.7	11.3	8.3
Netherlands	30.0	30.6	31.6	32.4	25.3	21.6	18.1	17.8	18.6	17.4	15.6	14.0
Norway	0.0	27.3	25.1	26.6	21.0	21.0	15.6	13.5	12.3	13.2	10.6	9.6
Portugal	35.3	26.4	29.9	33.3				19.6	19.4	18.4	17.1	14.7
Spain	21.3	23.4	22.5	25.8							18.6	16.2
Sweden	30.5	32.0	27.1	33.6	28.8	25.4	22.0	22.7	20.3	22.3	22.0	19.7
Switzerland									21.9	21.1	20.2	19.8
United Kingdom	34.6	36.3	36.2	34.5	31.7	28.1	26.5	23.9	23.2	21.7	17.9	13.6
United States	31.3	31.7	28.7	28.8	25.1	23.2	22.8	19.9	19.4	18.9	17.0	14.4
Average 20 Asian countries	8.9	11.2	12.5	13.8	16.8	18.2	20.5	20.1	19.9	19.0	18.7	20.1
Average 25 Latin America countries	14.7	15.2	16.6	18.4	19.2	20.1	19.9	19.6	18.7	17.0	16.4	15.4
Average 22 African countries	11.0	8.4	9.0	9.7	10.4	11.5	11.5	12.0	13.3	12.1	11.8	11.1
Average 67 Developing countries[f]	11.9	12.2	13.0	14.2	15.4	16.6	17.1	17.1	17.1	16.0	15.6	15.4
Average 21 advanced economies	29.6	28.6	30.4	30.5	23.3	19.6	18.3	17.5	17.7	16.8	16.2	13.3

[a] Bangladesh. 50–60 shares for Pakistan including Bangladesh.
[b] Pakistan including Bangladesh till 1972.
[c] South Vietnam till 1975. United Vietnam post 1975.
[d] Prior to 1993 including Eritrea.
[e] Till 1963 Tanganyika. excl. Zanzibar.
[f] Average developing countries excluding Malta and Cyprus.

Source: Szirmai, 2012.

2.1.2 The pro-manufacturing vision

The term *industrialization*, (i.e manufacturing growth) was, for a long time, synonymous with development, particularly amongst classical development economists. Participation in the global industrialization race was regarded *as sine qua non* for countries that wished to achieve accelerated economic growth, increasing labour productivity and socio-economic welfare improvements.

During the 1960s, the historical evidence available pointed towards the existence of a solid correlation between manufacturing development and economic growth. As shown in Table 5, countries with the highest shares of manufacturing in GDP were also the most developed economies. Classical development economists provided two sets of explanations for why manufacturing was the engine of economic growth. The first one focused on the (internal) 'special properties' of manufacturing and the second on the way in which these spread to the rest of the economy, triggering a process of increasing returns and economic growth.[14] The systematization of a *pro-manufacturing vision* was mainly attributable to the seminal work of Nicholas Kaldor and Albert Hirschman (amongst others).

Building on the classical work on increasing returns by Allyn Young (1928) and the empirical regularities pointed out by Kuznets, Chenery and Syrquin, Nicholas Kaldor developed his three famous laws (Kaldor, 1966, 1967, 1981. See also Chenery, Robinson and Syrquin, 1986). These ascertain the existence of increasing returns within manufacturing and the reasons why manufacturing is the engine of aggregate growth. The first of these laws states that the faster the rate of manufacturing growth, the faster the rate of economic growth of the overall system. The second law (also known as Verdoorn's law) asserts the existence of a strong positive causal relation between the rate of growth of manufacturing output and the rate of growth of manufacturing productivity.[15] Finally, the third law determines that aggregate productivity growth is positively associated with the growth of employment in manufacturing (and negatively related with the growth of non-manufacturing employment).

The 'special properties' (implicit in the second law) that allow manufacturing to trigger the overall growth of the economic system (through the realization of the first and third law) are threefold. Firstly, there are relatively broader opportunities for capital accumulation and intensification in manufacturing (in comparison to agriculture and services). Secondly, there are greater possibilities to exploit economies of scale induced by large-scale production and technical indivisibilities, both within and across industries. Finally, there are higher learning opportunities in manufacturing production through which embodied and disembodied technological progress is generated.

Given these special properties, specialization in manufacturing implies a double productivity gain (it allows countries to acquire a 'structural change bonus' and to avoid a 'structural change burden'). The former results from transferring labour from agriculture to manufacturing, the latter relates to the so-called 'Baumol's disease' (an overall slowdown of productivity caused by an over-dependence on services, especially labour intensive services such as personal services).

The mechanisms through which manufacturing is able to extend its special properties to the rest of the economy were explicitly formulated by Albert Hirschman (Hirschman, 1958). In his 'unbalanced growth model', each sector is linked with the rest of the economic system by its direct and indirect intermediate

[14] The different sources of increasing returns identified in the classical work of Smith, Babbage, Young and Kaldor are discussed in Andreoni and Scazzieri (2013). See Toner (1999) for a review of Kaldor's laws and their contributions to the Cumulative Causation Theory.

[15] This law is implicit in the idea stated by A. Young (1928) that "the division of labour depends upon the extent of the market, but the extent of the market depends upon the division of labour". This means that "an increase in the market triggers further specialisation which is a process that simultaneously increases the size of the market for specialist skills and activities" (Best, 1999:107).

purchase of productive inputs and sales of productive outputs – i.e. backward and *backw*. According to its system of linkages, each sector exercises 'push' and 'pull' forces on the rest of the economy. Unlike agriculture, the industrial sector is characterized by both strong backward and forward linkages and thus emerges as the main driver of development.[16]

However, sectors are not just linked through a set of physical relations of supply and demand. The embodied and disembodied knowledge generated within the manufacturing sector connects within and across sectors through so-called *spillover effects*. This is why, according to Hirschman (1981:75), the development process is "essentially the record of how one thing leads to another" through an incremental unfolding of production and technological linkages stemming from manufacturing production.

Economists embracing the pro-manufacturing vision have also stressed the importance of manufacturing in relation to other macroeconomic issues. Moreover, manufactured products have a high income elasticity of demand (as per capita income increases, demand decreases for agricultural products and increases for manufacturing products - the so-called *Engel law* of 1857). This opens up dynamic opportunities for the development of manufacturing production. Finally, flourishing production of manufacturing tradeables was considered a fundamental condition for avoiding balance of payments crises. This is the case in particular for countries which cannot rely on a high-value primary commodity export sector and whose income elasticity of demand is higher for their imports than the foreign income elasticity of demand for their exports (Prebisch, 1949).

The pro-manufacturing vision came under attack during the 1980s and was gradually abandoned in the following decade when the *pro-services vision* became dominant.

2.1.3 The pro-services vision

During the 1980s, the development of a pro-services vision was triggered by the fact that the service sector appeared to be replacing manufacturing as the leader in the process of economic growth in both advanced and developing countries. Turning to the figures, we see that the most advanced economies have, on average, lost nearly half of their manufacturing sector as a percentage of GDP since the 1960s as a result of an accelerated process of deindustrialization (see Figure 1).

Moreover, in the developing world, a set of phenomena seemed to run contrary to the historical pattern of structural change which today's advanced countries had followed (Palma, 2005; Dasgupta and Singh, 2005). Firstly, in several developing economies, the fall in manufacturing employment (in both relative and absolute terms) provided evidence of a form of premature deindustrialization. Secondly, the related phenomenon of 'jobless growth' emerged, as even fast-growing economies such as India witnessed employment stagnation. Finally, services often grew at a faster long-term rate in the 1990s than manufacturing (this was particularly marked in countries like India), which suggested that services can actually substitute manufacturing as an engine of growth.

Theoretical explanations for the rising share of services associated with economic growth mainly concentrate on final expenditure patterns and prices (i.e. *demand side factors*). The basic intuition is that as people's income increases, they begin to demand relatively more services. The falling demand for manufactured goods thus naturally (so the argument goes) leads to the shrinking of the manufacturing sector (Bell, 1973; Bhagwati, 1984a, 1984b; Baumol et al., 1985).

[16] The classical debate on agriculture vs manufacturing development is discussed in Andreoni, 2011b.

Most fundamentally, the idea that productivity increases in service industries are limited came under sustained attack with the flourishing of modern services such as finance, engineering and distribution. The increasing application of ICT technologies has resulted in major productivity improvements in services and the marginal cost of providing services has collapsed, indicating the potential for scale effects. Those supporting the pro-services vision thus questioned the notion of 'Baumol's disease'. They also emphasized the possibilities tradable knowledge-based services such as engineering, consulting and banking open up.

Countries such as Australia, Canada, Luxembourg and the United States are used as successful examples of the huge potential contribution the service sector can have in both employment creation (high-skilled workers in finance, business services, education and health in particular) and in productivity growth.

In terms of developing countries, the idea that industrialization was no longer synonymous with development also took root and was exemplified by the Indian experience. It was suggested that developing countries are now undergoing a historically novel pattern of structural change that is determined by a new technological paradigm. Accordingly, services such as ICT, business support and finance are replacing or complementing manufacturing in a pro-growth way. Little emphasis is given to the fact that developing countries run the risk of premature deindustrialization. There is little concern that this might undermine their capacity to meet future changes in consumer demand or to accumulate/build production capacities and institutions. This was, of course, precisely what characterized the manufacturing-led pattern of growth (Cohen and Zysman, 1987; Rowthorn and Coutts, 2004).

Although the pro-services vision remained dominant until recently, an increasing number of studies have stressed the importance of moving beyond these two polarized visions. Furthermore, an increasing number of scholars have highlighted important fallacies in the pro-services vision and the empirical evidence it offers.

2.1.4 Beyond polarization: Sources of deindustrialization, statistical illusions and symbiotic interdependencies

The first issue we must address if we are to move the debate beyond the crude industry versus services dichotomy is the issue of deindustrialization. We must investigate whether deindustrialization (often defined as a decline in the share of manufacturing employment in a given country) is indeed caused by the growing irrelevance of manufacturing as advocates of the pro-services vision suggest.

Robert Rowthorn et al. have carried out crucial studies on the rapid process of deindustrialization[17] experienced by most industrialized countries (in particular, the EU and United Kingdom),[18] and by many medium/high income developing countries in the 1980s and 1990s. They see this process as the "natural consequence of the industrial dynamism in an already developed economy" while "the pattern of trade specialisation among the advanced economies explains the differences in the structure of employment among them" (Rowthorn and Ramaswamy, 1999:4).

In other words, the main explanation for deindustrialization is to be found in the *"systematic tendency of productivity in manufacturing to grow faster than in services"* (Rowthorn and Ramaswamy, 1999:1-7). A recent study by Tregenna (2009:433) confirms this thesis by empirically demonstrating that the decline

[17] See Rowthorn et al., 1987, 1999, 2004. Deindustrialization is registered as a decline in manufacturing employment first in relative terms and then, at least in some countries, also in absolute terms.

[18] Most industrialized countries reached this phase of deindustrialization around the end of the 1960s and the beginning of the 1970s, while some high income developing countries (such as the rapidly industrializing countries of East Asia) entered this phase in the 1980s. The empirical analysis in Palma (2005) confirms the inverted U-type trajectory of manufacturing employment with respect to income per capita.

in manufacturing employment is "associated primarily with falling labour intensity of manufacturing rather than an overall decline in the size or share of the manufacturing sector".

Secondly, just as the sources of deindustrialization seem to be attributed more to superior manufacturing productivity than to strong performance of services, the statistical illusion issue also undermines the pro-services case. The decreasing relative importance of manufacturing measured as a share of a given country's total employment seems to be the result of a 'statistical illusion'. It occurs simply because a number of activities from design and data processing to transport, cleaning and security have been contracted out by manufacturing firms to specialist service providers.

Even if we ignore the underestimation of manufacturing employment shares resulting from the 'splintering effect', the reality is that many OECD countries have indeed experienced a steady (rather than drastic) decline in the share of manufacturing in total employment. Thus, in contrast to what the pro-services advocates suggest, deindustrialization is not a sudden process with declines in manufacturing output, productivity and demand. Rather, job losses have involved different industries and affected countries in different ways (with no exception for high-tech manufacturing) (Pilat et al., 2006).

During the period characterized by deindustrialization (1970 - 2004), manufacturing production and value added continued, in fact, to experience strong growth, and demand for manufacturing goods remained constant. Most tellingly, productivity growth in manufacturing remained high in many OECD countries while deindustrialization was occurring, and there is evidence that the manufacturing sector continued to drive the process of innovation and technological change. Although the growing investment in innovative services and the outsourcing of R&D to specialized labs (counted as 'services') have reduced business investment in manufacturing R&D, the latter sector still accounts for the bulk of spending on technological innovation and development.

Given the statistical illusions discussed above (the result of a blurring of the traditional distinction between services and manufacturing), measuring intersectoral interactions is extremely complex (Pilat and Wölfl, 2005). The bundle of interactions that connects manufacturing and services is becoming increasingly dense given the outsourcing of services activities from manufacturing firms to service providers. The existence of strong intersectoral interactions and interdependencies was initially revealed by a set of input-output analyses performed by Se-Hark Park and Kenneth Chan (1989). The third point that moves the debate ahead, then, focuses our attention on the 'symbiotic' interdependencies between manufacturing and services. This leads to the consideration of a fundamental question which has very often been under-evaluated in the polarized debate between manufacturing and services (between 'making' or 'doing').[19]

The influential work of Se-Hark Park and Kenneth Chan addressed this issue by separately examining the linkages that exist between disaggregated groups of services and various manufacturing industries[20] Their analysis, which included 26 countries selected from the UNIDO database, confirmed Hirschman's intuition that the manufacturing sector has larger multiplier effects than the services sector. Specifically, it tends to generate a two- to threefold greater output impact on the economy because of the denser *backward and forward linkages* formed within and around the manufacturing sector.[21] Moreover, Park and Chan's data

[19] Francois and Reinert note (1996:2) "While emphasis in the services literature has been placed on final expenditure patterns and prices, some of the most striking aspects of service sector growth relate instead to the relationship of services to the production structure of economies, particularly the relationship of the service sector to manufacturing".

[20] Empirical studies have highlighted that, "as the industrial base broadens and becomes more integrated, both horizontally and vertically, the employment impact of industrial activities should also increase substantially" (Park and Chan, 1989:201). This scenario is consistent with the 'macro-economic' effects observed by A. Young (1928) and later discussed in Kaldor (see above).

[21] The input-output analysis conducted by Pilat and Wölfl (2005:36) reached the same conclusion that "Manufacturing industries interact much more strongly with other industries, both as providers and as users of intermediate inputs. Even though services now contribute as providers of intermediate input to the performance of other industries, their role remains more limited than that of the manufacturing sector."

revealed the 'catalytic role' industry could play in fostering employment opportunities in the services sector (the *indirect employment effect*). Their study explicitly stressed that "the evolution of the intersectoral relationship between services and manufacturing in the course of development is symbiotic, in the sense that the growth of the service sector depends not only on that of the manufacturing sector, but also structural change of the former is bound to affect that of the latter" (Park and Chan, 1989:212).

These results have recently been confirmed by Guerrieri and Meliciani (2005). Their analysis shows that a country's capacity to develop its services sector depends on the specific structure of its manufacturing sector. That is because manufacturing industries require different producer services and tend to use them with different degrees of intensity. Their analysis also highlights how the cumulative expansion of services can follow both inter- and intra-sectoral patterns, as the same service producers are also intensive users of these producer services.

The abovementioned studies certainly debunked some of the misperceptions underlying the pro-services vision. They also qualified and refined many of the intuitions supporting the original pro-manufacturing arguments upon which the CIP index's focus, i.e. industrial competitiveness, is grounded.

2.2 Driving industrial competitiveness: The technological capabilities perspective

Building on the tradition of classical economists, Nicholas Kaldor was among the first to understand that countries' industrial performance is primarily determined by differences in technological capabilities when he claims that "in a growing world economy the growth of exports is mainly to be explained by the income elasticity of foreign countries for a country's products; but it is a matter of the innovative ability and adaptive capacity of its manufactures whether this income elasticity will tend to be relatively large or small" (Kaldor, 1981:603). Similarly, for Sanjaya Lall, the main architect of the UNIDO IDR 2002/3 and of the first CIP index, "Competitiveness depends on many things. One vital determinant – ultimately perhaps the most important single determinant – is the *skills of the workforce at all levels."* (Lall, 2001a:128; see also Lall, 1992; Fagerberg, 1988, 1996; Best, 1990).

Since the early 1970s, a growing number of empirical studies, mainly carried out in large-scale Latin American and Asian industries, have shown that technology is a complex bundle of knowledge which can be embodied not only in machinery, but also in people, organizational arrangements, routines and procedures[22]. These 'vectors of technology' are strictly interconnected and a basic improvement in one of them may therefore result in or require a major transformation of other vectors. For this reason, the very simple introduction of new machinery through technological diffusion always requires a creative process of problem-solving and adaptation-reconfiguration of the production process which, in turn, may lead to technological innovation. Although these studies initially focused on the technical aspects of technological capabilities, the organizational dimensions of learning and capability building entered the scene, leading to the development of a comprehensive and often articulated strand of literature called *technological capabilities literature.*

According to the technological capabilities perspective, the industrial competitiveness of any economic system crucially depends on a two-step learning process: industrial skills development through formal education/training and capabilities building through in-firm productive experiences. At the firm level,

[22] See Katz, 1987 and Lall, 1987. Until the late 1960s, "technology was identified almost exclusively with machinery (capital goods). Technological change was therefore seen either as development of new kinds of machinery (technological "innovation") or as acquisition of installation of new machinery which had already been developed elsewhere (the "diffusion" of technology)" (Bell and Albu, 1999:1716).

becoming efficient involves a vital learning process. As stressed in evolutionary economics, this process is collective, cumulative, uncertain and technology specific in nature; also, learning and production dynamics in firms are affected by externalities, problems of coordination in time and scale, accumulation of factors in concrete forms and agglomeration biases (Nelson and Winter, 1982; Dosi, 1988; Andreoni, 2013).

On the contrary, more orthodox approaches not only assume perfect factor mobility but, more importantly, rely on the idea that using technologies (machines, equipment, blueprints) does not imply any 'real' learning effort and that countries actually have the same abilities to master technologies. Even when learning appears as an explanatory variable in the new trade theory, it is treated as a form of predetermined (and passive) economies of scale over time. Thus, ultimately, there is no space for learning and production capabilities in these approaches.

Martin Bell and Keith Pavitt provide a comprehensive theoretical framework for the analysis of *technological capabilities* (Bell and Pavitt, 1993, 1995). In their work, technological capabilities are defined as the resources needed to generate and manage technological change (including skills, knowledge and experience and organizational systems). Specifically, technological capabilities refer to a firm's ability to undertake in-house improvements across different technological functions such as process and production organization, products, equipment and investments. These technological capabilities "needed to generate and manage technical change" very often "differ substantially from those needed to operate existing technical systems". The latter, that is, the "resources used to produce industrial goods at a given level of efficiency and given input combinations" refer to what Bell and Pavitt call *production capabilities* (Bell and Pavitt, 1995:78).

In Sanjaya Lall's matrix of technological and organizational capabilities, as reported in Table 6, firm-level capabilities are categorized by technical functions (investment, production, technology and marketing) and are accumulated through the capacity of performing more and more complex activities (from simple routine to adaptive duplicative activities, up to innovative, risky activities).

Table 6: Technological and organizational capabilities within firms

Table 5.1 Technological and organizational capabilities within firms

Nature of capacity building strategy and effort	Investment: Pre-investment	Investment: Project execution	Production: Process engineering	Production: Product engineering	Production: Industrial engineering and HRD	Technology: Domestic	Technology: Foreign	Marketing: Domestic	Marketing: Foreign
Basic									
Simple, routine: based mainly on internal effort and experience	Pre-feasibility and feasibility studies, site selection, scheduling, arranging finance	Routine engineering of civil works, ancillary services, erection and commissioning	Debugging plant; routine process coordination; quality management; routine maintenance; process quality certification	Assimilation of basic product design; product quality management and certification; minor adaptations to meet market needs	Workflow scheduling; time/motion studies; innovative management and optimization; skill upgrading and training	Local procurement systems and procedures, drawing in available knowledge from institutions	Foreign sourcing; information from suppliers; industry networking; accessing public information	Market research; distribution and servicing systems; some advertising	Export market analysis; links with buyers and other export channels. Design/ packaging capability
Intermediate									
Adaptive, duplicative: based on search, experimentation and inter-firm and other cooperation	Search for sources of technology, equipment. Contract negotiation	Equipment procurement, detailed engineering, staff recruitment and training	Capacity stretching; adapt/improve technology; use new techniques (JIT, TQM, etc.); routinized process engineering; preventive maintenance	Product quality/ design improvement; licensing new technology; reverse engineering; continuous monitoring of global technologies	Continuous and systematic productivity analysis and benchmarking; skill audit and formalized training; supply chain/logistics management; advanced inventory control	Technology transfer to and from local suppliers/buyers; coordination in design and manufacture; links with technology and other institutions. Capacity to take collective action	Vertical technology transfer; systematic coordination of international knowledge sources; links with technology institutions overseas	Dedicated marketing department. Systematic monitoring, feedback analysis. Branding and differentiation	Systematic market building and analysis of foreign markets. Alliances and networks abroad. Brand introduction. OEM arrangements
Advanced									
Innovative, risky: based on purposive effort, R&D and advanced forms of collaboration	Own project outline and design capability. World class project management capabilities	Basic process engineering, equipment design and start up. Turnkey capability	Continuous process improvement; process innovation; basic research; use of new process design methods. Organizational capacity for generating, codifying, socializing knowledge	Mastery of product design methods; new product innovation; basic research. Strategic alliances. Organizational capacity for innovation and risk taking	World-class industrial engineering and supply chain capabilities, training systems, inventory management	Continuous links with R&D institutions and universities. Licensing own technology to others. Deep innovative links with other firms. Specialization in context of networks and clusters	Cooperative R&D; strategic alliances; advanced leveraging strategies for new technologies. Foreign acquisitions, direct investment	Advanced brand creation; coordination with retailers/ buyers; advanced distribution systems	Brand deepening. ODM and OBM arrangements. Own marketing and design channels and affiliates abroad

Source: Based on Lall (1992).
Note: *HRD* is human resources development. This is only an illustrative list of capabilities within a manufacturing firm. It does not include several types of capability, such as financial management, labour relations, logistics and so on.

Source: UNIDO, 2002:96-97.

The accumulation and development of technological and organizational capabilities is not only the outcome of a given firm's intended investment, but is also affected by a series of factors that are external to the firm. The development of capabilities at the firm level is affected by the presence of capabilities at the meso- and macro-levels. In fact, the discovery, acquisition, adaptation and re-configuration of technologies is based on a continuous collective learning process which takes place intra-firm but, more crucially, inter-firm and within industrial clusters. This is nothing more than the meso- and macro-institutional framework into which firms are embedded and into which different agents such as public and private research institutes, universities, vocational-technical schools, technology information and productivity centres, technology extension agencies and industrial services providers, just to mention a few, produce, exchange and use knowledge (O'Sullivan, 2011).

Box 1: Institutional support to technological efforts of firms

Box 7.1 Institutional support to technological efforts of firms

Basic industrial services

- Promote inward investment
- Provide export services
- Provide management services
  - Collect marketing information
  - Collect data on exports and imports
  - Provide managerial consulting
- Provide financial services (accounting, tax assistance, investment advice)

Technology information centres

- Provide information technology to firms, including networks, software, Internet capabilities, intranet, and databases
- Perform troubleshooting, assistance, and repair to firms
- Provide training in informational technology applications

Metrology, Standards, Testing, and Quality Control Centres

- Define domestic standards
- Assist firms in meeting International Organization for Standardization (ISO) compliance standards
  - Train firms in ISO standards and regulatory requirements
  - Test products to ensure compliance with standards
  - Provide technical assistance to firms
- Help firms with calibration of instruments
  - Maintain calibrated standards and calibration equipment
  - Calibrate firms' machinery

Productivity Centres

- Improve quality
- Improve productivity, efficiency
- Provide training

Technological Extension Agencies

- Extend available technology to businesses lacking technical capabilities
- Help firms use cleaner production technologies
- Provide information on available technology
- Identify problems and use access to technology sources to solve problems
- Serve as external consultants and assist firms with trouble-shooting
- Promote cooperation of small and medium-size enterprises with larger research and cluster initiatives (South Africa MAC program)

Research and Development Laboratories

- Design new processes and products.
- Train businesses through demonstration, participation and extension
- Implement new technologies
  - Import and learn foreign technology
  - Adapt foreign technologies to local needs
  - Integrate these technologies into economy in collaboration with firms

Source: UNIDO.

Source: UNIDO, 2002:118.

In order to capture the intrinsic collective nature of learning dynamics, Sanjaya Lall refers to the existence of *national technological capabilities* that arise from an interplay between capabilities, incentives and institutions. Embracing the OECD's three-pronged approach, Lall (1992:170) stresses how "[o]ver the longer term, economic growth arises from the interplay of *incentives and capabilities*. The capabilities define the best that can be achieved; while the incentives guide the use of the capabilities and, indeed stimulate their expansion, renewal or disappearance. Both incentives and capabilities operate within an *institutional framework*: institutions set rules of the game, as well as directly intervening in the play; they act to alter capabilities and change incentives; and they can modify behaviour by changing attitudes and expectations."

Thus, production and technological capabilities building at the firm level is affected by the broader 'national learning system', in particular by three interlocking sets of factors constituting what Lall calls the *"triangle of competitiveness"* (Lall, 2001a:20).

- *incentives* (macroeconomic environment, trade policy, domestic industrial policies and domestic demand);
- *factor markets* (technical skills, finance and access to information);
- *institutions* (supporting education and training, standards, metrology, technical extension, R&D, long-term credit, etc.).

From the perspective of technological capabilities building, industrial clusters acquire a greater importance as 'knowledge systems' more so than 'production systems'. In other words, they are more crucial in a dynamic rather than static sense. Industrial clusters have generally been described and classified (horizontal vs vertical) on the basis of 'the materials they use and the goods they produce, [but] it is knowledge stocks within firms and knowledge flows to them, between them and within them which underlie change in the types of goods they produce and the methods they use to produce them' (Bell and Albu, 1999:1722). At the firm level, technological dynamism can only be achieved if the cluster is a knowledge system. For this reason, the internal characteristics of the cluster as a network for knowledge exchange and accumulation are crucial, although strongly context and technology dependent. At the cluster level, the acquisition of new knowledge is affected by the degree of openness of the cluster: the more the cluster is closed, the more it is destined to lock-in, for cognitive inbreeding or entropic death.

However, openness to 'global knowledge' can be realized on the basis of different institutional and organizational arrangements such as, for example, through different kinds of 'gatekeepers', namely public institutes, the private association of firms or private-public partnerships that arise from the local cluster (Mazzoleni and Nelson, 2007; O'Sullivan 2011). Thus, the relationship between local industrial clusters and global value chains can be structured into different institutional frameworks and regulated on the basis of different corporate governance models. Being linked to global value chains represents a learning opportunity that enterprises in developing countries can exploit to upgrade their capabilities (Pietrobelli and Rabellotti, 2011).

2.3 Industrial competitiveness: From learning in manufacturing to structural economic dynamics

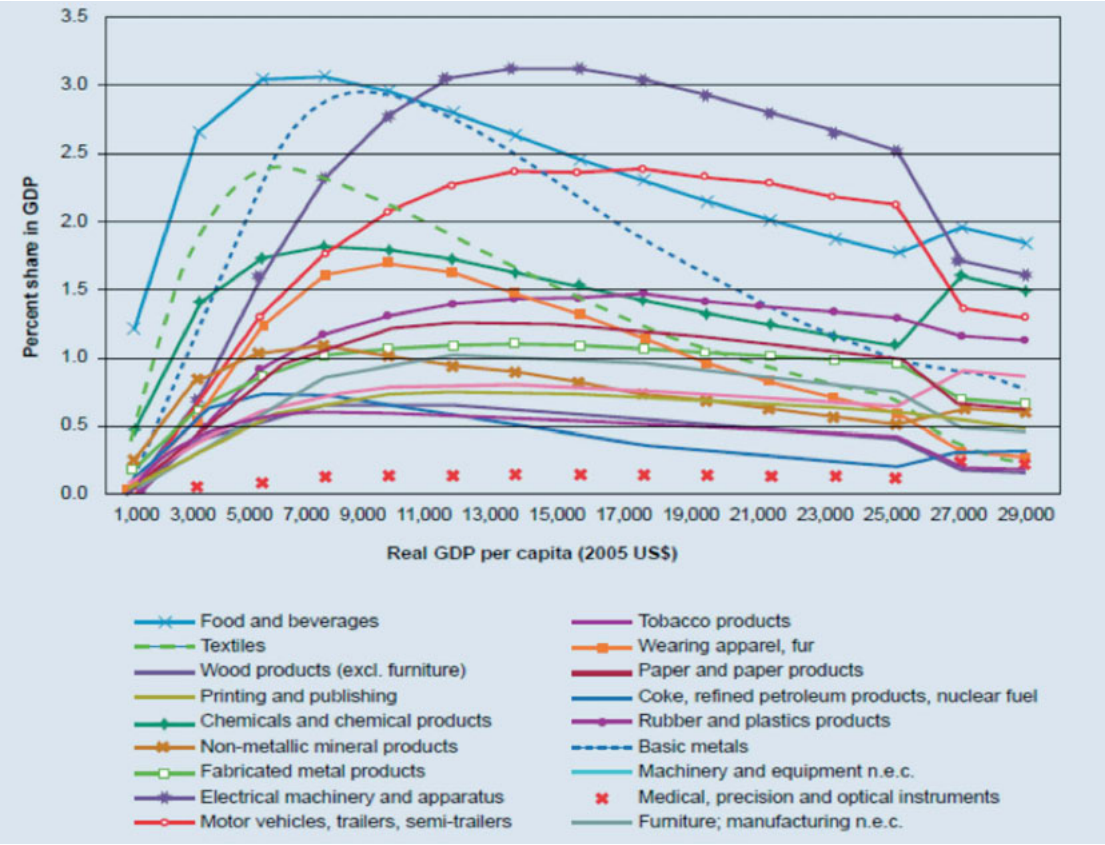
Learning dynamics and thus technological capabilities development are ultimately reflected in countries' structural change and their path of economic growth. In fact, economic growth and, broadly speaking, economic development always implies a process of structural change, the latter being best understood as the process of sectoral re-composition of an economic system. Structural change is a long-term process through which countries experience a transformation and diversification of their production and technological structures and, as a result, of their final and intermediate demand composition (Pasinetti, 1981, 1993; Chenery et al., 1986; Landesmann and Scazzieri, 1990; Andreoni and Scazzieri, 2013). Changes in the relative importance of sectors' production and shares of capital invested and labour employed, namely structural change, entail both:

- a process of *sectoral transition*, whereby countries move across sectors, from low productivity activities with low value – such as agriculture or garment production – to medium and high productivity sectors – such as manufacturing or motor vehicle production (see Figure 2 above);

- and a process of *sectoral deepening*, through which countries move within sectors (in particular within manufacturing), from low to high value added sub-sectors, the latter being characterized by higher profits and wages as well as a broader scope for technological development and innovation.

An analysis at the sub-sectoral level confirms the existence of qualitative transformations within the manufacturing sector as countries' GDP per capita increases. Now, as Lall notes, "there are many roads to heaven" (Lall, 2004:7) and the speed at which countries undergo qualitative transformations varies over time, depending on the pace of their respective technological change. However, while different manufacturing development trajectories are possible, some are more likely to occur at certain stages of development than others. Figure 3 illustrates how the shares of different manufacturing sub-sectors in GDP tend to change across large countries as they move from one stage of development to another, the latter measured by the real GDP per capita. Thus, for example, at early stages of economic development with a GDP per capita below US$ 3.000, a country's manufacturing sector mainly consists of four fast growing industries: food and beverages, textiles, chemicals and chemical products, and basic metals. Between US$ 3.000 and 7.000 per capita, countries tend to experience a rapid diversification of their manufacturing sector involving a broad set of both labour intensive and resource-based activities, while the capital and skill intensive activities tend to increase once the US$ 8.000 threshold has been reached.

Figure 3: Change in share of manufacturing sub-sectors in GDP at selected per capita income levels for large countries



Source: Haraguchi and Rezonja, 2010.

Since Rosenstein-Rodan's path-breaking research in development studies, economists have adopted a structuralist approach and have assigned particular emphasis to the transformative power of industrialization, both in terms of the economic system but also of institutions and society (Rosenstein-Rodan, 1943). Specifically, they have concentrated on the analysis of long-term structural change and on the identification of those structural bottlenecks impeding or slowing down industrialization.

Latin American structuralism, encapsulated in the work of Raul Prebisch and Celso Furtado, focused on the specific challenges developing countries face given an international 'centre – periphery' geography of power (Prebisch, 1949; Furtado, 1964). Problems connected to lack of foreign exchange, dualism in international trade, technology transfer and state intervention were all emphasized. This research was in line with the work of Albert Hirschman and, later, of two Cambridge economists, Nicholas Kaldor and Joan Robinson. In particular, as discussed above, Kaldor's empirical investigations aimed at identifying those *stylized facts* of manufacturing development through which general principles of structural change were deduced.

The development of a comprehensive approach to the analysis of structural change dynamics only really took shape with the second generation of post-Keynesian economists, in particular Richard Goodwin and Luigi Pasinetti, as well as the empirical work of Simon Kuznets and Hollis Chenery. At the most fundamental level, a structural economic dynamics approach starts from the recognition that economic growth is a *sector-specific* process (and not sector-neutral or activity-neutral as is the case in the more traditional neoclassical models such as Solow's) (Kerr and Scazzieri, 2012; Syrquin, 2010). Thus, at any given point in time, the economic system has to be represented by a multi-sectoral model characterized by a particular *compositional structure*. This structure is inherently subject to change in a *'truly dynamic sense'*. This means that the structure of the economic system "*evolves* through time, with productivity and demand growing at different rates from sector to sector and independently of one another"*(*Pasinetti, 2012:555-557).

As a result of these compositional changes, the productivity potential of any given economic system within the structural economic dynamics approach will be different and subject to continuous change over time. However, at each given point in time, certain parts of the structure have to remain fixed in order for others to be able to change. In other words, structural economic dynamics follow a specific hierarchy of change determined by both the elements of the system and their interdependences.[23]

Technological capabilities development is the fundamental trigger behind the structural economic dynamics of a multi-sectoral economic system. Countries' structural transformations, their sectoral re-composition and technological upgrading are complex multi-layered processes on which their industrial competitiveness depends. What occurs when a technological impulse triggers structural change dynamics within and across sectors can be illustrated within a multi-sectoral representation of the economic system. As Richard Goodwin stressed, an "important innovation in energy, or transport, or automated control, will gradually lead to alteration of least-cost processes in many other sectors and thus will initiate technological change over a long period. This will persist over time, not only because any such improvement undergoes prolonged small improvements, but also because it usually needs extensive adaptation to a variety of uses" (Goodwin, 1987:147)[24]. This explains why there is a very strong correlation between productivity increase in manufacturing and in other sectors. Among the bundle of intersectoral relationships, those linkages through which innovative technologies are developed, transferred, adjusted and adopted across sectors take centre stage. This is because these interdependencies (which are technological in nature) are the main drivers of

[23] In this respect, the principle of relative invariance postulates that "any given economic system subject to an impulse or force is allowed to change its original state by following an adjustment path that belongs to a limited set of feasible transformations. [...] The impulse from which the original state of the economy is modified may be purely exogenous but the actual process of transformation can be explained in terms of the dynamic characteristics of the existing structure" (Landesmann and Scazzieri, 1990:96; see also Andreoni and Scazzieri, 2013).

[24] See also Rosenberg, 1983, 1994. Andreoni, 2011b, 2013 analyse processes of intersectoral learning.

the processes of qualitative transformation and quantitative expansion of a country's productive structure.

The CIP index builds on these theoretical foundations and contributes to the empirical analysis of the current global industrial landscape. Not only does the CIP index indirectly reflect technological capabilities dynamics within certain national boundaries, it also directly tracks countries' relative changes in their structural economic variables and their effects on countries' overall industrial competitiveness.

3. The UNIDO Competitive Industrial Performance Index: A Retrospective

UNIDO has a longstanding tradition in benchmarking cross-country competitive industrial performances and in assessing structural drivers of competitiveness. In fact, when it was first published in the IDR 2002/3, the CIP index was part of a broader package of industrial diagnostics – i.e. the *Industrial Development Scoreboard* – in which the competitive industrial performance assessment was complemented by industrial capabilities indicators. Thus, the adoption of a multi-layered approach allowed for the matching of industrial competitiveness performance with industrial drivers. Industrial capability indicators result from the identification and measurement of five drivers of industrial performance, namely: skills, technological effort, inward FDI, royalty and technical payments abroad and modern infrastructure. By contrast, the last two IDRs 2009 and 2011 do not include any indicator for structural drivers of competitiveness. The IDR 2011 presents a second revised version of the CIP index and complements the analysis with process/outcome indicators of energy intensity and sustainable industrialization. Criteria of sustainability in the assessment process tend to introduce a "bridge between the static and dynamic approaches, as well as between output evaluation and process evaluation" (Aiginger, 2006:167).

In its first formulation in the IDR 2002/3, the CIP index was represented as a composite index obtained as an aggregation of equally weighted sub-indicators (scale adjusted and normalized). Notably, IDRs have always complemented the benchmarking exercise based on the CIP index with disaggregated analyses of the different patterns followed by its sub-indicators. Thus, despite being a composite index, the CIP index has maintained a strong modular character. The indicators that constitute the CIP index in its various formulations are detailed in section 3.1 (for the four sub-indicators index, CIP.4), section 3.2 (for the six sub-indicators index, CIP.6) and section 3.3 (for the eight sub-indicators index, CIP.8). Methodological issues arising from the weighting and aggregation techniques adopted, problems connected to the existence of tradeoffs due to the aggregation of the primary dimensions and issues of uncertainty in the rankings are discussed in the statistical appendix.

3.1 The 'four-indicators' CIP index (CIP.4): The capacity to produce and export manufactures dimension

Building on previous analyses of manufactured export patterns, the IDR 2002/3 *'Competing Through Innovation and Learning'* provides the first country ranking by competitive industrial performance (Lall, 2000, 2011a). The latter is constructed by aggregating four indicators of competitive industrial performance. This is why the first version of the CIP index is labeled here as CIP.4 index. The first two basic indicators of the CIP.4 index capture a country's 'capacity to produce and export manufactures'. The four indicators follow.

Indicator 1: Manufacturing Value Added per capita (MVApc)

MVApc captures the level of a country's industrialization and is expressed in per capita to adjust for country size. The MVApc is the relative value of the total net manufacturing output to population size. Unlike gross output, MVA is free of double counting as the cost of intermediate consumption is excluded; also, it is measured at basic prices to avoid tax distortions. Provided that data is available, instead of assuming the total population as the producer of total net manufacturing output, it would be more accurate to consider MVA in relation to the total number of employees or, better yet, the total number of hours worked (UNIDO, 2010a:217). If industry were fully exposed to international competition, then MVApc alone would capture not only the 'production efficiency' element, but also the 'competitive' one. As domestic industries are not fully (and equally) exposed to international competition, export performance must be factored in.

Indicator 2: Manufactured Exports per capita (MXpc)

MXpc captures the ability of a country to produce goods competitively and to implicitly keep up with technological changes. Like MVApc, MXpc is expressed in per capita to adjust for country size. Data on manufactured exports indicate *prima facie* international efficiency and reveal structural trends (Lall, 2001a). However, data on the MXpc of large economies are biased by the existence of large internal demand and incentives towards domestic markets. Also, data on re-exports are not available at regular intervals for all countries.

The first two basic indicators present two main problems. Firstly, it is impossible to distinguish between industrial (or export) structures based on genuine technological capabilities and those based on low-tech assembly in high-tech industry (UNIDO, 2002). For example, a high-technology export from one country can either come from locally assembled imported components (with few local inputs) or from complex production processes implying high levels of production and technological capabilities. In other words, an exporter that simply assembles imported high-technology products appears as sophisticated as one that designs and produces them using local components, if both report the same export value. Secondly, the indicators MVApc and MXpc reveal very little about the kinds (and levels/quality) of technologies being deployed or about the nature of local production and technological capabilities – i.e. *technological deepening* (Lall, 2001a).

While there is no immediate solution to the first problem, the second problem raised above was dealt with by disaggregating the MVA and MX (Manufactured Exports) data and examining their technological composition (Lall, 2000). The IDR 2002/3 followed this strategy and adopted the following two technological classifications for a decomposition analysis of the industrial (based on ISIC codes revision 2) and export structures (based on SITC code revision 2).[25]

Table 7: SITC rev. 2

Type of exports	SITC sections, divisions or groups
Resource based	01 (excl. 011), 023, 024, 035, 037, 046, 047, 048, 056, 058, 06, 073, 098, 1 (excl.121), 233, 247, 248, 25, 264, 265, 269, 323, 334, 335, 4, 51, 512 (excl. 512 and 513), 52 (excl. 524), 53 (excl. 533), 551, 592, 62, 63, 641, 66 (excl. 665 and 666), 68
Low tech	61, 642, 65 (excl. 653), 665, 666, 67 (excl. 671, 672 and 678), 69, 82, 83, 84, 85, 89 (excl. 892 and 896)
Medium tech	266, 267, 512, 513, 533, 55 (excl. 551), 56, 57, 58, 59 (excl. 592), 653, 671, 672, 678, 711, 713, 714, 72, 73, 74, 762, 763, 772, 773, 775, 78, 79 (excl. 792), 81, 872, 873, 88 (excl. 881), 95
High tech	524, 54, 712, 716, 718, 75, 761, 764, 77 (excl. 772, 773 and 775), 792, 871, 874, 881

Source: UNIDO, 2002.

Table 8: ISIC rev. 2

Type of manufacturing	ISIC divisions, major groups or groups
Resource based	31, 331, 341, 353, 354, 355, 362, 369
Low tech	32, 332, 361, 381, 390
Medium and high tech	342, 351, 352, 356, 37, 38 (excl. 381)
High tech	3522, 3852, 3832, 3845, 3849, 385

Source: UNIDO, 2002.

[25] Because reporting of data at the group (four-digit) level of ISIC is inadequate to allow the separation of medium- and high-tech products, the category 'high-tech manufacturing' was not used: instead, medium- and high-tech products were combined in one category. The sectoral shares of value added were then calculated in relation to the total for all manufacturing sectors (UNIDO, 2002).

Box 2: Lall's technological classification of manufactured exports

Classification	Examples
Primary products:	Fresh fruit, meal, rice, cocoa, tea, coffee, wood, coal, crude petroleum, gas
Manufactured products	
Resource-based manufactures	
Agro/forest-based products	Prepared meats/fruits, beverages, wood products, vegetable oils
Other resource-based products	Ore concentrates, petroleum/rubber products, cement, cut gems, glass
Low-technology manufactures	
Textile/fashion cluster	Textile fabrics, clothing, headgear, footwear, leather manufactures, travel goods
Other low technology	Pottery, simple metal parts/structures, furniture, jewellery, toys, plastic products
Medium technology manufactures	
Automotive products	Passenger vehicles and parts, commercial vehicles, motorcycles and parts
Medium technology process industries	Synthetic fibres, chemicals and paints, fertilizers, plastics, iron, pipes/tubes
Medium technology engineering industries	Engines, motors, industrial machinery, pumps, switchgear, ships, watches
High-technology manufactures	
Electronics and electrical products	Office/data processing/telecommunications equip, TVs, transistors, turbines, power-generating equipment
Other high technology	Pharmaceuticals, aerospace, optical/measuring instruments, cameras
Other transactions:	Electricity, cinema film, printed matter, "special" transactions, gold, art, coins, pets

Source: Lall, 2000:341.

Given these four categories – i.e. *resource-based, low-tech, medium-tech and high-tech*, the following two indicators were developed with the explicit aim of capturing a country's degree of technological deepening and upgrading:

Indicator 3: Medium- and High-tech MVA share in total manufacturing (MHVAsh)

MHVAsh captures the technological complexity of manufacturing. The higher the share of MHVA in MVA, the more technologically complex the industrial structure of a given country and its overall industrial competitiveness. Empirical analyses have shown that development generally entails a structural transition from resource-based and low-tech activities to medium- and high-tech activities. The more complex the production structures of a given country become, the higher the opportunities for learning and technological innovation at the sectoral and intersectoral levels (Chenery, Robinson and Syrquin, 1986. See also Mowery and Rosenberg, 1989).

Indicator 4: Medium- and High-tech manufactured Exports share in total manufactured exports

MHXsh captures the technological content and complexity of exports. The share of medium- and high-tech products in manufactured exports is considered jointly with the previous indicator, because MHXsh might differ substantially from MHVAsh in certain circumstances. For example, large import-substituting developing countries are characterized by a relatively more complex structure of MVA than of manufactured exports.

Clearly, the adoption of one specific technological classification instead of others is discretional and significantly affects the construction of the index and, in turn, the obtainable results. For example, Keith Pavitt famously proposed another classification that distinguishes between resource-based, labour intensive, scale intensive, differentiated and science-based manufactures (Pavitt, 1984; Lall, 2000, 2011). Moreover, only very detailed product categories allow capturing specific quality differences within given categories (*resource-based, low-tech, medium-tech and high-tech*) as well as information about the process involved in manufacturing a product in different locations. As a matter of fact, production processes of the same commodity are contextually different. This is the reason why many more recent contributions have performed competitive industrial performance analyses starting from trade-based data on countries' export baskets (Lall et al., 2006; Hausmann et al., 2007). Finally, the exclusion of resource-based manufactures and low-technology manufactures means that countries following a resource-based industrialization strategy, for example, will receive a lower overall ranking.

Given the modular character of the CIP index, the effect of each individual indicator on the final ranking can be analysed separately. Correlation analyses can also be performed. The UNIDO IDR 2002/3 revealed that the correlation between MVA per capita and the technological structure of MVA is the strongest. This is not surprising: increasing levels of industrialization require (and trigger) increasing accumulation of more/higher/different kinds of production capabilities. The same circular and cumulative process applies to manufactured exports: the higher the level of exports per capita, the more sophisticated the MVA structure, and the higher the level of industrialization, the larger the per capita exports.[26]

The CIP.4 index captures the process of *sectoral deepening*, that is, a country's movement from low to high value added industries within manufacturing. However, it overlooks the equally important process of *sectoral transition*, that is, the movement across sectors from low to medium and high productivity sectors (generally from agriculture to manufacturing). Thus, the first revision of the CIP index aimed at factoring in countries' structural transition from agriculture towards manufacturing industries. This is a crucial step, especially if we want to assess the industrial performance of dual economies at early stages of industrialization.

3.2 The 'six-indicators' CIP (CIP.6): First revision

The CIP.4 index underwent a process of revision in the IDR 2004 *'Industrialization, Environment and the Millennium Development Goals in sub-Saharan Africa'*.[27] The CIP.4 index was adjusted to include two additional indicators in the 'technological deepening and upgrading' dimension: the share of MVA in GDP and the share of manufactured exports in total exports. Moreover, the database for calculating the CIP.6 index was significantly improved. The revised CIP index (CIP.6) is structured as follows: two main

[26] Moreover, looking at the correlation coefficients of country level per capita manufactured exports with RCA (revealed comparative advantage) by technological categories across the world, the hypothesis according to which most successful exporters specialize in medium-high-tech activities is confirmed (Lall, 2000).

[27] In UNIDO (2007), the same CIP index was calculated for the years 1993, 1998, 2003. The IDR 2005 'Capability Building for Catching Up' presented the six sub-indicators of the CIP.6 in a disaggregated form.

dimensions, two basic indicators (those of the CIP.4) and two composite indicators simply calculated as the arithmetic average of their respective sub-indicators.

First dimension: Capacity to produce and export manufactures dimension

Indicator 1: Manufacturing Value Added per capita (MVApc)
Indicator 2: Manufactured Exports per capita (MXpc)

Second dimension: Technological deepening and upgrading dimension

Composite indicator: Industrialization intensity (INDint)

This composite indicator is obtained as the arithmetic average of the following two sub-indicators:

Indicator 3: Medium- and High-tech Manufacturing Value Added share in total manufacturing
Indicator 4: Share of MVA in GDP (MVAsh) capturing manufacturing's weight in the economy.

The creation of this composite indicator responds to the need to capture the contribution of the manufacturing sector to total production as well as the technological complexity of manufacturing industries (see above). Clearly, an indicator of industrialization intensity as such captures (positively) the fact that country's specialization in medium-high-tech activities is conducive to cumulative learning dynamics. However, this composite indicator still does not capture the sometimes very significant technological differences within each technological category. This problem is clearly a recurring one: it arises from the difficulty of identifying the most appropriate 'unit of analysis/measurement' – i.e. sectors, industries, resource-based, L-M-H-tech activities – provided certain data availability and the specific objective of the assessment.

Composite indicator: Manufactured Exports Quality (MXQual)

This composite indicator is obtained as the arithmetic average of the following two sub-indicators:

Indicator 5: Medium- and High-tech manufactured Exports share in total manufactured exports (MHXsh)
Indicator 6: Manufactured Exports share in total exports (MXsh) capturing manufacturing's weight in export activity.

For those countries reporting combined sectors, the technological classification (medium-high-tech value added) was adjusted (ISIC rev.2 and rev.3 and SITC rev.2).[28]

The theoretical framework on which the CIP.6 index is based maintains the idea that at the very core, a country's competitive industrial performance is determined by domestic learning dynamics.[29] Even FDI and technological transfer are primarily considered a 'domestic affair'. For the latter to be beneficial (e.g. to drive technological upgrading), domestic firms are required to undertake strategic learning efforts. This is why the CIP.6 index was initially designed to capture the industrial outcome of mainly 'endogenous' dynamics/factors.

[28] See the UNIDO Technical Note 2007 for a step-by-step description of the data adjustment procedure adopted.

[29] The centrality assigned to technological deepening in manufacturing industries in comparison with the agricultural sector or services is justified by the fact that processes of technological deepening in agriculture (but also in services) tend to be 'manufacturing driven' (Andreoni, 2011b). In the case of services, significant technological change is mainly realized in the domain of production-related services.

However, to capture the evolving nature of industrial systems, indicators need to be continuously updated in order to reflect the 'current reality' of international industrial systems. In this respect, a number of empirical studies (Bhattacharya et al., 2001; Lall and Albaladejo, 2004; Lall and Weiss, 2005; Gallagher et al., 2008; Kaplinsky et al., 2006, 2010), have suggested that countries' industrial performance is progressively more affected by 'exogenous' factors, such as third-country competition, as a result of the increasing integration/transformation of international markets and industrial systems. These empirical studies show how the emergence of new global large economies (or regional powers) affects the chances of industrial upgrading of less developed countries and challenges the consolidated positions of industrialized economies.

Relationships between countries are redesigned along both competitive and complementary patterns. This means that the transformation of the international industrial scene affects countries as well as industries (and firms as their components) in different ways. As stressed by Lall and Albaladejo (2004:1442) with reference to the challenge China poses to East Asian manufactured exports: "The main issue is not so much as direct competition between China and its neighbors – this is clearly growing – but how the latter's specialization changes in response". Having factored in the exogenous factors – i.e. competitive threat – the problem is again to understand the internal industrial transformation of countries under threat. Of course, it is very difficult to disentangle the causational chains linking 'exogenous factors' and 'endogenous' dynamics of industrial transformation. In order to assess the impact of exogenous factors on countries' industrial performance and progress, the abovementioned studies depend on world market share analysis. Market shares are considered the most immediate and common measure for capturing export threat or competitive impact.

3.3 The 'eight-indicators' CIP (CIP.8): Second revision

The IDR 2011 *'Industrial Energy Efficiency for Sustainable Wealth Creation: Capturing Environmental, Economic and Social Dividends'* proposes a second revision of the CIP index that includes both endogenous and exogenous factors/dynamics. The three fundamental dimensions considered are:

First dimension (endogenous): Capacity to produce and export manufactures

Indicator 1: Manufacturing Value Added per capita (MVApc)
Indicator 2: Manufactured Exports per capita (MXpc).

Second dimension (endogenous): Technological deepening and upgrading

Composite indicator: Industrialization intensity, INDint = [MHVAsh + MVAsh]/2
Composite indicator: Manufactured Exports Quality, MXQual = [MHXsh + MXsh]/2.

Third dimension (exogenous): World impact

Indicator 7: Impact of a country on World Manufacturing Value Added (ImWMVA)

measured by a country's share in world MVA, which indicates a country's relative performance and impact in manufacturing.

Indicator 8: Impact of a country on world manufactures trade (ImWMT)

measured by a country's share in world manufactured exports. The latter shows a country's competitive position relative to others in international markets. That is, gains in world market share reflects more competitiveness; losses signal deterioration.

Although there is no clear-cut technique for analysing an 'export threat', the widely adopted measure of 'market share' seems to provide sound results as documented by various studies.

In sum, the revised version of the CIP index (CIP.8) encompasses three dimensions, captured by four indicators and two composite indicators (8 indicators in total). Although the number of indicators of the CIP.8 index has increased, the composite indicator maintains a modular character. Two positive implications arise. Firstly, according to the specific level/unit of analysis under consideration, the CIP.8 index can be used in a more or less aggregated form. Secondly, the aggregation of indicators does not yield results that are difficult to explain, as is typically the case with overly composite indicators. The standardization and aggregation methods are the same used for the CIP.6 index (arithmetic average with equal weights) while the technological classification is ISIC rev.3 and SITC rev.3 adjusted (see section 2.2). The fact that the CIP.8 index balances out size without penalizing large industrial countries with large domestic markets is noteworthy. Moreover, the consideration of the impact dimension introduces innovative heuristics in the analysis of competitive industrial interactions.[30]

3.4 The CIP index: Third revision and validation

Throughout 2012, the CIP.8 index was validated and its aggregation methodology reviewed (Andreoni, 2012). The statistical annex of the report presents the set of validation tests that were performed. Given the scope of the benchmarking exercise, data availability and country coverage, the three dimensions and the eight selected indicators remained the same in the CIP index. However, in order to overcome the well known aggregation problems affecting composite indices, the geometric mean was adopted (instead of more traditional linear aggregation techniques) while equal weights were retained.

Composite indicators are characterized by two fundamental aggregation problems. Firstly, when the importance of each component (i.e. its weight) is the result of an ex ante subjective evaluation, the same data set can provide completely different information. As Ravallion (2010:10) points out, it is "common practice [...] to identify a set of component variables, group these in some way and attach equal weight to these groups. However, little or no attention is given to the implied tradeoffs in the space of the primary dimensions being aggregated, and whether they are defensible."

It is crucial to bear in mind that equal weighting does not mean 'no weights'. Rather, it implicitly implies that the weights are equal, in other words, that all sub-indicators considered are 'worth' the same in the composite.[31] Aside from being a courageous assumption, the equal weighting of the various sub-indicators is additionally problematic, because if sub-indicators have a high degree of correlation, various forms of miscounting may penetrate the index. For example, if two collinear indicators were included, the unique dimension they capture would be double counted in the composite index. This is why rules of thumb should be introduced to define a threshold beyond which the positive correlation is a clear symptom of double counting. Finally, although justifiable for comparability given certain informational goals, keeping weights unchanged across time and space is problematic when the composite indicator is used as a tool for defining best practices or setting priorities.

The second type of aggregation problem composite indicators face relates to the choice of aggregating different components under the implicit assumption that they are substitutable. In other words, poor performance in one sub-indicator can be compensated for by high values in other sub-indicators.

[30] As effectively discussed in Lall and Albaladejo (2004:1444), the consideration of a "matrix of competitive interactions" allows the identification of possible competitive scenarios, like direct or partial export threat or, more interestingly, mutual withdrawal.

[31] A broad set of alternative weighting methods are provided in the statistical methods literature such as factor analysis or principal component analysis to participatory methods that incorporate the various stakeholders involved in the process of performance assessment and policy design (Munda, 2005). See also Munda and Nardo (2005) and OECD (2008).

By contrast, geometric aggregation is better suited if we want to maintain a certain degree of non-compensability between individual sub-indicators (OECD, 2008). Moreover, while linear aggregation rewards base indicators proportionally to the weights (so compensability is constant), geometric aggregation rewards countries with higher scores (so compensability is lower for the composite indicators with low values).

The policy implications of adopting different aggregation techniques are manifold (OECD, 2008). For example, a country with low scores on one indicator will need a much higher score on the others to improve its situation when geometric aggregation is used. Also, considering that "the marginal utility from an increase in low absolute score would be much higher than in a high absolute score under geometric aggregation" (OECD, 2008), a country would have greater incentive to politically address those dimensions with low scores if the composite index adopts a geometric rather than linear aggregation technique.

Given these considerations and the advantage the geometric mean offers in avoiding factor substitutability, the CIP index adopts a non-linear aggregation technique. The weighting schema remains one of simple equal weights, provided that disaggregated statistics included in each composite indicator are also shown and the transparency of the composite is maintained.

Another important aspect in benchmarking industrial competitiveness is identification of the most appropriate *country comparators*. International comparisons are particularly difficult when countries involved are at different stages of development. Not only are countries at different stages of development endowed with different degrees of production and technological capabilities, but their capabilities are often of different types. This is because the technologies employed in production and the industries in which countries specialize differ from one another. These problems of country comparability suggest the need to benchmark countries which are at the same stage of development, in other words, those which tend to have similar production/technological structures.

The selection of various country groups may result either from the adoption of cluster analysis techniques or simply by selecting groups of countries on the basis of development level indicators. The number of comparators is actually less important than the selection criteria adopted. As highlighted in the IDR 2005: there is no optimal number of comparators, and different countries may use them for different purposes. A large number of comparators from across the world may be used (assuming that the data is readily available) to assess performance for broad issues like MVA or export performance, technology structures or inward FDI. A smaller set may be used to assess other variables like skill formation, R&D or risk ratings (UNIDO, 2005).

Country groupings entail three main functions:

- setting up the modality of aggregation for monitoring the changes in overall patterns of growth and structure;
- allowing international comparison specifies the leading regions and country groups and those lagging behind;
- providing a foundation for statistical analyses using basic and advanced techniques such as computation of mean value at the aggregated level, margin of variation, outlier detection and distribution pattern.

The CIP index aims to compare the broadest possible sample of countries and to adopt different country grouping criteria.

In 2012, UNIDO developed a new country classification which groups countries according to their level of industrial development:

1. Industrialized countries

2. Emerging industrial economies

3. Other developing countries

4. Least developed countries.

The CIP report provides snapshots of countries' industrial competitiveness, distinguishing both regional groups and a set of relevant comparators. Specifically, countries have been grouped by their income per capita level as a general proxy of development, and by their level of industrial development according to the new UNIDO country classification.

4. The Competitive Industrial Performance Ranking





4.1 The industrial competitiveness of nations: The CIP index 2010 ranking

The CIP index was computed in 2010 for 135 countries. The benchmarking exercise allows us to identify the relative industrial competitiveness of nations and to rank them accordingly. The analysis of the world ranking was performed by quintiles of the world ranking. The top, upper middle, middle, lower middle and bottom quintiles of the rankings are identified by different colours (see Table 9). Descriptive statistics for each quintile were also computed to emphasize the existence of inequalities within and across quintiles (see Table 10).[32] The world ranking reveals an articulate albeit familiar pattern. Among the most industrially competitive nations in the world, we find all high income industrialized countries and the large industrializing economy of China ranked seventh. The upper middle of the ranking is mainly populated by transition economies and emerging industrial powers mostly from Asia, but also from Latin America. The lower middle range as well as the bottom of the ranking primarily include low income or relatively small countries, with the exception of Iran (Islamic Republic of), Pakistan, Bangladesh and Nigeria. Almost all African economies congregate in the bottom quintile of the ranking, with the only exceptions being South Africa, Egypt, Tunisia, Morocco and Mauritius.

Top quintile of the CIP ranking

In 2010, the most industrially competitive nations (top quintile) included a quite a heterogeneous mix of economies. As expected, the top five positions are occupied by Japan, Germany, the United States, the Republic of Korea and China, Taiwan Province. While the first three countries have been top contenders since 1990, the latter two economies ranked fourteenth and tenth, respectively, in 1990. This is partially reflected in the sectoral composition of these economies, the latter two having an MVAsh equal to almost 30 percent. On the other hand, differences in MVAsh are also explained by the varying structural trajectories followed by Germany and Japan (which maintains a high MVAsh of nearly 20 percent) in contrast to the United States.

Taken together, the top five countries account for almost half of the share of world manufacturing value added (ImWMVA is equal to 48.6 percent) and one-third of world manufactures trade (ImWMT is equal to 31.2 percent). The United States alone accounts for half of the top five's world manufacturing value added, while Germany accounts for one-third of the top five's world manufactures trade. The extremely high level of industrialization of these five economies is captured by a level of manufacturing value added which is almost double the average MVApc of the top quintile of the ranking (the mean is US$ 5.823 with a low standard deviation, see Table 10 for a comparison).

Although these economies are all highly industrialized, the MXpc indicator denotes a high level of dispersion (the standard deviation is around US$ 4.000 per capita). This reveals both the distinct export orientation of these economies and the different pulls of their own internal demand. The United States is by far the country with the biggest population and internal market (ranked third in the world with a population of more than 300 million) followed by Japan and Germany, while the Republic of Korea and China, Taiwan Province are relatively smaller economies. The average MXpc of these four latter economies is almost US$ 10.000 and around 70 percent of their exported products are medium- and high-tech (in the case of Japan it is nearly 80 percent). The same figure for the United States is slightly lower, equal to 64 percent in line with the average MHXpc of the top quintile in the ranking (see Table 9).

[32] The descriptive statistics detailed in the following country quintiles and group tables are the mean, median and standard deviation. The possibility of comparing the mean and median is particularly important when there is one or more countries that perform very differently from the others (outliers). In this situation, the mean will be biased while the median provides the typical value in the country distribution. Finally, the standard deviation describes how spread out country performance is. This information is particularly relevant if we want to understand to what extent countries' performance in the quintiles and groups differs.

The small 'city state' of Singapore is not included in the top five, although the country has the world's highest manufacturing value added per capita (MVApc) and manufactured exports per capita (MXpc). Japan and Switzerland are the only comparable countries in terms of MVApc, while Belgium is the only comparable one in terms of MXpc.

The highest ranking lower income country in the top quintile is China. Given its population size and its stage of development, China is the country with the lowest MVApc and MXpc in the top quintile, but second in terms of world manufacturing value added share (ImpWMVA) behind the United States and followed by Japan. As the ImWMT indicator reveals, China has followed an export-led development model which allowed the country to gain an 11 percent share in WMT (world manufactures trade). Within only 15 years. Manufacturing industries constitute the main sector in the Chinese economy, accounting for 35 percent of the economy's overall GDP. Despite its stage of development, China shows remarkable performances in both MHVAsh and MHXsh, just below the top quintile average (see Table 9). The other lower income countries in the top quintile are Malaysia, Mexico and Thailand. Given their stages of industrial development, these countries' MVApc and MXpc values are below average. Taken together, they account for 3 percent of world manufacturing value added and 5 percent of world manufactures trade.

The rest of the top quintile is populated by high income European industrialized countries (with few exceptions), a number of transition economies and Canada which alone accounts for 2 percent of world manufactures trade and 1.5 percent of world manufacturing value added. Overall, countries in the top quintile of the ranking account for 83 percent of world manufacturing value added and of world manufactures trade.

Table 9: Competitive Industrial Performance (CIP) index, 2010

CIP ranking 2010	CIP index 2010	Country	MVApc	MXpc	MHVAsh %	MVAsh %	MHXsh %	MXsh %	ImWMVA %	ImWMT %
1	0.5409	Japan	7993.99	5521.02	53.70	20.39	79.75	91.62	14.126	6.532
2	0.5176	Germany	4666.91	13397.43	56.76	18.57	72.34	86.81	5.317	10.219
3	0.4822	United States of America	5522.09	2736.13	51.52	14.85	64.74	76.76	24.036	7.974
4	0.4044	Republic of Korea	4782.7	9280.33	53.41	29.09	75.85	96.85	3.220	4.183
5	0.3649	China, Taiwan Province	6153.1	10825.16	61.88	29.87	72.40	96.01	1.968	2.318
6	0.3456	Singapore	8198.27	35709.08	73.41	24.47	68.99	89.76	0.521	1.519
7	0.3293	China	820.018	1123.62	40.70	34.16	60.52	96.25	15.329	14.063
8	0.3118	Switzerland	7168.38	23651.56	34.91	18.44	69.67	91.49	0.750	1.657
9	0.3114	Belgium	3793.78	34137.53	42.28	14.99	54.95	87.38	0.552	3.326
10	0.3095	France	2885.09	7237.36	45.41	12.16	65.77	88.42	2.494	4.189
11	0.2945	Italy	2847.72	6935.05	39.33	14.94	53.93	91.62	2.325	3.791
12	0.2896	Netherlands	3324.63	22081.02	40.07	12.48	55.01	73.97	0.759	3.374
13	0.2850	Sweden	6559.37	15375.64	46.96	20.04	57.69	89.70	0.838	1.316
14	0.2782	United Kingdom	3162.34	5247.64	41.99	11.44	63.22	79.54	2.691	2.989
15	0.2695	Ireland	6506.68	23959.50	64.07	23.11	53.84	91.65	0.407	1.004
16	0.2436	Austria	4869.48	14926.31	41.74	18.43	59.97	86.97	0.569	1.167
17	0.2345	Canada	3077.73	6667.54	37.35	11.88	55.72	62.14	1.437	2.084
18	0.2220	Finland	6795.27	12001.19	45.36	24.72	48.98	91.10	0.500	0.592
19	0.1979	Spain	1896.88	4571.87	34.28	12.01	57.40	83.74	1.183	1.910
20	0.1931	Czech Republic	2148.21	11816.28	44.62	28.15	67.94	90.99	0.302	1.113
21	0.1834	Malaysia	1426.92	5930.92	41.76	27.10	63.49	83.30	0.551	1.533
22	0.1776	Mexico	1007.93	2166.16	38.45	15.99	78.71	80.09	1.538	2.212

CIP ranking 2010	CIP index 2010	Country	MVApc	MXpc	MHVAsh %	MVAsh %	MHXsh %	MXsh %	ImWMVA %	ImWMT %
23	0.1712	Thailand	1053.66	2517.15	46.16	36.61	61.82	83.93	0.949	1.518
24	0.1705	Denmark	3887.02	12839.14	30.51	12.46	51.88	72.81	0.294	0.651
25	0.1696	Poland	1489.98	3639.62	35.35	22.51	58.14	87.83	0.781	1.277
26	0.1647	Israel	3235.62	7728.48	55.61	13.83	55.79	96.21	0.325	0.520
27	0.1562	Slovakia	2303.72	11125.34	43.32	27.43	66.26	93.80	0.172	0.556
28	0.1438	Australia	2660.73	4520.90	23.01	10.10	20.00	46.72	0.786	0.894
29	0.1402	Hungary	1210.31	8291.96	53.47	21.08	77.99	87.04	0.166	0.763
30	0.1283	Turkey	1012.73	1286.70	30.04	20.23	42.47	87.72	1.088	0.926
31	0.1196	Norway	3766.78	7396.27	24.09	9.17	52.21	27.09	0.249	0.328
32	0.1152	Slovenia	2716.24	11094.26	45.52	20.89	62.96	90.83	0.075	0.206
33	0.1128	Brazil	622.099	667.55	34.97	13.51	36.30	67.30	1.712	1.230
34	0.1043	Portugal	1503.64	4098.30	22.36	12.90	40.53	90.17	0.223	0.407
35	0.1012	Argentina	1749.37	877.58	25.84	16.41	45.05	52.43	0.986	0.331
36	0.0976	Russian Federation	503.997	1028.70	23.14	17.07	24.37	36.08	0.978	1.337
37	0.0940	Saudi Arabia	1157.32	2020.66	41.12	11.77	35.54	21.71	0.423	0.494
38	0.0823	Indonesia	302.264	395.68	37.81	26.40	29.05	60.09	1.002	0.878
39	0.0794	Kuwait	2224.27	6899.25	18.09	10.34	13.45	40.93	0.094	0.231
40	0.0774	Belarus	907.294	2361.97	18.76	32.95	39.01	89.22	0.120	0.208
41	0.0772	South Africa	567.274	991.15	21.24	14.93	45.66	68.32	0.387	0.452
42	0.0761	Luxembourg	3737.35	24557.20	4.97	6.59	38.04	85.76	0.025	0.110
43	0.0747	India	120.185	153.83	37.27	15.04	28.24	85.16	2.028	1.738
44	0.0726	Philippines	296.026	516.61	45.31	21.34	79.66	93.30	0.381	0.445
45	0.0721	Chile	972.374	1943.12	18.92	15.37	11.76	46.96	0.230	0.308
46	0.0675	Romania	341.552	2111.40	33.88	13.06	54.69	90.36	0.100	0.413
47	0.0674	Lithuania	964.003	5343.24	18.46	18.35	37.83	85.63	0.044	0.165
48	0.0673	New Zealand	1986.1	3213.92	13.86	12.83	21.34	46.36	0.118	0.128
49	0.0653	Greece	1289.68	1429.10	17.17	9.10	37.19	73.69	0.200	0.148
50	0.0603	Croatia	999.359	2356.28	31.77	16.19	49.46	90.42	0.063	0.099
51	0.0603	Venezuela (Bolivarian Republic of)	895.462	750.42	34.28	16.50	8.11	32.55	0.360	0.202
52	0.0583	Estonia	978.874	8360.44	25.66	15.47	42.28	86.22	0.018	0.102
53	0.0564	Ukraine	213.571	974.35	20.78	20.25	43.25	85.57	0.133	0.408
54	0.0540	Viet Nam	176.135	551.02	20.26	25.47	27.99	69.30	0.221	0.464
55	0.0523	Iran (Islamic Republic of)	361.2	378.50	40.70	16.44	23.91	33.55	0.371	0.260
56	0.0506	Costa Rica	1034.84	1420.96	16.58	20.07	58.94	73.29	0.067	0.061
57	0.0488	Qatar	1988.82	8817.29	17.44	2.78	28.15	15.88	0.024	0.086
58	0.0476	Tunisia	490.97	1272.14	9.32	17.36	45.02	82.59	0.072	0.126
59	0.0460	Bulgaria	398.788	1958.22	25.57	15.52	35.40	70.99	0.041	0.135
60	0.0460	Trinidad and Tobago	868.108	5480.32	39.38	8.39	17.70	73.95	0.016	0.068
61	0.0452	Malta	1257.27	8406.84	44.92	11.30	56.16	93.04	0.007	0.032
62	0.0450	Egypt	361.72	206.49	22.30	17.54	25.88	62.37	0.398	0.152
63	0.0437	Peru	448.575	623.75	14.49	14.01	5.21	51.19	0.179	0.167
64	0.0401	Colombia	405.257	268.72	20.71	12.95	35.97	32.60	0.268	0.119
65	0.0382	Iceland	4007.83	4001.09	14.18	11.41	45.58	26.82	0.017	0.011
66	0.0374	Morocco	239.737	425.92	21.61	12.93	38.26	77.64	0.107	0.128
67	0.0373	China, Hong Kong SAR	478.412	1093.80	32.58	1.41	53.74	54.84	0.049	0.075
68	0.0367	Latvia	480.598	3190.16	20.77	9.61	35.18	80.85	0.015	0.066
69	0.0361	Oman	941.115	1857.99	16.75	8.24	42.71	16.27	0.036	0.048
70	0.0347	Kazakhstan	346.39	767.39	6.84	13.48	39.96	21.13	0.076	0.112

CIP ranking 2010	CIP index 2010	Country	MVApc	MXpc	MHVAsh %	MVAsh %	MHXsh %	MXsh %	ImWMVA %	ImWMT %
71	0.0331	El Salvador	513.158	564.29	19.13	22.85	14.86	89.57	0.051	0.037
72	0.0328	Jordan	401.311	728.98	24.91	17.03	47.30	79.24	0.036	0.044
73	0.0326	Uruguay	1342.83	626.46	13.40	14.54	22.62	39.11	0.063	0.024
74	0.0315	Pakistan	116.878	99.77	24.57	17.52	9.95	82.40	0.280	0.160
75	0.0303	Lebanon	625.022	726.84	19.95	9.22	46.81	72.22	0.037	0.028
76	0.0262	Serbia	146.024	771.86	20.05	15.97	32.82	78.21	0.020	0.071
77	0.0256	Guatemala	223.879	408.98	16.25	12.03	20.33	69.50	0.045	0.054
78	0.0254	Bangladesh	86.7396	75.99	20.20	17.37	4.34	91.74	0.200	0.118
79	0.0240	Mauritius	803.997	1103.53	2.98	15.63	2.93	95.59	0.014	0.013
80	0.0235	Sri Lanka	190.646	297.35	12.11	13.81	9.48	70.10	0.052	0.054
81	0.0233	Syrian Arab Republic	206.128	232.41	21.52	14.37	22.69	43.87	0.061	0.046
82	0.0220	Algeria	142.336	414.71	11.28	6.39	0.46	25.75	0.070	0.136
83	0.0219	Bosnia and Herzegovina	210.547	885.83	29.17	10.14	23.00	72.69	0.011	0.032
84	0.0214	The f. Yugosl. Rep of Macedonia	388.821	835.51	14.60	17.69	18.08	63.35	0.011	0.019
85	0.0212	Swaziland	496.923	883.78	0.01	30.97	28.96	92.86	0.008	0.010
86	0.0206	Botswana	184.335	2252.13	21.59	4.28	4.84	93.70	0.005	0.041
87	0.0199	Ecuador	247.952	269.86	8.04	13.66	23.04	21.25	0.047	0.034
88	0.0186	Cyprus	918.488	640.88	12.32	6.58	60.43	75.21	0.011	0.005
89	0.0166	Côte d'Ivoire	99.0589	182.50	14.99	17.40	32.54	36.16	0.028	0.034
90	0.0160	Cambodia	100.73	239.29	0.26	19.82	7.94	65.17	0.021	0.034
91	0.0159	Honduras	279.673	143.70	7.16	19.89	27.79	40.40	0.029	0.012
92	0.0153	Bolivia (Plurinational State of)	167.064	276.34	5.05	13.69	3.28	39.80	0.023	0.026
93	0.0152	Jamaica	260.663	418.83	18.77	7.10	5.51	92.58	0.010	0.011
94	0.0144	Albania	214.538	359.49	14.36	11.34	15.42	75.26	0.010	0.011
95	0.0143	Nigeria	24.5856	113.87	33.44	4.51	7.47	20.82	0.054	0.167
96	0.0127	Georgia	136.05	229.35	21.39	10.44	49.18	76.73	0.008	0.009
97	0.0121	Cameroon	140.167	64.71	11.01	19.70	11.45	32.80	0.038	0.012
98	0.0113	Armenia	203.595	201.12	5.81	14.83	24.80	69.20	0.008	0.006
99	0.0111	Paraguay	193.78	146.10	12.87	11.96	13.18	20.82	0.017	0.009
100	0.0108	Congo	67.2177	601.98	2.42	5.32	83.42	34.91	0.004	0.022
101	0.0100	Senegal	56.2691	115.95	17.66	10.74	14.05	71.42	0.010	0.014
102	0.0100	Kenya	46.7688	62.12	4.08	10.01	24.93	48.85	0.026	0.023
103	0.0095	Gabon	201.059	712.75	5.39	4.44	10.09	18.23	0.004	0.011
104	0.0095	Barbados	296.422	725.68	38.11	3.48	39.18	91.11	0.001	0.002
105	0.0088	Fiji	252.964	374.42	5.54	11.56	9.92	56.90	0.003	0.003
106	0.0085	United Republic of Tanzania	45.6784	43.72	1.18	10.02	13.58	48.54	0.028	0.018
107	0.0083	Azerbaijan	70.7655	257.54	6.34	2.89	17.23	10.49	0.008	0.021
108	0.0081	Suriname	307.66	693.60	11.64	9.88	9.38	15.93	0.002	0.003
109	0.0079	Mongolia	60.3637	451.58	5.30	7.67	1.91	62.93	0.002	0.012
110	0.0078	Panama	347.045	66.05	6.13	5.71	15.00	32.66	0.017	0.002
111	0.0077	Zambia	44.2736	111.49	21.08	10.01	14.33	19.55	0.008	0.013
112	0.0075	China, Macao SAR	832.347	264.97	3.55	2.25	7.06	43.47	0.006	0.001
113	0.0065	Belize	475.506	285.02	18.46	11.90	0.06	30.89	0.002	0.001
114	0.0062	Republic of Moldova	53.3502	155.36	5.55	9.32	13.09	61.57	0.003	0.005
115	0.0058	Tajikistan	84.8618	15.50	2.40	30.42	66.30	13.82	0.008	0.002
116	0.0055	Madagascar	28.4274	31.86	3.28	12.16	4.26	72.03	0.008	0.006
117	0.0045	Kyrgyzstan	42.4413	60.19	4.36	11.49	19.95	25.50	0.003	0.003
118	0.0043	Ghana	26.3711	26.25	0.80	7.45	24.99	12.49	0.009	0.006

CIP ranking 2010	CIP index 2010	Country	MVApc	MXpc	MHVAsh %	MVAsh %	MHXsh %	MXsh %	ImWMVA %	ImWMT %
119	0.0043	Nepal	18.1747	21.54	1.89	6.76	20.73	77.22	0.008	0.006
120	0.0040	Uganda	25.2921	11.78	11.07	6.82	15.16	34.83	0.012	0.004
121	0.0038	Yemen	33.192	23.94	3.89	5.65	6.12	9.45	0.011	0.005
122	0.0034	Mozambique	47.6064	7.61	10.74	11.86	9.28	7.84	0.015	0.002
123	0.0034	Saint Lucia	227.549	253.34	7.83	4.59	30.00	61.64	0.001	0.000
124	0.0032	Cape Verde	147.13	48.69	27.10	8.83	0.02	59.26	0.001	0.000
125	0.0031	Malawi	17.2107	19.57	12.51	9.48	14.64	27.64	0.004	0.003
126	0.0030	Sudan	37.3428	6.63	8.47	6.62	4.76	2.96	0.021	0.003
127	0.0030	Haiti	36.2575	6.19	5.26	9.87	3.80	82.97	0.005	0.001
128	0.0027	Niger	9.2339	20.65	24.77	5.26	12.86	67.44	0.002	0.003
129	0.0022	Rwanda	21.7544	8.78	6.66	6.42	7.64	46.38	0.003	0.001
130	0.0019	Ethiopia	9.2491	2.51	9.41	4.61	31.91	9.84	0.011	0.002
131	0.0011	Central African Republic	15.2243	6.08	9.25	6.63	8.29	31.07	0.001	0.000
132	0.0006	Burundi	7.4443	1.95	1.54	7.36	23.95	15.73	0.001	0.000
133	0.0000	Eritrea	7.2731	0.47	7.05	5.59	14.67	34.57	0.001	0.000
133	0.0000	Gambia	15.5917	7.47	3.90	4.64	11.13	39.40	0.000	0.000
133	0.0000	Iraq	5.1947	3.71	24.68	0.68	25.12	0.27	0.002	0.001

Upper middle quintile of the CIP ranking

With the exception of China, the United States and Japan, which are all positioned in the top quintile, the upper middle quintile includes some of the most populated countries in the world. These, listed by population size, are India, Indonesia, Brazil, Russian Federation, Philippines, Viet Nam, Turkey and South Africa. The other countries in the upper middle quintile are mainly transition economies (some of them members of the European Union). Finally, Australia and some top oil net exporters also congregate in this quintile.

Within this very heterogeneous group of countries, India has the highest share in WMVA (world manufacturing value added), although it has the lowest MVApc and MXpc as a result of its population size. In this respect, the only comparable country is China whose MVApc and MXpc are, however, seven times higher than India's. If we take these data together with other figures (for example, the MVAsh equal to 15 percent), they confirm the fact that India's sectoral composition is highly service dependent. However, its manufacturing structure is relatively more complex than the respective quintile's country comparators (see Table 10). India registers an MHVAsh equal to 37 percent, a figure which is lower than that of the Philippines but slightly higher than Brazil's and very similar to Indonesia's. In terms of the technological composition of the export basket, the figures diverge. India's export basket only consists of 28 percent medium- and high-tech products (similar to Indonesia), while Brazil, South Africa and Philippines perform much better in that respect.

The four BRICS economies in the upper middle quintile are ranked in the following order: Brazil, Russian Federation, South Africa and India. Taken together, they account for almost half of the WMVA share of the entire upper middle quintile (around 5 percent) and one-third of the WMT share of the entire upper middle quintile (around 5 percent). Despite the tremendous difference in population size (even excluding India, Brazil's population is roughly one-fourth higher than that of the Russian Federation, and four times that of South Africa), the first three countries have comparable MVApc figures. The Russian Federation has the highest MXpc, but the lowest MHXpc and MXsh. This reveals that more than half of the Russian Federation's export basket is composed of natural resources, while its remaining manufactured products are relatively low-tech. The Russian Federation is the second largest oil net exporter and oil producer in

the world. The same 'natural resources' effect is registered for other oil net exporters, namely Saudi Arabia, Norway, Venezuela (Bolivarian Republic of) and Kuwait. Also, Brazil and South Africa underperform relatively to the MXsh median value in the upper middle quintile (see Table 9). Among the emerging industrial economies, Viet Nam most notably ranked 54 in 2010 and entered the upper middle quintile (the country ranked 72 in 2000).

The transition economies in the upper middle quintile are also quite diverse, from small traditional manufacturing economies which are members of the European Union (such as Hungary, Slovenia, Romania, Lithuania and Estonia) to relatively bigger countries such as Belarus and Ukraine. Some of them, like Hungary and Slovenia, are outliers in the upper middle quintile due to their export orientation and the technological complexity of their exports, while the other countries tend to perform below the quintile average. Overall, countries in the upper middle quintile of the ranking account for 12 percent of world manufacturing value added and 13 percent of world manufactures trade.

Middle quintile of the CIP ranking

Countries in the middle quintile of the CIP ranking are again quite heterogeneous. With the exception of four major highly populated countries, namely Iran (Islamic Republic of), Egypt, Pakistan and Bangladesh, the other countries are mainly small economies from South and Central Asia, Latin America and Africa. Taken together, the four biggest countries account for a population of almost 500 million people and whose MVApc is, on average, around US$ 250 per capita, far below the quintile average which is nearly US$ 700 per capita. Overall, the average MVApc and MXpc of the countries in the middle quintile are half of those registered in the upper middle group (see Table 10).

Taken together, countries in the middle quintile account for 2.6 percent of world manufacturing value added and 2.3 percent of world manufactures trade. Although few countries such as Costa Rica, Qatar, Malta and Iceland show levels of MVApc and MXpc which are comparable to those of countries in the upper middle group, their global impact is very limited given their size. Overall, there is a wide dispersion within this quintile, in particular in terms of the export structures of the countries (see Table 9). For example, the MHXsh indicator is double the quintile average in economies such as Costa Rica, China, Hong Kong SAR and Malta (where it is around 55 percent) and may be as low as 3 percent as in the case of Mauritius, the only sub-Saharan country in the middle quintile.

Lower middle and bottom of the CIP ranking

The lower two quintiles of the CIP ranking include the least industrialized countries in the world. Taken together, they account for 0.6 percent of world manufacturing value added and 0.7 percent of world manufactures trade. The great majority of these countries are on the African continent. The biggest country in the lower middle quintile in terms of population size is Nigeria with a population of roughly 160 million. Nigeria and Algeria are among the main exporters of oil and natural gas in the world. Their manufactured exports structure is denoted by the MXsh indicator which is below (almost half of) the lower middle quintile average (see Table 9).

Overall, the level of industrialization of the lower middle quintile is less than one-third of that registered in the middle quintile, as indicated by the MVApc and MXpc average indicators. This figure becomes even more dramatic if we consider the bottom quintile where both MVApc and MXpc do not reach US$ 100 on average. If we take the median instead of the mean into account, the average values for MVApc and MXpc reduce by one-third. Not surprisingly, the level of technological complexity captured by MHVAsh and MHXsh are, on average, around 10 percent and 17 percent, respectively, half of the value registered for countries in the middle quintile. Table 10 highlights the profound inequalities that exist

across different quintiles of the ranking, while Table 9 provides disaggregated indicators that make up the CIP index value. These disaggregated figures reveal major inequalities in industrial development across different countries in the world.

Table 10: Ranking of countries in the Competitive Industrial Performance (CIP) index, 2010

Quintiles	MVApc	MXpc	MHVAsh	MVAsh	MHXsh	MXsh	ImWMVA	ImWMT	
Top	3984.350	11598.077	45.959	20.376	62.770	86.694	3.109	3.096	*Mean*
	3324.625	9280.327	43.319	18.571	61.820	88.417	0.838	1.910	*median*
	2191.209	9017.832	9.837	7.198	8.194	8.070	5.524	3.143	*standard deviation*
							83.935	83.589	*Total*
Upper middle	1254.629	3858.957	27.484	16.419	38.683	68.034	0.452	0.497	*Mean*
	978.874	2020.658	24.085	15.470	38.038	73.689	0.223	0.407	*median*
	1011.965	5090.731	11.115	5.903	17.537	23.160	0.527	0.422	*standard deviation*
							12.211	13.416	*Total*
Middle	695.046	1696.520	20.711	13.473	30.441	62.169	0.096	0.085	*Mean*
	448.575	728.978	20.048	14.011	32.817	70.994	0.051	0.068	*median*
	778.552	2312.415	9.521	4.679	16.133	24.446	0.109	0.057	*standard deviation*
							2.602	2.297	*Total*
Lower middle	213.115	449.843	12.388	11.435	21.450	52.257	0.018	0.027	*Mean*
	193.780	276.342	11.278	10.442	15.421	48.847	0.011	0.014	*median*
	179.445	449.589	9.826	6.468	18.737	26.791	0.017	0.038	*standard deviation*
							0.497	0.724	*Total*
Bottom	99.100	71.082	9.145	8.150	15.076	36.423	0.006	0.003	*Mean*
	33.192	20.650	6.658	6.825	13.088	32.657	0.004	0.002	*median*
	183.467	113.396	7.568	5.295	13.510	24.387	0.006	0.003	*standard deviation*
							0.165	0.084	*Total*

4.2 World top 20 performers in 2010

The prospect for a country to climb the CIP index world ranking and move from a lower to a higher quintile depends on its capacity to improve its relative performance in all three different competitiveness dimensions, each of them captured by different CIP sub-indicators. We often observe that countries which are able to improve in one competitiveness dimension also tend to improve in other dimensions over time, given the existence of a certain degree of interdependence and cumulativeness in the process of increasing industrial competitiveness. This explains why many of the top 20 performers are those countries we also find in the top quintile of the world ranking. But this is not always the case as shown in Table 11. Listing the top 20 performers for all indicators not only reveals countries' comparative strengths, but also draws our attention to potential biases and the main features of the overall world ranking.

The capacity to produce and export manufactures is measured by the MVApc and the MXpc. As these indicators present per capita figures, large countries with a high population size and internal demand tend to underperform. Thus, it is not surprising that we find Singapore, Switzerland, Finland, Sweden, Ireland, Austria, Iceland, Denmark, Belgium and Netherlands among the top performers in MVApc. Among the top 20 performers, the average MVApc is above US$ 5.000 per capita, a threshold reached by only eight economies in the world. Remarkably, Japan is ranked second with an MVApc almost equal to Singapore's and significantly higher than the median value. Among the other larger economies, the United States ranks

eighth, with an MVApc just above the top 20 performers' average; the Republic of Korea and Germany follow. However, in contrast to the United States, Germany and the Republic of Korea are also among the top 20 performers in MXpc.

The MXpc ranking is characterized by a quite significant dispersion with a standard deviation of roughly US$ 8.400 per capita. Interestingly, with the exception of Germany and the Republic of Korea, the MXpc dimension is dominated by small highly industrialized economies capable of producing goods competitively and of keeping abreast of changing technologies. Among this group, the average is around US$ 16.000 per capita, although the distribution is highly skewed with Singapore (1st) registering a scope which is nearly nine times higher than Hungary's (20th).

The technological deepening and upgrading dimension of competitiveness is measured by two composite indicators, namely by industrial intensity and manufactured exports quality. These composite indicators are obtained by adopting a linear aggregation technique (arithmetic mean). This implies that the INDint and MXQual rankings tend to be affected by factors' compensability. For example, let's take the INDint ranking. Here, China with a top world MVAsh equal to 34 percent and a relatively equal MHVAsh to 40 percent ranks sixth in the composite INDint index. On the contrary, the United States ranks 20th as a result of its relatively low MVAsh equal to 15 percent and an MHVAsh equal to 51 percent (see Table 9). The MVAsh indicator in this dimension favours emerging industrial economies such as Malaysia (9th), Indonesia (14th) and Philippines (15th), as well as transition economies in the upper middle of the world CIP ranking. The fact that the Republic of Korea (4th), Japan (12th) and Germany (13th) appear among the INDint top 20 performers is attributable to their willingness and capacity to maintain manufacturing production with a high technological content at home.

The export quality composite indicators determine that Philippines is the top performer. This surprising result is mainly attributable to the fact that Philippines is a country 'specialized' in assembling components produced by countries such as Germany or Japan which own technologies, organize the entire production process, manage the business and sell the products. Thus, the export quality indicator tends to capture what countries export, but not how and to what extent they contribute to the production of the exported goods. The lack of an adequately disaggregated technological classification of exported goods makes this problem even more serious. Among the other top performers also affected by this distortive effect, Mexico ranks above Germany, China and France. Small European transition economies, namely Hungary, Slovakia, Czech Republic and Slovenia, enter the top 20 ranking as well.

The world impact dimension is captured by the share of countries in world manufacturing production and manufactures trade. In both cases, although in different positions, the world top performers are the United States, China, Japan and Germany. While the United States ranks first with almost one-fourth of world manufacturing value added, China is the world top exporter of manufactured goods with a 14 percent global share. Among high income countries, Germany is the only economy with a share of around 10 percent of world manufactures trade. By contrast, Japan with a higher population and higher internal demand pull than Germany, accounts for 6.5 percent of WMT, despite producing 14 percent of WMVA. Taken together, the first four top performers have an impact on WMVA and WMT equal to 58 percent and 38 percent, respectively.

With regard to the global impact dimension, the top four performers are followed by a group of relatively comparable countries, namely the Republic of Korea, France, Italy and United Kingdom. Their shares in WMVA and WMT range from 3 percent to 2 percent and from 4 percent to 3 percent, respectively. Among the other countries with a high world impact, India and the Russian Federation appear in both rankings, while Brazil is only listed in the top 20 in terms of ImWMVA. South Africa is not among the top 20 performers.

If we consider the top 20 performers in terms of the world impact dimension, countries overall account for 85 percent of world manufacturing value added and 78 percent of world manufactures trade. These data confirm the high concentration of manufacturing production and exports across countries.

Table 11: Ranking of top 20 performers in three dimensions of competitiveness and according to six indicators, 2010

	Capacity to produce and export manufactures				Technological deepening and upgrading				World impact			
		MVApc		MXpc		INDint		MXQual		ImWMVA		ImWMT
1	Singapore	8198.274	Singapore	35709.08	Singapore	0.831	Philippines	0.959	United States of America	24.036	China	14.063
2	Japan	7993.985	Belgium	34137.53	China, Taiwan Province	0.828	Republic of Korea	0.955	China	15.329	Germany	10.219
3	Switzerland	7168.375	Luxembourg	24557.2	Thailand	0.814	Japan	0.951	Japan	14.126	United States of America	7.974
4	Finland	6795.266	Ireland	23959.5	Republic of Korea	0.759	China, Taiwan Province	0.930	Germany	5.317	Japan	6.532
5	Sweden	6559.365	Switzerland	23651.56	Ireland	0.749	Hungary	0.917	Republic of Korea	3.220	France	4.189
6	Ireland	6506.683	Netherlands	22081.02	China	0.743	Switzerland	0.890	United Kingdom	2.691	Republic of Korea	4.183
7	China, Taiwan Province	6153.097	Sweden	15375.64	Czech Republic	0.686	Mexico	0.885	France	2.494	Italy	3.791
8	United States of America	5522.091	Austria	14926.31	Slovakia	0.667	Germany	0.882	Italy	2.325	Netherlands	3.374
9	Austria	4869.479	Germany	13397.43	Malaysia	0.652	Slovakia	0.881	India	2.028	Belgium	3.326
10	Republic of Korea	4782.695	Denmark	12839.14	Hungary	0.648	Czech Republic	0.877	China, Taiwan Province	1.968	United Kingdom	2.989
11	Germany	4666.907	Finland	12001.19	Finland	0.644	Singapore	0.877	Brazil	1.712	China, Taiwan Province	2.318
12	Iceland	4007.826	Czech Republic	11816.28	Japan	0.640	China	0.860	Mexico	1.538	Mexico	2.212
13	Denmark	3887.018	Slovakia	11125.34	Germany	0.636	France	0.850	Canada	1.437	Canada	2.084
14	Belgium	3793.781	Slovenia	11094.26	Indonesia	0.615	Slovenia	0.846	Spain	1.183	Spain	1.910
15	Norway	3766.775	China, Taiwan Province	10825.16	Philippines	0.596	Israel	0.831	Turkey	1.088	India	1.738
16	Luxembourg	3737.346	Republic of Korea	9280.327	Slovenia	0.591	Malta	0.817	Indonesia	1.002	Switzerland	1.657
17	Netherlands	3324.625	Qatar	8817.292	Sweden	0.589	Malaysia	0.810	Argentina	0.986	Malaysia	1.533
18	Israel	3235.619	Malta	8406.836	Belarus	0.577	Sweden	0.809	Russian Federation	0.978	Singapore	1.519
19	United Kingdom	3162.344	Estonia	8360.444	Israel	0.562	Austria	0.808	Thailand	0.949	Thailand	1.518
20	Canada	3077.729	Hungary	8291.955	United States of America	0.548	Thailand	0.804	Sweden	0.838	Russian Federation	1.337
Mean		5060.464	mean	16032.675	mean	0.669	mean	0.872	mean	4.262	mean	3.923
Median		4724.801	median	12420.17	median	0.645	median	0.876	median	1.840	median	2.653
Standard dev		1675.034	Standard dev	8423.3	Standard dev	0.089	Standard dev	0.050	Standard dev	6.193	Standard dev	3.357
									Total	85.245	total	78.467

4.3 Regional industrial competitiveness

The regional distribution of the CIP ranking allows us to better focus our attention on the relative competitiveness of nations in specific geographic areas. This is interesting for countries seeking to benchmark their 'local' industrial competitiveness and, in particular, to identify comparable countries in their regional area or continent. Regional industrial competitiveness rankings also provide information about inequalities within and across regions in the world. This information is particularly relevant for understanding processes of regional economic integration, their achievements and current challenges.

Europe

In Europe, 16 countries belong to the top quintile of the CIP world ranking, followed by 13 economies positioned in the upper middle quintile. This latter group of countries includes the Russian Federation and a number of transition economies, some of which are new members of the European Union. The Russian Federation is positioned in the middle of the regional ranking, followed mainly by transition economies such as Belarus, Romania, Croatia, Ukraine, Bulgaria, Serbia and Bosnia and Herzegovina (see Table 12).

Table 12: Regional industrial competitiveness in Europe and world ranking comparison

EUROPE					
CIP Regional	World ranking	Country	CIP Regional	World ranking	Country
1	2	Germany	20	34	Portugal
2	8	Switzerland	21	36	Russian Federation
3	9	Belgium	22	40	Belarus
4	10	France	23	42	Luxembourg
5	11	Italy	24	46	Romania
6	12	Netherlands	25	47	Lithuania
7	13	Sweden	26	49	Greece
8	14	United Kingdom	27	50	Croatia
9	15	Ireland	28	52	Estonia
10	16	Austria	29	53	Ukraine
11	18	Finland	30	59	Bulgaria
12	19	Spain	31	61	Malta
13	20	Czech Republic	32	65	Iceland
14	24	Denmark	33	68	Latvia
15	25	Poland	34	76	Serbia
16	27	Slovakia	35	83	Bosnia and Herzegovina
17	29	Hungary	36	84	The f. Yugosl. Rep of Macedonia
18	31	Norway	37	94	Albania
19	32	Slovenia	38	114	Republic of Moldova

Taken as a whole, Europe accounts for 22.4 percent of world manufacturing value added and 44 percent of world manufactures trade. As for the three main competitiveness dimensions, Europe consists of quite a heterogeneous group of countries. This is why there is a wide dispersion, denoted by the standard deviation in the MVApc and MHVAsh figures. These figures tend to be sensibly lower when compared to the North America region. The manufactured exports per capita figure, by contrast, is double on average (see Table 20).

Box 3: The European Union industrial competitiveness

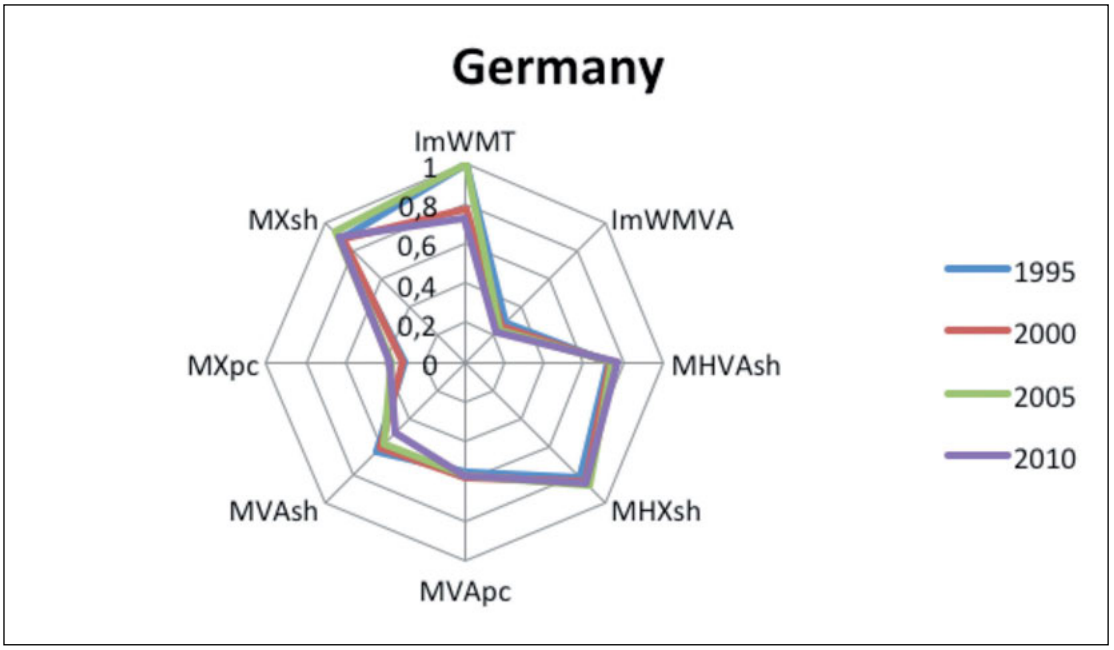
The European Union is among the most developed areas in the world with a population of 500 million citizens distributed across 27 countries. The EU27 captures the world's largest share of manufactures trade equal to 40.3 percent (which is almost seven times that of the United States and more than three times that of China). More than half of the manufactured exports are medium- and high-tech products, as are more than two-thirds of Germany's exports. The European Union also produces 20 percent of WMVA (only below the United States with an ImpWMVA of 24 percent) of which one-third are medium- and high-tech products. For example, the European Union hosts one-third of world production of machine tools (Germany and Italy combined account for two-thirds of the total production in the CECIMO region which includes the EU, EFTA and Turkey). Overall, the dispersion within the EU27 area tends to be lower than within the Europe region (see Table 13).

Table 13: The European Union and its four major manufacturing countries

European Union - EU27	MVApc	MXpc	MHVAsh	MVAsh	MHXsh	MXsh	ImWMVA	ImWMT
mean	2806.746	10575.123	36.625	16.167	53.992	83.630	0.754	1.495
median	2716.243	8360.444	40.071	14.988	54.950	87.040	0.294	0.651
standard dev	1880.623	7934.007	13.420	5.796	11.596	13.009	1.185	2.151
Germany	4666.907	13397.430	56.759	18.571	72.335	86.813	5.317	10.219
France	2885.087	7237.361	45.413	12.158	65.769	88.417	2.494	4.189
Italy	2847.715	6935.053	39.331	14.942	53.933	91.618	2.325	3.791
United Kingdom	3162.344	5247.637	41.987	11.444	63.221	79.538	2.691	2.989

Among its member states, five major economies, namely Germany (1st), France (4th), Italy (5th) and the United Kingdom (8th) account for a population of around 270 million overall and these countries contribute half of world manufacturing value added (equal to 12.8 percent) and manufactures trade share (21.2 percent). Small highly dynamic countries such as Belgium and Netherlands are strongly interlinked with the main European industrial block and complement their highly competitive exports. As illustrated by the radar graphs below, although Germany, France, Italy and the United Kingdom have represented the main bulk of the industrial power of the European Union over the last 20 years, their industrial structures differ profoundly. The following radar graphs plot the evolution of the eight structural economic variables for the four countries over the last 20 years. Germany and Italy have maintained broader manufacturing bases, as indicated by the MVAsh indicators. Together with France, the three countries have a strong export orientation, however, Italy shows a relatively less technologically advanced export basket. By contrast, for France and the United Kingdom, the MHXsh is above 60 percent, but still far below that of Germany (see Figure 4).

Figure 4: Industrial transformations of the four major manufacturing countries of the European Union over time (normalized figures)



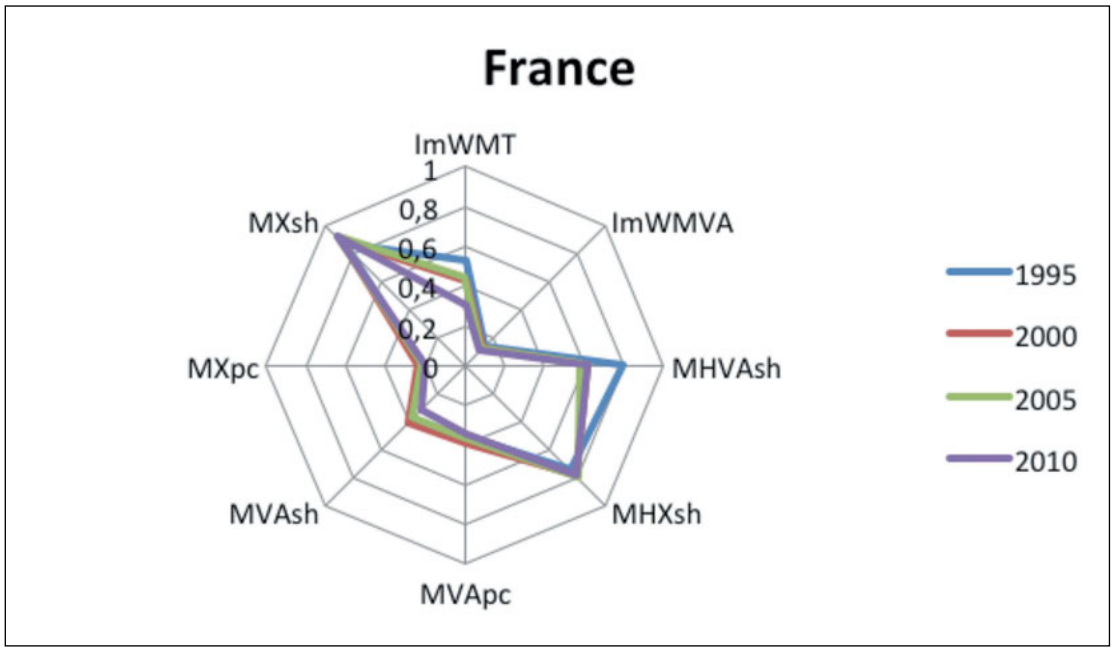
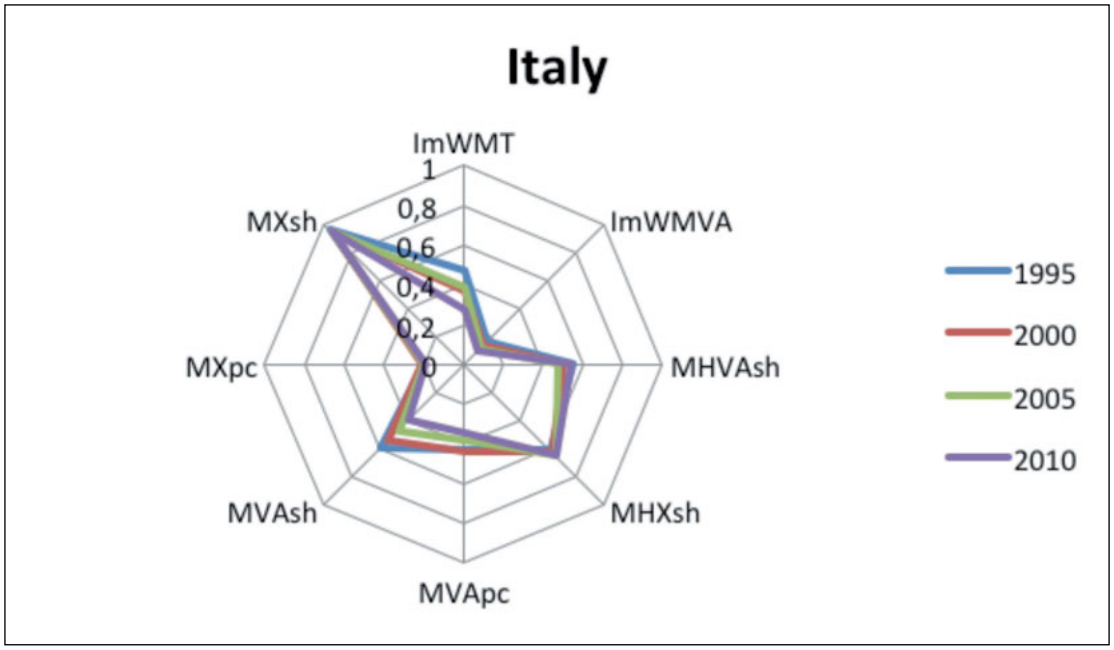
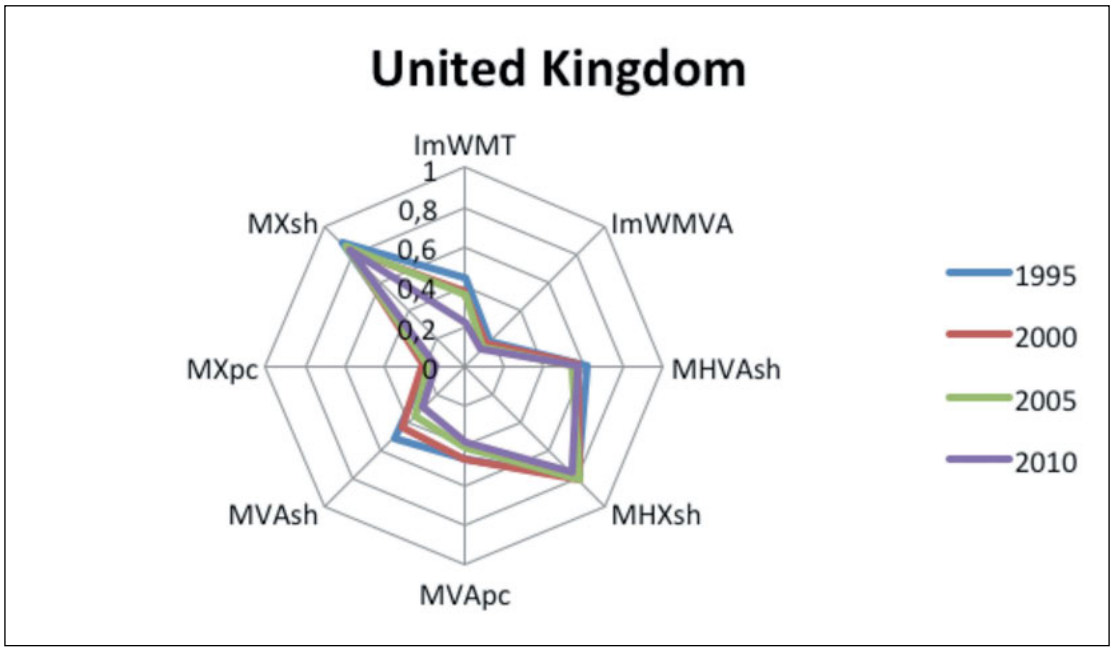


Figure 4: Industrial transformations of the four major manufacturing countries of the European Union over time (normalized figures)





North America

The United States is the third most competitive industrial nation in the world CIP ranking behind Germany and Japan. In the United States, the MVApc reaches roughly US$ 5.500 per capita with a population of around 315 million people. This figure is also reflected in the share of WMVA equal to 23.4 percent, more than three points higher than for the EU27. Fifty-one percent of total MVA is constituted of medium- and high-tech activities and 64 percent of manufactured exports are medium- and high-tech products. Canada is a much more export oriented economy, capturing 2 percent of WMT, while only accounting for 1.4 percent of WMVA of which 37 percent is in medium- and high-tech manufacturing products. Canada is also the ninth largest exporter of oil in the world. Overall, the region has the world's highest MVApc equal to US$ 4.300, one-fourth higher than the average value of the top quintile of the world ranking (see Table 9).

Table 14: Regional industrial competitiveness in North America and world ranking comparison

NORTH		
CIP Regional	World ranking	Country
1	3	United States of America
2	17	Canada

Latin America and the Carribean

In the Latin America and Carribean region, the top five industrially competitive countries are those in the top and upper middle quintile of the CIP world ranking (see Table 15). Brazil and Mexico are the two large emerging economies in the region with a population of around 195 million and 113 million, respectively. Mexico is the most industrially competitive country in the region with an MVApc that is almost double that of Brazil, although Argentina with its long industrial history accounts for nearly half of the region's MVApc (see Table 15). Taken together, Brazil, Mexico and Argentina account for 4.2 percent of WMVA and 3.7 percent of WMT. Though the latter shares reach 5.6 percent and 4.9 percent, respec- tively, we observe a high concentration of manufacturing and high inequalities within the region as a whole. This is also confirmed by the very high standard deviation in MVApc and the overall low level of MHXsh (see Table 20). Countries holding middle and lower positions in the regional ranking are small countries. Even countries such as Chile (4th) and Venezuela (Bolivarian Republic of) (5th), which rank just below the three major economies in the region, are highly dependent on exporting natural resources as the very low level of manufactured exports in total exports MXsh indicates (see Table 9).

Table 15: Regional industrial competitiveness in Latin America and the Carribean and world ranking comparison

LATIN AMERICA AND THE CARRIBEAN					
CIP Regional	World ranking	Country	CIP Regional	World ranking	Country
1	22	Mexico	13	87	Ecuador
2	33	Brazil	14	91	Honduras
3	35	Argentina	15	92	Bolivia (Plurinational State of)
4	45	Chile	16	93	Jamaica

LATIN AMERICA AND THE CARRIBEAN					
CIP Regional	World ranking	Country	CIP Regional	World ranking	Country
5	51	Venezuela (Bolivarian Republic of)	17	99	Paraguay
6	56	Costa Rica	18	104	Barbados
7	60	Trinidad and Tobago	19	108	Suriname
8	63	Peru	20	110	Panama
9	64	Colombia	21	113	Belize
10	71	El Salvador	22	123	Saint Lucia
11	73	Uruguay	23	127	Haiti
12	77	Guatemala			

East Asia and the Pacific

The only other region comparable to Europe and North America in terms of industrial and technological development is East Asia and the Pacific. This region hosts half of the top 10 most industrially competitive nations in the world (five are in the top seven positions), namely Japan, the Republic of Korea, China, Taiwan Province, Singapore and China (see Table 16). The next five economies in the ranking include two large countries, with Indonesia and Philippines accounting for 240 and 95 million people, respectively. Although the MVApc is fairly low in both countries (around US$ 300 per capita), Indonesia, given its size, captures 1 percent of WMVA. The lower middle and bottom of the regional ranking includes both a catching-up economy, Viet Nam[33], but also a country like Mongolia whose structural economic variables are comparable with sub-Saharan African countries'. This is why the standard deviation for this regional group is the highest among all regional groups (see Table 20).

Table 16: Regional industrial competitiveness in East Asia and the Pacific and world ranking comparison

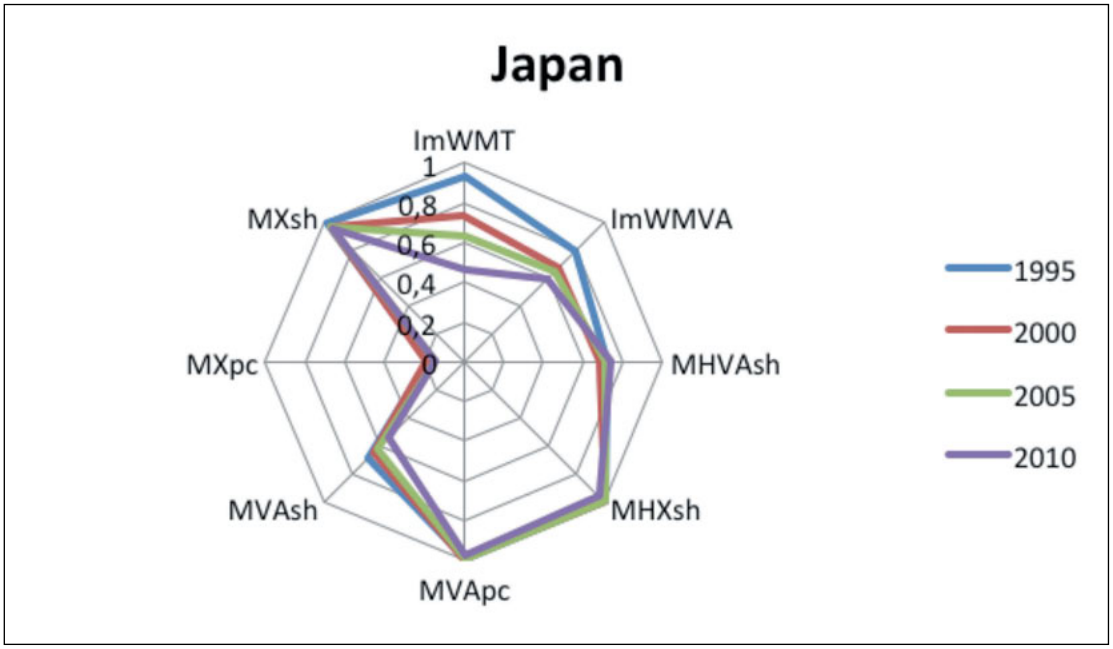
EAST ASIA AND THE PACIFIC					
CIP Regional	World ranking	Country	CIP Regional	World ranking	Country
1	1	Japan	10	44	Philippines
2	4	Republic of Korea	11	48	New Zealand
3	5	China, Taiwan Province	12	54	Viet Nam
4	6	Singapore	13	67	China, Hong Kong SAR
5	7	China	14	90	Cambodia
6	21	Malaysia	15	105	Fiji
7	23	Thailand	16	109	Mongolia
8	28	Australia	17	112	China, Macao SAR
9	38	Indonesia			

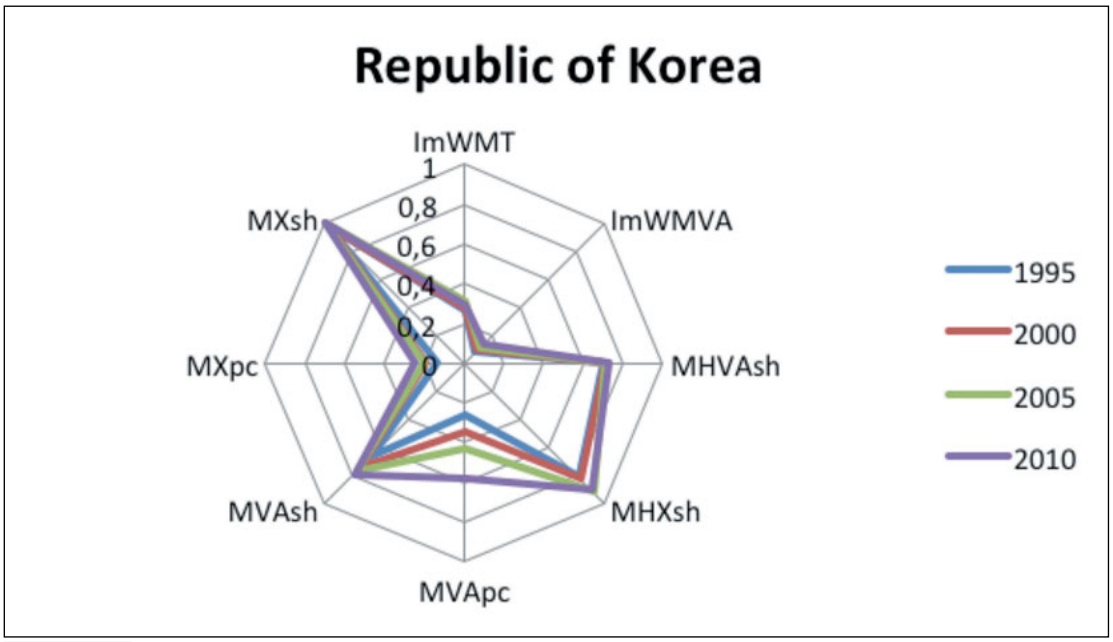
Taking aside China's huge economy, the other four top performers show an MVApc of almost US$ 6.800, on average, and a share of medium- and high-tech activities in total MVA and total MX that ranks highest in the world. Overall, the top 5 countries in the region host 35 percent of WMVA and 28 percent of

[33] The Viet Nam Industrial Competitiveness Report 2011 produced by UNIDO provides an in-depth industrial competitiveness analysis for the country, describing in detail its industrial catching-up trajectory.

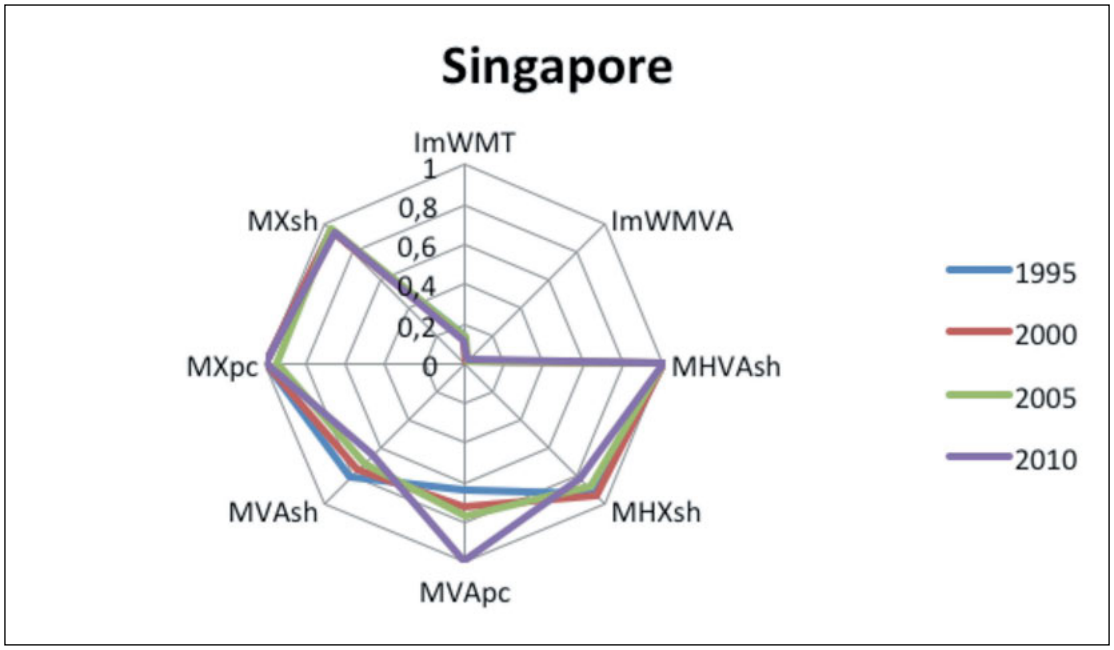
WMT, China alone being the second highest ranking country in the world with a share in WMVA of 15.4 percent (behind the United States and above Japan) and the highest ranking in terms of WMT with a share of 15.3 percent (followed by Germany). While Japan has lead the industrial competitiveness ranking since 1990, the other three economies are relatively new entrants in the top position of the world ranking.[34] The evolution of the main structural economic variables over the last 20 years has been plotted for those three economies (see radar graphs below). Both the Republic of Korea and Singapore have consistently increased their capacity to produce and export (as revealed by the MVApc's constant increases). The common trait is the strong performance of these three economies in MHVAsh and MHXsh, the latter indicators revealing their high levels of technological complexity and deepening.

Figure 5: Comparison of the industrial transformations of Japan, Republic of Korea and Singapore over time (normalized figures)





[34] The longitudinal analysis showing the CIP index ranking over the last 20 years is presented in Chapter 5.



South and Central Asia

In contrast to the other emerging large economies, India as the top performer of this region shows a considerably lower MVApc, less than one-fourth of China's. However, despite its population size, second only to China, India captures 2.1 percent of WMVA and 1.6 percent of WMT. All other countries in the region are in the middle or bottom of the world industrial competitiveness ranking (see Table 17). Overall, the region shows aggregate figures which are comparable to sub-Saharan Africa's (see Table 20). Notwithstanding, the region captures 3 percent of WMVA and 2.4 percent of WMT (four times and three times higher, respectively, than figures for the sub-Saharan Africa region).

Table 17: Regional industrial competitiveness in South and Central Asia and world ranking comparison

SOUTH AND CENTRAL ASIA		
CIP Regional	World ranking	Country
1	43	India
2	55	Iran (Islamic Republic of)
3	70	Kazakhstan
4	74	Pakistan
5	78	Bangladesh
6	80	Sri Lanka
7	115	Tajikistan
8	117	Kyrgyzstan
9	119	Nepal

Middle East and North Africa

The top five performers in the Middle East and North Africa region include the highly industrialized Israel and the emerging industrial economy Turkey (see Table 18). The latter, which has a population of almost 80 million, is the only larger country in the region with an MVApc higher than US$ 1.000 (Egypt only represents one-third) and a certain export capacity in medium- and high-tech manufactures (around 40 percent of the export basket, while it is only around 25 percent in the case of Egypt). The three 'oil dependent economies', Saudi Arabia, Kuwait and Qatar, follow Turkey in the regional ranking. Saudi Arabia is the strongest net oil exporter (and producer) in the world, while Kuwait ranks fourth and Qatar twelvth in the oil net export world ranking. Eight out of 20 countries in the region are ranked in the lower middle and bottom of the world industrial competitiveness ranking. Taken as a whole, the region accounts for almost 3 percent of WMVA and 3 percent of WMT (one-third of both these world shares are attributable to Turkey). Although these figures are similar to those of South and Central Asia, the per capita figures reveal profound differences if we factor in population size (see Table 20).

Table 18: Regional industrial competitiveness in Middle East and North Africa and world ranking comparison

MIDDLE EAST AND NORTH AFRICA					
CIP Regional	World ranking	Country	CIP Regional	World ranking	Country
1	26	Israel	11	75	Lebanon
2	30	Turkey	12	81	Syrian Arab Republic
3	37	Saudi Arabia	13	82	Algeria
4	39	Kuwait	14	88	Cyprus
5	57	Qatar	15	96	Georgia
6	58	Tunisia	16	98	Armenia
7	62	Egypt	17	107	Azerbaijan
8	66	Morocco	18	121	Yemen
9	69	Oman	19	126	Sudan
10	72	Jordan	20	133	Iraq

Sub-Saharan Africa

In the world industrial landscape, the entire sub-Saharan Africa region accounts for less than 1 percent of both WMVA and WMT shares. Thirteen out of 25 countries are in the bottom quintile of the world industrial competitiveness ranking, while ten are in the lower middle quintile (see Table 19). The MVApc in the region is around US$ 125 on average, but there is wide dispersion in the data. The MVApc median value falls to one-third in comparison to the regional average, while the MXpc is more than five times higher (see Table 20). South Africa is by far the most competitive industrial nation in the region, as well as the biggest most competitive country on the entire continent. South Africa alone accounts for half of the MVA and WMT shares of the entire region.[35] Mauritius is the second most industrially competitive country in the region and the only one ranking in the middle quintile. Not only are its structural economic

[35] The Tanzania Industrial Competitiveness Report produced by UNIDO in 2012 as well as the UNIDO Africa Investor Report 2011 provide in-depth analysis of the region and offer complementary industrial diagnostics which are consistent with the industrial competitiveness analysis developed here.

variables sensibly higher than the regional average, but it also outperforms others in the world middle quintile due to its capacity to manufacture products (MVApc). Among the other countries in the regional ranking, Nigeria and Algeria are the main oil net exporters.

Table 19: Regional industrial competitiveness in sub-Saharan Africa and world ranking comparison

SUB-SAHARAN AFRICA					
CIP Regional	World ranking	Country	CIP Regional	World ranking	Country
1	41	South Africa	14	116	Madagascar
2	79	Mauritius	15	118	Ghana
3	85	Swaziland	16	120	Uganda
4	86	Botswana	17	122	Mozambique
5	89	Côte d'Ivoire	18	124	Cape Verde
6	95	Nigeria	19	125	Malawi
7	97	Cameroon	20	128	Niger
8	100	Congo	21	129	Rwanda
9	101	Senegal	22	130	Ethiopia
10	102	Kenya	23	131	Central African Republic
11	103	Gabon	24	132	Burundi
12	106	United Republic of Tanzania	25	133	Gambia
13	111	Zambia			

Table 20: Statistics on country groups in the regional industrial competitiveness ranking

Country group	MVApc	MXpc	MHVAsh	MVAsh	MHXsh	MXsh	ImWMVA	ImWMT	
Europe									
	2384.101	8497.639	32.004	16.244	48.198	79.703	0.591	1.163	mean
	1700.262	6139.144	32.829	15.495	52.045	86.515	0.186	0.411	median
	2069.746	8224.810	14.171	5.947	16.137	16.895	1.042	1.903	standard deviation
							22.466	44.211	total
North America									
	4299.910	4701.839	44.435	13.368	60.233	69.449	12.736	5.029	mean
	4299.910	4701.839	44.435	13.368	60.233	69.449	12.736	5.029	median
	1728.425	2779.927	10.025	2.098	6.379	10.336	15.980	4.165	standard deviation
							25.472	10.058	total
Latin America and the Carribean									
	578.621	860.769	19.040	12.836	23.300	55.354	0.257	0.223	mean
	426.916	594.017	17.518	13.588	19.013	51.812	0.046	0.036	median
	434.754	1171.929	11.445	5.021	19.717	23.858	0.494	0.517	standard deviation
							5.651	4.907	total

Country group	MVApc	MXpc	MHVAsh	MVAsh	MHXsh	MXsh	ImWMVA	ImWMT	
East Asia and the Pacific									
	2210.277	4854.676	32.853	20.031	43.614	72.753	2.309	2.035	mean
	832.347	1123.620	37.814	21.339	53.737	69.297	0.521	0.878	median
	2793.430	8603.095	22.199	10.703	28.750	19.537	4.753	3.552	standard deviation
							39.253	34.599	total
South and Central Asia									
	151.946	207.785	16.703	15.814	24.763	55.624	0.336	0.273	mean
	116.878	99.770	12.109	15.044	20.733	70.098	0.076	0.112	median
	124.484	243.854	14.865	6.419	18.970	31.428	0.648	0.556	standard deviation
							3.026	2.453	total
Middle East and North Africa									
	721.587	1699.052	19.643	10.487	31.608	48.335	0.142	0.151	mean
	381.515	533.399	19.020	10.393	31.847	53.119	0.036	0.047	median
	863.406	2716.690	12.398	5.516	17.430	32.647	0.258	0.236	standard deviation
							2.843	3.015	total
Sub-Saharan Africa									
	124.044	280.720	11.037	9.891	18.009	43.003	0.026	0.032	mean
	45.678	48.690	9.409	8.830	13.585	34.906	0.008	0.009	median
	194.463	515.331	9.020	5.954	16.739	26.279	0.073	0.090	standard deviation
							0.699	0.867	total

4.4 The industrial competitiveness of nations by income and industrial comparators

Countries are not only interested in benchmarking their 'local' industrial competitiveness, that is, their relative industrial performance within a certain regional area. World regions are highly aggregated entities characterized by wide dispersion in performance, even when we take traditionally industrialized areas such as Europe into consideration. In the global manufacturing landscape, countries identify a certain number of relevant comparators and track their relative performance and policies. On the one hand, countries might be interested in comparing their performance to that of countries which are at the same stage of economic development measured by their income per capita. These income comparators might, of course, be within or outside the regional borders. On the other hand, countries might be interested in comparing themselves with countries that have a similar industrial structure. The identification of industrial comparators may rely on different criteria. The following tables show the results of such comparisons.

The CIP ranking by income comparators reveals the different development models countries have followed, even within the high income OECD group, and how they have been affected by different de-industrialization processes. Not surprisingly, we find the top four world performers among the high income OECD group, followed by medium and small European countries and transition economies (see Table 21). Overall, they account for almost two-thirds of world manufacturing value added and world manufactures trade. This group outperforms all other income groups in all share and per capita indicators (see Table 26). The high income non-OECD countries include two East Asian economies, a number of oil dependent economies and a few other small countries (see Table 22).

Table 21: Industrial competitiveness ranking by income comparators, high income OECD country group

HIGH INCOME OECD					
Income ranking	World ranking	Country	Income ranking	World ranking	Country
1	1	Japan	17	20	Czech Republic
2	2	Germany	18	24	Denmark
3	3	United States of America	19	25	Poland
4	4	Republic of Korea	20	26	Israel
5	8	Switzerland	21	27	Slovakia
6	9	Belgium	22	28	Australia
7	10	France	23	29	Hungary
8	11	Italy	24	31	Norway
9	12	Netherlands	25	32	Slovenia
10	13	Sweden	26	34	Portugal
11	14	United Kingdom	27	42	Luxembourg
12	15	Ireland	28	48	New Zealand
13	16	Austria	29	49	Greece
14	17	Canada	30	52	Estonia
15	18	Finland	31	65	Iceland
16	19	Spain			

Table 22: Industrial competitiveness ranking by income comparators, high income non-OECD country group

HIGH INCOME NON-OECD					
Income ranking	World ranking	Country	Income ranking	World ranking	Country
1	5	China, Taiwan Province	10	69	Oman
2	6	Singapore	11	88	Cyprus
3	37	Saudi Arabia	12	104	Barbados
4	39	Kuwait	13	112	China, Macao SAR
5	50	Croatia			
6	57	Qatar			
7	60	Trinidad and Tobago			
8	61	Malta			
9	67	China, Hong Kong SAR			

The upper middle income group is led by China and by three other large economies: Brazil, Russian Federation and South Africa. Other large emerging industrial economies, namely Malaysia, Thailand, Turkey, Argentina and Belarus, are represented in the top 10. The subsequent countries are relatively smaller economies mainly concentrated in the middle quintile of the world industrial competitiveness ranking (see Table 23). Taken as a whole, the region accounts for one-fourth of world manufacturing value added and world manufactures trade (see Table 26).

Table 23: Industrial competitiveness ranking by income comparators, upper middle income country group

UPPER MIDDLE INCOME WORLD					
Income ranking	World ranking	Country	Income ranking	World ranking	Country
1	7	China	20	64	Colombia
2	21	Malaysia	21	68	Latvia
3	22	Mexico	22	70	Kazakhstan
4	23	Thailand	23	72	Jordan
5	30	Turkey	24	73	Uruguay
6	33	Brazil	25	75	Lebanon
7	35	Argentina	26	76	Serbia
8	36	Russian Federation	27	79	Mauritius
9	40	Belarus	28	82	Algeria
10	41	South Africa	29	83	Bosnia and Herzegovina
11	45	Chile	30	84	The f. Yugosl. Rep of Macedonia
12	46	Romania	31	86	Botswana
13	47	Lithuania	32	87	Ecuador
14	51	Venezuela (Bolivarian Republic of)	33	93	Jamaica
15	55	Iran (Islamic Republic of)	34	103	Gabon
16	56	Costa Rica	35	107	Azerbaijan
17	58	Tunisia	36	108	Suriname
18	59	Bulgaria	37	110	Panama
19	63	Peru	38	123	Saint Lucia

The lower middle income group is led by three large Asian economies, Indonesia, India and Philippines, followed by industrializing countries such as Ukraine and Viet Nam. The remaining part of the group includes a mix of economies in the middle and lower middle quintile of the world industrial competitiveness ranking. Many of them are located in the Middle East and North Africa, Latin America and sub-Saharan Africa. The countries in the latter case tend to be oil net exporters such as Nigeria (see Table 24). Taken as a whole, they account for 5 percent of world manufacturing value added and world manufactures trade (see Table 26). Finally, the low income group includes Bangladesh at the top, followed by smaller economies in South and Central Asia and sub-Saharan Africa (see Table 25). Both aggregate and individual countries' figures reveal an extremely low overall level of industrial development (see Table 9 and 26).

Table 24: Industrial competitiveness ranking by income comparators, lower middle income country group

LOWER MIDDLE INCOME WORLD					
Income	World ranking	Country	Income ranking	World ranking	Country
1	38	Indonesia	18	95	Nigeria
2	43	India	19	96	Georgia
3	44	Philippines	20	97	Cameroon

LOWER MIDDLE INCOME WORLD					
Income	World ranking	Country	Income ranking	World ranking	Country
4	53	Ukraine	21	98	Armenia
5	54	Viet Nam	22	99	Paraguay
6	62	Egypt	23	100	Congo
7	66	Morocco	24	101	Senegal
8	71	El Salvador	25	105	Fiji
9	74	Pakistan	26	109	Mongolia
10	77	Guatemala	27	111	Zambia
11	80	Sri Lanka	28	113	Belize
12	81	Syrian Arab Republic	29	114	Republic of Moldova
13	85	Swaziland	30	118	Ghana
14	89	Côte d'Ivoire	31	121	Yemen
15	91	Honduras	32	124	Cape Verde
16	92	Bolivia (Plurinational State of)	33	126	Sudan
17	94	Albania	34	133	Iraq

Table 25: Industrial competitiveness ranking by income comparators, low income country group

LOW INCOME WORLD					
Income	World ranking	Country	Income ranking	World ranking	Country
1	78	Bangladesh	11	125	Malawi
2	90	Cambodia	12	127	Haiti
3	102	Kenya	13	128	Niger
4	106	United Republic of Tanzania	14	129	Rwanda
5	115	Tajikistan	15	130	Ethiopia
6	116	Madagascar	16	131	Central African Republic
7	117	Kyrgyzstan	17	132	Burundi
8	119	Nepal	18	133	Gambia
9	120	Uganda	19	133	Eritrea
10	122	Mozambique			

Table 26: Statistics on country groups by income comparators

Country group	MVApc	MXpc	MHVAsh	MVAsh	MHXsh	MXsh	lmWMVA	lmWMT	
High income OECD									
	3637.9060	10704.4975	38.1553	16.4997	55.7089	79.7454	2.0954	2.0491	mean
	3235.6190	8291.9550	41.7384	14.9417	55.7886	87.0401	0.5521	1.1134	median
	1889.0927	7790.4618	14.3718	5.9848	14.4221	18.7728	4.8537	2.4640	standard deviation

Country group	MVApc	MXpc	MHVAsh	MVAsh	MHXsh	MXsh	ImWMVA	ImWMT	
							64.9574	63.5230	total
High income non-OECD									
	2024.1012	6546.0155	33.1798	10.5438	41.9206	61.7391	0.2476	0.3830	mean
	999.3594	2356.2810	32.5780	8.3858	42.7073	73.9550	0.0360	0.0752	median
	2382.6740	9471.9438	19.9291	8.6087	20.9243	31.0153	0.5434	0.7130	standard deviation
							3.2191	4.9787	total
Upper middle income world									
	597.8738	1315.7192	21.1488	15.0228	31.5391	61.0265	0.6794	0.6957	mean
	464.5866	856.5439	19.9989	15.1503	33.9994	69.6595	0.0683	0.1224	median
	400.9654	1270.5550	11.5582	7.7622	19.7609	26.7307	2.4806	2.2896	standard deviation
							25.8170	26.4374	total
Lower middle income world									
	181.6157	283.3142	16.6459	13.8243	22.3973	53.4202	0.1488	0.1454	mean
	171.5993	217.9206	16.9570	12.4785	17.8733	60.8281	0.0222	0.0137	median
	134.9109	236.5627	11.1859	6.7728	19.3231	27.4702	0.3831	0.3374	standard deviation
							5.0595	4.9452	total
Low income world									
	32.1789	31.5162	6.6444	9.9570	17.2793	41.6023	0.0087	0.0060	mean
	23.5233	13.6438	4.8122	8.4227	14.1134	37.1117	0.0063	0.0024	median
	26.1972	55.1576	5.8604	6.3019	14.3589	23.6495	0.0087	0.0093	standard deviation
							0.1574	0.1078	total

Ranking countries according to their level of industrial development, the overall picture does not change dramatically, as countries' industrial and economic development measured by per capita income are tightly interconnected (see Table 27). With the exception of China, the ranking by industrial comparators also reflects the world industrial competitiveness ranking, at least in the top quintile. The reason is that countries' industrial comparators are identified according to sub-indicators of the CIP, that is, MVApc and ImWMVA. Taken as a whole, industrialized economies account for almost 70 percent of world manufacturing value added and world manufactures trade (see Table 31).

Similarly, among the emerging industrial economies group (see Table 28), we find large countries such as China, Brazil, Mexico and South Africa and several transition economies that have been catching up in the last decades. Although their structural trajectories differ significantly, the countries are at a similar stage of industrial development as measured by MVApc and MXpc. Taken as a whole, emerging industrial economies account for almost 28 percent of world manufacturing value added and world manufactures trade (see Table 31).

The last two groups include other developing countries and least developed countries which are located at the bottom of the world industrial competitiveness ranking, the only exceptions being Philippines, Viet Nam and Bangladesh (see Table 20 and 30).

Table 27: Industrial competitiveness ranking by industrial comparators, industrialized economies group

Industrial development	World ranking	Country	MVApc	MXpc	ImWMVA	ImWMT
1	1	Japan	7993.985	5521.015	14.126	6.532
2	2	Germany	4666.907	13397.430	5.317	10.219
3	3	United States of America	5522.091	2736.134	24.036	7.974
4	4	Republic of Korea	4782.695	9280.327	3.220	4.183
5	5	China, Taiwan Province	6153.097	10825.160	1.968	2.318
6	6	Singapore	8198.274	35709.080	0.521	1.519
7	8	Switzerland	7168.375	23651.560	0.750	1.657
8	9	Belgium	3793.781	34137.530	0.552	3.326
9	10	France	2885.087	7237.361	2.494	4.189
10	11	Italy	2847.715	6935.053	2.325	3.791
11	12	Netherlands	3324.625	22081.020	0.759	3.374
12	13	Sweden	6559.365	15375.640	0.838	1.316
13	14	United Kingdom	3162.344	5247.637	2.691	2.989
14	15	Ireland	6506.683	23959.500	0.407	1.004
15	16	Austria	4869.479	14926.310	0.569	1.167
16	17	Canada	3077.729	6667.544	1.437	2.084
17	18	Finland	6795.266	12001.190	0.500	0.592
18	19	Spain	1896.882	4571.873	1.183	1.910
19	20	Czech Republic	2148.213	11816.280	0.302	1.113
20	21	Malaysia	1426.915	5930.921	0.551	1.533
21	24	Denmark	3887.018	12839.140	0.294	0.651
22	26	Israel	3235.619	7728.479	0.325	0.520
23	27	Slovakia	2303.721	11125.340	0.172	0.556
24	28	Australia	2660.727	4520.901	0.786	0.894
25	29	Hungary	1210.312	8291.955	0.166	0.763
26	31	Norway	3766.775	7396.271	0.249	0.328
27	32	Slovenia	2716.243	11094.260	0.075	0.206
28	34	Portugal	1503.641	4098.299	0.223	0.407
29	36	Russian Federation	503.997	1028.697	0.978	1.337
30	39	Kuwait	2224.274	6899.250	0.094	0.231
31	42	Luxembourg	3737.346	24557.200	0.025	0.110
32	47	Lithuania	964.003	5343.235	0.044	0.165
33	48	New Zealand	1986.101	3213.924	0.118	0.128
34	52	Estonia	978.874	8360.444	0.018	0.102
35	57	Qatar	1988.824	8817.292	0.024	0.086
36	61	Malta	1257.272	8406.836	0.007	0.032
37	65	Iceland	4007.826	4001.087	0.017	0.011
38	67	China, Hong Kong SAR	478.412	1093.803	0.049	0.075
39	112	China, Macao SAR	832.347	264.975	0.006	0.001

Table 28: Industrial competitiveness ranking by industrial comparators, emerging industrial economies group

Industrial development	World ranking	Country	MVApc	MXpc	ImWMVA	ImWMT
1	7	China	820.0180	1123.6200	15.3289	14.0629
2	22	Mexico	1007.9250	2166.1570	1.5376	2.2124
3	23	Thailand	1053.6560	2517.1530	0.9491	1.5181
4	25	Poland	1489.9830	3639.6220	0.7811	1.2775
5	30	Turkey	1012.7340	1286.6960	1.0884	0.9259
6	33	Brazil	622.0987	667.5453	1.7121	1.2301
7	35	Argentina	1749.3670	877.5810	0.9857	0.3311
8	37	Saudi Arabia	1157.3230	2020.6580	0.4229	0.4943
9	38	Indonesia	302.2641	395.6795	1.0017	0.8779
10	40	Belarus	907.2939	2361.9730	0.1196	0.2084
11	41	South Africa	567.2742	991.1478	0.3866	0.4523
12	43	India	120.1849	153.8274	2.0283	1.7382
13	45	Chile	972.3740	1943.1180	0.2304	0.3083
14	46	Romania	341.5519	2111.4020	0.0999	0.4135
15	49	Greece	1289.6790	1429.0980	0.2001	0.1484
16	50	Croatia	999.3594	2356.2810	0.0626	0.0989
17	51	Venezuela (Bolivarian Republic of)	895.4624	750.4219	0.3597	0.2018
18	53	Ukraine	213.5706	974.3479	0.1334	0.4076
19	56	Costa Rica	1034.8420	1420.9560	0.0668	0.0614
20	58	Tunisia	490.9696	1272.1410	0.0724	0.1256
21	59	Bulgaria	398.7875	1958.2220	0.0412	0.1355
22	64	Colombia	405.2574	268.7242	0.2684	0.1192
23	68	Latvia	480.5979	3190.1600	0.0149	0.0663
24	69	Oman	941.1152	1857.9860	0.0360	0.0476
25	70	Kazakhstan	346.3900	767.3919	0.0755	0.1120
26	73	Uruguay	1342.8290	626.4600	0.0627	0.0236
27	76	Serbia	146.0240	771.8588	0.0200	0.0709
28	79	Mauritius	803.9971	1103.5250	0.0144	0.0132
29	84	The f. Yugosl. Rep of Macedonia	388.8205	835.5067	0.0110	0.0191
30	88	Cyprus	918.4880	640.8757	0.0112	0.0052
31	108	Suriname	307.6595	693.6025	0.0020	0.0030

Table 29: Industrial competitiveness ranking by industrial comparators, least developed countries group

Regional	World ranking	Country	MVApc	MXpc	ImWMVA	ImWMT
1	78	Bangladesh	86.7396	75.9896	0.1999	0.1179
2	90	Cambodia	100.7296	239.2937	0.0212	0.0337
3	101	Senegal	56.2691	115.9478	0.0104	0.0143
4	106	United Republic of Tanzania	45.6784	43.7185	0.0275	0.0176
5	111	Zambia	44.2736	111.4939	0.0077	0.0130
6	116	Madagascar	28.4274	31.8613	0.0084	0.0063
7	119	Nepal	18.1747	21.5419	0.0075	0.0060
8	120	Uganda	25.2921	11.7830	0.0119	0.0037

Regional	World ranking	Country	MVApc	MXpc	ImWMVA	ImWMT
9	121	Yemen	33.1920	23.9383	0.0112	0.0054
10	122	Mozambique	47.6064	7.6077	0.0149	0.0016
11	125	Malawi	17.2107	19.5735	0.0036	0.0027
12	126	Sudan	37.3428	6.6349	0.0213	0.0030
13	127	Haiti	36.2575	6.1908	0.0050	0.0012
14	128	Niger	9.2339	20.6504	0.0020	0.0030
15	129	Rwanda	21.7544	8.7765	0.0032	0.0009
16	130	Ethiopia	9.2491	2.5134	0.0115	0.0021
17	131	Central African Republic	15.2243	6.0769	0.0010	0.0003
18	132	Burundi	7.4443	1.9461	0.0010	0.0002
19	133	Eritrea	7.2731	0.4694	0.0005	0.0000

Table 30: Industrial competitiveness ranking by industrial comparators, other developing economies group

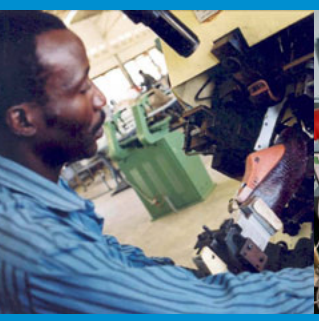
Industrial development	World ranking	Country	MVApc	MXpc	ImWMVA	ImWMT
1	44	Philippines	296.0264	516.6089	0.3808	0.4449
2	54	Viet Nam	176.1349	551.0216	0.2213	0.4636
3	55	Iran (Islamic Republic of)	361.2004	378.5034	0.3711	0.2603
4	60	Trinidad and Tobago	868.1077	5480.3210	0.0162	0.0684
5	62	Egypt	361.7198	206.4879	0.3979	0.1521
6	63	Peru	448.5753	623.7479	0.1793	0.1669
7	66	Morocco	239.7371	425.9229	0.1074	0.1277
8	71	El Salvador	513.1584	564.2864	0.0507	0.0373
9	72	Jordan	401.3109	728.9779	0.0358	0.0436
10	74	Pakistan	116.8777	99.7700	0.2802	0.1602
11	75	Lebanon	625.0215	726.8412	0.0365	0.0285
12	77	Guatemala	223.8785	408.9824	0.0445	0.0545
13	80	Sri Lanka	190.6457	297.3475	0.0516	0.0539
14	81	Syrian Arab Republic	206.1284	232.4145	0.0611	0.0461
15	82	Algeria	142.3358	414.7089	0.0697	0.1360
16	83	Bosnia and Herzegovina	210.5467	885.8250	0.0115	0.0323
17	85	Swaziland	496.9225	883.7827	0.0080	0.0099
18	86	Botswana	184.3349	2252.1340	0.0050	0.0407
19	87	Ecuador	247.9522	269.8627	0.0472	0.0344
20	89	Côte d'Ivoire	99.0589	182.4966	0.0279	0.0344
21	91	Honduras	279.6732	143.7003	0.0291	0.0119
22	92	Bolivia (Plurinational State of)	167.0637	276.3419	0.0232	0.0257
23	93	Jamaica	260.6629	418.8261	0.0099	0.0107
24	94	Albania	214.5382	359.4858	0.0096	0.0108
25	95	Nigeria	24.5856	113.8676	0.0538	0.1669
26	96	Georgia	136.0500	229.3532	0.0081	0.0091
27	97	Cameroon	140.1665	64.7066	0.0381	0.0118
28	98	Armenia	203.5952	201.1246	0.0084	0.0056
29	99	Paraguay	193.7799	146.0973	0.0173	0.0087

Industrial development	World ranking	Country	MVApc	MXpc	ImWMVA	ImWMT
30	100	Congo	67.2177	601.9828	0.0037	0.0224
31	102	Kenya	46.7688	62.1223	0.0263	0.0234
32	103	Gabon	201.0594	712.7484	0.0039	0.0110
33	104	Barbados	296.4223	725.6843	0.0012	0.0020
34	105	Fiji	252.9642	374.4215	0.0030	0.0030
35	107	Azerbaijan	70.7655	257.5435	0.0085	0.0207
36	109	Mongolia	60.3637	451.5818	0.0023	0.0116
37	110	Panama	347.0450	66.0502	0.0168	0.0021
38	113	Belize	475.5055	285.0173	0.0020	0.0008
39	114	Republic of Moldova	53.3502	155.3619	0.0027	0.0053
40	115	Tajikistan	84.8618	15.5047	0.0083	0.0020
41	117	Kyrgyzstan	42.4413	60.1900	0.0032	0.0031
42	118	Ghana	26.3711	26.2513	0.0091	0.0061
43	123	Saint Lucia	227.5487	253.3440	0.0005	0.0004
44	124	Cape Verde	147.1301	48.6897	0.0012	0.0003
45	133	Iraq	5.1947	3.7097	0.0022	0.0013

Table 31: Statistics on country groups by industrial comparators

Country name	MVApc	MXpc	MHVAsh	MVAsh	MHXsh	MXsh	ImWMVA	ImWMT	
Industrialized economies									
	3436.483	10540.768	37.578	16.021	52.751	75.629	1.749	1.779	mean
	3077.729	8291.955	41.738	14.942	55.723	86.813	0.500	1.004	median
	2131.047	8396.134	16.442	7.285	17.978	22.842	4.378	2.289	standard deviation
							68.219	69.394	total
Emerging industrial economies									
	758.964	1392.701	24.389	17.049	38.852	65.959	0.907	0.894	mean
	820.018	1123.620	20.776	15.632	39.008	73.689	0.133	0.202	median
	417.482	856.434	11.392	7.174	17.506	25.242	2.734	2.511	standard deviation
							28.125	27.710	total
Other developing countries									
	260.776	608.138	17.791	13.720	24.356	58.781	0.082	0.085	mean
	208.338	393.743	17.509	13.678	22.843	69.250	0.036	0.036	median
	177.398	976.290	11.209	6.324	19.730	24.863	0.117	0.116	standard deviation
							2.635	2.714	total
Least developed countries									
	83.422	105.661	10.080	8.899	15.340	41.676	0.013	0.009	average
	42.441	26.251	6.658	7.449	13.585	34.827	0.005	0.003	median
	111.476	162.369	9.059	5.500	13.063	27.296	0.034	0.021	standard deviation
							0.431	0.292	total

5. Industrial Competitiveness Over 20 Years (1990-2010)





This chapter of the report presents a longitudinal analysis of world industrial competitiveness over the last two decades, 1990s – 2000s. The CIP index is primarily a static benchmarking tool, although it can also be used to provide a snapshot of countries' competitive industrial performance at regular intervals. In previous Industrial Development Reports, longitudinal comparisons were performed with a limited number of countries and time intervals: in the IDR 2002/3, the CIP index (CIP.4 index format) was computed for 1998 and 1985, covering 87 and 76 countries, respectively; the IDR 2004 included the CIP index (CIP.6 index format) covering three decades, 1980, 1990 and 2000, including a sample of 93 countries (by adopting the same index format, the IDR 2009 expanded the benchmarking sample of countries to 122 countries for both 2000 and 2005); finally, the IDR 2011 compared 118 with the current CIP.8 format for 2005 and 2009.

5.1 Two decades of industrial competitiveness

Ranking countries across years using static indicators such as the CIP index entails two major problems. Firstly, given the relatively higher information requirements of the CIP index in comparison with its previous formats (CIP.4 and CIP.6 indices), the number of countries covered decreases drastically, from 135 in 2010 to only 53 countries in 1990. Secondly, because the CIP index covers different numbers of countries in each base year, problems of comparison, in particular of countries' movements in the rankings across the years, will emerge. We tried to address both methodological problems.

The first problem was partially resolved by recalculating the CIP index for all countries for which data were available over the last two decades and by comparing snapshots of world industrial competitiveness every five years. The country coverage for each five-year period is as follows:

- 1990 (coverage: 53 countries) – 1995 (coverage: 106 countries)
- 1995 (coverage: 106 countries) – 2000 (coverage: 129 countries)
- 2000 (coverage: 129 countries) – 2005 (coverage: 134 countries)
- 2005 (coverage: 134 countries) – 2010 (coverage: 135 countries).

The top 20 performers in each industrial competitiveness dimension for the base years considered are presented in the tables of the report's annex.

Drawing from this dataset, dynamic indicators have been computed to illustrate countries' structural trajectories and the speed of change in structural economic variables. Annual growth rates have been computed for the per capita figures, MVApc and MXpc; the sub-indicators have been calculated as share figures (MVAsh, MXsh, MHVAsh, MHXsh, ImWMVA and ImWMT) and we present cumulative changes over a span of five years. In the case of countries' world share figures, that is, ImWMVA and ImWMT, the results are strongly affected by the change in country coverage over the period 1990 – 1995. The world industrial competitiveness rankings for the subsequent time periods are much more comparable, as countries tend to enter the ranking in the middle, lower middle and bottom quintiles. These countries are highlighted in colour in Table 32.

The second problem arising in longitudinal analyses of world industrial competitiveness rankings is mainly attributable to the fact that countries entering the ranking over time affect the relative positioning of all other countries, independently from their performance in the sub-indicators of the CIP index. In order to avoid that countries climb the world ranking or, vice versa, drop several positions as a result of new entrants in the world industrial competition, a virtual ranking is provided which recounts movements in

the rankings, excluding the new entrants. The virtual world industrial competitiveness ranking is named CIP* and the net change in the world ranking is named Change*.

The longitudinal analysis of world industrial competitiveness is also performed by regional groups, income groups and industrial development groups for a span of ten years, from 1990 to 2000 and from 2000 to 2010. This part of the analysis aims at highlighting long-term structural trajectories of different country groups and indicating changes in the relationships among the structural economic variables composing the CIP index.

Before addressing the details of the longitudinal analysis and the identification of countries' structural trajectories, Table 32 provides a first overview of the world industrial competitiveness rankings over the last two decades, from 1990 to 2000. Countries are listed according to the 2010 world industrial competitiveness ranking and subdivided into quintiles. The same division by quintile is also used for the 2000 period. The comparison between the 2010 CIP world ranking and the 2000 CIP world ranking for the top and upper middle quintile of the rankings allows us to highlight the winners and losers over the last decade.

As shown in Table 33, the three fastest catching up economies in the industrial competitiveness ranking have been Viet Nam, China and India, which gained 18, 16 and 9 positions, respectively, in the world ranking. The other countries include a number of successful transition economies which are members of the European Union, namely Poland, Slovakia, Romania, Lithuania and Czech Republic. Although at a slower pace, Ukraine and the Russian Federation climbed 6 and 3 positions, respectively. Three countries from the Middle East and North Africa region also belong to this group, a rapidly industrializing country with a large population size, i.e. Turkey, and two major oil exporters and producers, Kuwait and Saudi Arabia. Among the industrialized economies, while Japan, Germany and the United States maintain their positions, Switzerland and three East Asian economies have registered the most impressive jump in the ranking. The Republic of Korea, in particular, gained 8 positions within only 10 years (in fact, within only five years if we consider that it has maintained its fourth position in the world ranking since 2005).

While some countries have been gaining positions, others have dropped significantly in the industrial competitiveness ranking. Among the most important mature industrial economies, Canada and the United Kingdom are the two countries that have lost a lot of ground, 11 and 10 positions, respectively. The other two major European industrial economies, France and Italy, have also lost 5 and 4 positions, respectively. Among the largest emerging industrial economies, Philippines, Mexico and Brazil have fallen back in the industrial competitiveness ranking.

Given data availability, the identification of winners and losers for a longer time span can only be achieved for the top 20 countries. The analysis confirms the main results presented in Table 33 and shows the rapid and cumulative process of increasing industrial competitiveness experienced in particular by China, the Republic of Korea, the Czech Republic and China, Taiwan Province. These variations are also highlighted in Table 33.

Table 32: The CIP index world ranking over 20 years, 1990 - 2010

Countries arranged by 2010 CIP ranking	Ranking 2010	Ranking 2009	Ranking 2008	Ranking 2007	Ranking 2006	Ranking 2005	Ranking 2004	Ranking 2003	Ranking 2002	Ranking 2001	Ranking 2000	Ranking 1999	Ranking 1998	Ranking 1997	Ranking 1996	Ranking 1995	Ranking 1994	Ranking 1993	Ranking 1992	Ranking 1991	Ranking 1990
Japan	1	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Germany	2	1	1	1	2	2	2	2	2	3	3	3	3	3	3	2	2	2	2	2	NA
United States of America	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	3	3	3	3	3	2
Republic of Korea	4	4	4	4	4	4	5	9	10	10	12	13	15	15	13	13	14	13	15	15	14
China, Taiwan Province	5	5	5	5	5	10	10	11	11	12	10	12	11	11	11	12	12	12	11	11	10
Singapore	6	7	9	9	7	9	11	13	13	13	11	10	12	9	9	10	9	10	12	12	11
China	7	10	14	15	16	18	19	19	21	22	23	23	23	23	25	26	27	29	30	NA	NA
Switzerland	8	9	10	12	13	13	13	12	12	11	14	11	10	10	10	7	7	7	7	7	6
Belgium	9	6	7	8	9	6	7	8	8	9	9	9	8	8	7	8	10	9	8	8	8
France	10	8	6	6	6	5	4	4	5	4	5	5	5	6	6	6	6	6	5	6	5
Italy	11	11	8	7	10	8	6	5	7	7	7	6	6	5	5	5	5	5	6	5	4
Netherlands	12	13	12	13	14	14	15	15	15	14	15	14	13	12	12	11	11	11	9	9	9
Sweden	13	15	11	10	11	12	12	14	14	15	13	15	14	14	14	14	13	14	13	13	12
United Kingdom	14	14	13	11	8	7	8	7	6	5	4	4	4	4	4	4	4	4	4	4	3
Ireland	15	12	15	14	12	11	9	6	4	6	8	8	9	13	15	15	16	16	17	17	15
Austria	16	16	16	17	17	16	16	16	17	17	17	17	16	16	16	16	15	15	14	14	13
Canada	17	17	18	16	15	15	14	10	9	8	6	7	7	7	8	9	8	8	10	10	7
Finland	18	18	17	18	18	17	17	17	16	16	16	18	18	18	18	18	19	19	19	19	18
Spain	19	19	19	19	19	19	18	18	18	18	18	16	17	17	17	17	17	17	16	16	16
Czech Republic	20	20	20	20	23	23	23	23	23	24	26	28	27	28	28	30	30	30	NA	NA	NA
Malaysia	21	22	23	22	20	21	21	21	22	21	20	21	21	20	20	20	20	21	24	22	23
Mexico	22	23	22	23	22	22	22	22	20	19	19	19	20	21	21	21	22	22	22	25	25
Thailand	23	26	27	25	24	24	24	25	25	25	24	24	28	25	24	24	26	26	28	27	26
Denmark	24	21	21	21	21	20	20	20	19	20	21	20	19	19	19	19	18	18	18	18	17
Poland	25	24	26	26	26	28	28	32	31	33	33	34	34	35	34	36	35	37	41	NA	NA
Israel	26	25	25	28	25	25	25	24	24	23	22	22	22	22	22	22	21	20	20	21	20
Slovakia	27	27	24	24	28	29	31	31	35	35	35	35	35	36	37	35	37	NA	NA	NA	NA
Australia	28	29	29	30	29	27	27	27	26	26	25	25	26	24	23	23	23	24	25	23	21

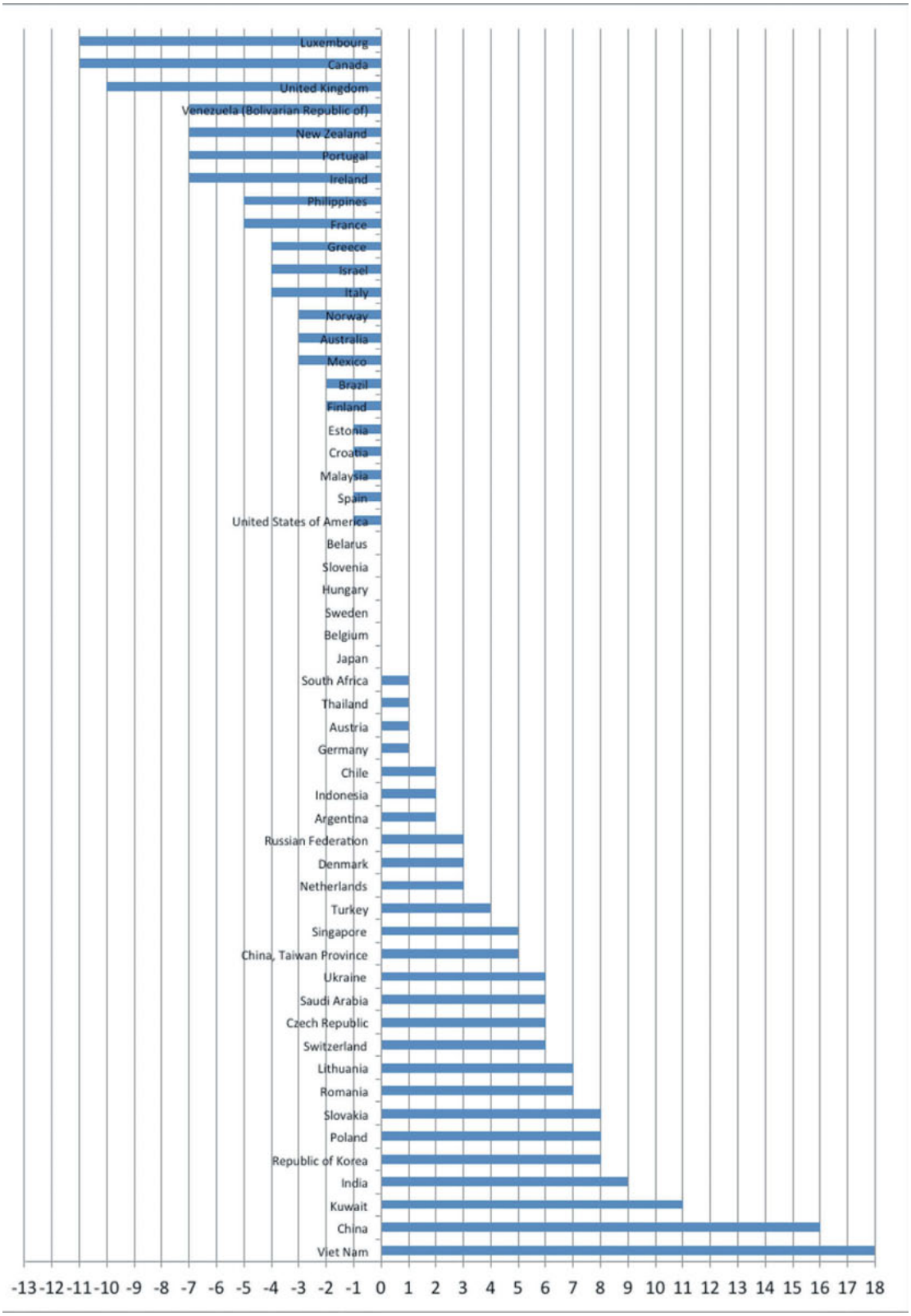
Countries arranged by 2010 CIP ranking	Ranking 2010	Ranking 2009	Ranking 2008	Ranking 2007	Ranking 2006	Ranking 2005	Ranking 2004	Ranking 2003	Ranking 2002	Ranking 2001	Ranking 2000	Ranking 1999	Ranking 1998	Ranking 1997	Ranking 1996	Ranking 1995	Ranking 1994	Ranking 1993	Ranking 1992	Ranking 1991	Ranking 1990
Hungary	29	28	28	27	27	26	26	26	28	29	29	29	31	34	41	38	41	41	37	NA	NA
Turkey	30	31	30	29	30	31	29	33	33	34	34	33	33	33	32	32	33	32	31	28	27
Norway	31	30	31	32	31	30	30	29	29	28	28	26	25	26	26	25	24	25	23	20	19
Slovenia	32	32	32	31	32	32	32	30	30	30	32	31	30	30	31	31	31	31	29	NA	NA
Brazil	33	34	33	34	34	34	34	35	34	32	31	32	29	29	29	29	29	27	27	26	24
Portugal	34	33	34	33	33	33	33	28	27	27	27	27	24	27	27	27	28	28	26	24	22
Argentina	35	35	36	37	37	37	37	37	39	36	37	36	32	31	33	33	32	33	32	NA	NA
Russian Federation	36	36	35	35	35	36	36	36	37	39	39	40	39	39	36	NA	NA	NA	NA	NA	NA
Saudi Arabia	37	37	38	38	38	38	38	39	42	43	43	43	40	40	40	41	40	39	35	31	NA
Indonesia	38	40	42	41	42	41	42	42	40	41	40	42	44	42	39	39	39	38	40	36	33
Kuwait	39	38	39	39	41	47	48	48	47	52	50	49	48	46	65	60	57	59	60	50	42
Belarus	40	42	40	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
South Africa	41	41	41	40	39	39	41	41	41	42	42	41	43	41	38	37	38	36	38	NA	NA
Luxembourg	42	39	37	36	36	35	35	34	32	31	30	30	NA	NA	NA	NA	NA	NA	NA	NA	NA
India	43	43	50	50	50	52	53	53	53	53	52	52	52	49	48	48	50	53	52	44	38
Philippines	44	45	45	42	40	40	39	38	36	38	38	37	37	38	43	46	46	45	44	33	NA
Chile	45	44	44	43	43	43	44	45	45	46	47	47	46	45	45	43	45	44	43	37	34
Romania	46	47	52	49	49	50	50	52	51	55	53	55	56	54	49	50	51	51	50	40	32
Lithuania	47	49	43	44	45	46	47	47	49	51	54	56	51	52	54	53	56	52	48	NA	NA
New Zealand	48	48	47	45	44	42	40	40	38	40	41	39	38	37	35	34	34	34	33	29	28
Greece	49	46	46	46	46	45	45	43	44	44	45	44	41	44	42	40	36	35	34	30	29
Croatia	50	51	48	48	48	48	46	46	46	47	49	50	47	47	47	45	43	42	36	NA	NA
Venezuela (Bolivarian Republic of)	51	50	53	64	61	44	43	56	54	45	44	46	42	43	44	42	42	40	39	32	35
Estonia	52	52	49	47	47	49	51	50	52	50	51	54	53	56	59	56	NA	NA	NA	NA	NA
Ukraine	53	53	51	52	51	54	52	54	56	59	59	62	62	59	55	NA	NA	NA	NA	NA	NA
Viet Nam	54	55	60	62	62	64	64	66	68	71	72	71	79	NA	NA	NA	NA	NA	NA	NA	NA
Iran (Islamic Republic of)	55	68	70	66	65	68	69	70	71	72	76	75	76	77	NA	NA	NA	NA	NA	NA	NA
Costa Rica	56	57	54	53	52	53	55	51	50	49	48	45	49	51	61	58	58	NA	NA	NA	NA

Countries arranged by 2010 CIP ranking	Ranking 2010	Ranking 2009	Ranking 2008	Ranking 2007	Ranking 2006	Ranking 2005	Ranking 2004	Ranking 2003	Ranking 2002	Ranking 2001	Ranking 2000	Ranking 1999	Ranking 1998	Ranking 1997	Ranking 1996	Ranking 1995	Ranking 1994	Ranking 1993	Ranking 1992	Ranking 1991	Ranking 1990
Qatar	57	54	56	51	55	61	59	60	59	60	61	58	54	57	58	55	47	47	45	39	NA
Tunisia	58	56	58	60	59	57	56	55	55	54	55	51	50	50	50	47	48	49	49	41	37
Bulgaria	59	58	57	55	58	59	60	58	60	61	65	65	63	60	52	NA	NA	NA	NA	NA	NA
Trinidad and Tobago	60	65	55	57	56	56	62	61	63	57	60	64	64	63	63	62	67	61	57	47	NA
Malta	61	62	59	54	54	55	54	49	48	48	46	48	45	48	46	44	44	43	42	34	31
Egypt	62	59	63	69	68	67	65	64	66	65	64	66	66	64	68	65	63	NA	NA	NA	NA
Peru	63	63	64	61	64	65	67	71	70	70	69	70	69	68	67	64	62	62	58	NA	NA
Colombia	64	61	61	56	57	58	58	59	58	56	56	57	55	55	53	49	49	46	47	38	NA
Iceland	65	60	62	58	60	60	57	57	57	58	58	53	57	53	51	51	53	54	53	43	39
Morocco	66	67	68	65	66	63	63	62	61	63	62	60	60	65	62	59	59	56	NA	NA	NA
China, Hong Kong SAR	67	64	65	59	53	51	49	44	43	37	36	38	36	32	30	28	25	23	21	NA	NA
Latvia	68	66	66	63	63	62	61	65	65	67	67	68	65	66	66	63	66	NA	NA	NA	NA
Oman	69	70	69	70	78	83	86	87	67	69	71	77	73	74	75	74	70	65	NA	NA	NA
Kazakhstan	70	69	67	67	69	70	70	73	76	77	79	80	78	71	71	66	NA	NA	NA	NA	NA
El Salvador	71	71	71	68	67	66	76	75	75	73	74	69	68	69	73	71	68	NA	NA	NA	NA
Jordan	72	73	73	72	73	72	71	74	73	75	86	79	81	81	77	70	69	67	61	49	43
Uruguay	73	72	72	73	72	71	72	72	74	66	66	63	61	62	60	57	54	55	NA	NA	NA
Pakistan	74	74	74	71	70	69	68	68	69	68	68	67	67	67	64	61	60	57	56	48	41
Lebanon	75	75	75	74	76	73	74	76	78	81	83	83	77	NA	NA	NA	NA	NA	NA	NA	NA
Serbia	76	76	76	76	74	79	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Guatemala	77	79	80	78	86	75	80	80	84	78	81	76	72	75	74	73	71	64	NA	NA	NA
Bangladesh	78	78	81	80	77	81	79	81	83	84	84	82	82	79	79	76	75	68	64	54	46
Mauritius	79	77	78	75	71	74	66	63	62	62	63	61	58	61	56	54	55	50	51	42	36
Sri Lanka	80	81	83	81	79	80	77	77	77	76	73	72	75	76	76	72	72	66	62	51	44
Syrian Arab Republic	81	80	79	79	81	91	91	93	94	102	97	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Algeria	82	87	87	86	89	86	85	84	85	82	78	84	84	80	78	75	73	63	59	NA	NA
Bosnia and Herzegovina	83	83	82	83	84	87	87	89	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
The f. Yugosl. Rep of Macedonia	84	82	77	77	80	78	78	79	79	80	75	74	71	72	70	68	65	NA	NA	NA	NA

Countries arranged by 2010 CIP ranking	Ranking 2010	Ranking 2009	Ranking 2008	Ranking 2007	Ranking 2006	Ranking 2005	Ranking 2004	Ranking 2003	Ranking 2002	Ranking 2001	Ranking 2000	Ranking 1999	Ranking 1998	Ranking 1997	Ranking 1996	Ranking 1995	Ranking 1994	Ranking 1993	Ranking 1992	Ranking 1991	Ranking 1990
Swaziland	85	84	85	84	75	76	75	69	72	74	70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Botswana	86	86	84	82	83	82	81	78	80	83	80	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ecuador	87	85	86	88	87	89	88	86	87	88	87	86	83	82	80	79	74	70	68	55	47
Cyprus	88	88	89	91	90	88	84	83	82	85	82	78	74	73	72	67	64	60	54	46	40
Côte d'Ivoire	89	89	91	90	88	84	82	85	86	86	85	81	80	78	82	78	NA	NA	NA	NA	NA
Cambodia	90	93	92	92	92	92	90	90	90	92	93	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Honduras	91	91	90	89	91	93	89	88	88	87	90	87	86	84	83	89	84	76	NA	NA	NA
Bolivia (Plurina-tional State of)	92	92	94	96	94	96	94	95	93	91	89	85	88	86	85	81	78	71	67	NA	NA
Jamaica	93	90	88	85	85	85	83	82	81	79	77	73	70	70	69	69	61	58	55	45	NA
Albania	94	94	102	93	107	108	97	98	97	96	98	92	100	102	96	NA	NA	NA	NA	NA	NA
Nigeria	95	107	100	113	104	112	111	112	105	129	123	111	109	100	107	NA	NA	NA	NA	NA	NA
Georgia	96	98	96	97	95	97	100	105	103	104	103	102	102	NA	NA	NA	NA	NA	NA	NA	NA
Cameroon	97	96	95	94	97	101	103	101	102	95	101	91	90	90	91	87	80	72	66	53	45
Armenia	98	100	97	95	93	90	92	91	92	99	96	95	94	92	NA	NA	NA	NA	NA	NA	NA
Paraguay	99	99	98	99	100	102	98	97	95	94	94	94	91	88	87	83	79	74	70	57	49
Congo	100	97	104	107	120	119	116	116	113	114	112	116	114	110	105	97	90	83	NA	NA	NA
Senegal	101	101	99	104	111	100	99	96	99	97	99	93	92	95	93	NA	NA	NA	NA	NA	NA
Kenya	102	102	105	103	101	98	107	99	98	103	102	97	95	93	89	84	82	75	69	56	48
Gabon	103	105	106	105	103	104	102	103	100	100	100	98	96	97	95	91	86	78	NA	NA	NA
Barbados	104	104	103	102	99	99	95	94	91	90	88	88	85	83	81	77	76	69	63	NA	NA
Fiji	105	103	101	100	98	95	93	92	89	89	91	89	87	85	84	80	77	73	65	52	52
United Republic of Tanzania	106	111	111	116	119	120	118	118	115	115	114	109	107	108	NA	NA	NA	NA	NA	NA	NA
Azerbaijan	107	106	107	101	102	103	105	108	106	105	105	100	97	89	88	NA	NA	NA	NA	NA	NA
Suriname	108	116	114	117	112	116	115	117	114	119	119	96	93	91	92	85	81	NA	NA	NA	NA
Mongolia	109	108	108	106	109	110	108	107	107	108	111	107	105	103	98	NA	NA	NA	NA	NA	NA
Panama	110	112	113	110	108	106	104	104	96	93	92	90	89	87	86	82	NA	NA	NA	NA	NA
Zambia	111	109	109	111	110	109	110	110	109	107	109	101	103	99	101	95	89	81	NA	NA	NA
China, Macao SAR	112	95	93	87	82	77	73	67	64	64	57	59	59	58	57	52	52	48	46	35	30

Countries arranged by 2010 CIP ranking	Ranking 2010	Ranking 2009	Ranking 2008	Ranking 2007	Ranking 2006	Ranking 2005	Ranking 2004	Ranking 2003	Ranking 2002	Ranking 2001	Ranking 2000	Ranking 1999	Ranking 1998	Ranking 1997	Ranking 1996	Ranking 1995	Ranking 1994	Ranking 1993	Ranking 1992	Ranking 1991	Ranking 1990
Belize	113	110	115	109	106	107	106	106	112	112	95	99	98	94	94	88	85	77	71	NA	NA
Republic of Moldova	114	113	110	108	105	105	101	102	101	101	104	103	99	98	90	86	83	NA	NA	NA	NA
Tajikistan	115	117	117	115	113	113	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Madagascar	116	114	112	112	118	117	113	114	117	111	106	108	108	106	102	98	92	82	72	59	51
Kyrgyzstan	117	118	116	114	115	115	109	109	111	109	108	105	101	96	97	90	NA	NA	NA	NA	NA
Ghana	118	119	121	120	117	111	117	115	110	110	110	106	104	104	99	94	88	80	73	NA	NA
Nepal	119	120	119	118	114	114	112	111	108	106	107	104	106	101	100	92	87	NA	NA	NA	NA
Uganda	120	122	122	122	121	125	124	125	125	124	124	118	116	112	108	103	96	NA	NA	NA	NA
Yemen	121	121	120	121	122	121	123	120	122	125	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mozambique	122	115	118	119	116	118	114	113	116	117	118	114	113	111	110	102	95	NA	NA	NA	NA
Saint Lucia	123	123	123	123	123	123	122	121	119	120	116	112	111	107	103	93	96	86	73	60	NA
Cape Verde	124	126	127	126	127	126	120	122	120	121	117	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Malawi	125	128	129	127	126	128	125	124	126	122	120	117	112	109	106	100	91	84	73	60	52
Sudan	126	125	125	98	96	94	96	100	104	98	NA	NA	NA	NA	NA	96	NA	NA	NA	NA	NA
Haiti	127	124	124	124	124	122	119	119	118	116	113	110	110	105	104	101	94	79	73	58	50
Niger	128	127	126	125	125	124	121	123	121	118	115	113	NA	NA	NA	NA	NA	NA	NA	NA	NA
Rwanda	129	129	128	128	129	129	127	127	124	126	126	119	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethiopia	130	130	131	130	130	130	128	128	129	129	127	120	117	114	111	105	NA	NA	NA	NA	NA
Central African Republic	131	131	130	129	128	127	126	126	123	123	121	115	115	113	109	99	93	85	NA	NA	NA
Burundi	132	132	132	131	131	131	129	129	129	128	127	120	117	114	111	104	96	86	NA	NA	NA
Eritrea	133	133	133	132	132	132	130	130	128	127	125	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gambia	133	133	133	132	132	132	130	130	129	129	127	120	117	114	111	105	NA	NA	NA	NA	NA
Iraq	133	133	133	132	132	132	130	130	127	113	122	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Country coverage	135	135	135	134	134	134	132	132	131	131	129	122	119	116	113	106	98	87	76	61	53

Table 33: Winners and losers in world competitive industrial performance rankings from 2000 to 2010 for the top and upper middle quintiles



5.2 Catching up, forging ahead, falling behind

The computation of dynamic indicators is of critical importance if we want to explain why and how some countries have been catching up, forging ahead or falling behind. Also, this allows to explain the speed and intensity at which structural change dynamics have been taking place and have transformed the overall industrial competitiveness of nations. Starting from the period 1990-1995, the following sections retrace countries' changes in structural economic variables.

Period 1990-1995

In the top and upper middle ranking during the period 1990-95 (see Table 34), Poland, China and Thailand registered two digit annual growth rates (AGR) of MVApc, followed by Malaysia, Indonesia and the Republic of Korea, where the same figures were around 8 percent. Ireland and Singapore in the top quintile, as well as Chile and India in the upper middle quintile, also showed a sustained increase in their capacity to produce manufactures. Albeit to different degrees, the performances of these nine countries were mainly attributable to external demand, but also to their strong technological efforts which resulted in important transformations of their export basket composition. All the listed countries, with the exception of China for which data are not available, experienced a two digit AGR of their MXpc, from 10 percent to 21 percent. With the exception of India and Chile, the export basket changed in favour of medium- and high-tech manufactures from 11 percent to 17 percent within five years.

The country with the best export performance during this period was Mexico which reported an AGR of MXpc of almost 35 percent and a cumulative change in MHXsh of 30 percent. However, if we consider the other value added indicators, the domestic content of export production remained low and even decreased over the period. In the Latin America region, Argentina and Peru registered sustained increases in their industrial capacities, while in South Asia, Bangladesh showed an AGR of its MVApc of around 5 percent. On the African continent, Uganda, Mauritius, Oman and Tunisia are those countries which experienced significant increases in the AGR of their MVApc.

Given the significant change in country coverage, which doubled in five years, figures based on world manufacturing value added and world manufactures trade shares are less reliable. However, the results are quite clear for some of the larger economies. The Republic of Korea's WMVA and WMT shares increased significantly, while all other traditional industrial economies experienced an overall negative development, partially due to the relatively slow growth of MVApc.

Table 34: Catching up, forging ahead and falling behind, 1990 - 1995

1990 CIP	1995 CIP	1995 CIP*	Change	Change*	*Arranged by 1995*	MVApc AGRate	MXpc AGRate	MHVAsh Change	MVAsh Change	MHXsh Change	MXsh Change	ImWMVA Change	IMWT Change
1	1	1	0	0	Japan	0.04	8.61	-2.27	-1.18	1.10	-0.55	-1.764	-0.481
	2				Germany	-1.51			-3.48			-1.177	
2	3	2	-1	0	United States of America	2.01	7.29	0.57	0.43	-0.09	2.27	1.298	-0.806
3	4	3	-1	0	United Kingdom	-0.18	5.27	-3.08	-1.38	1.44	3.06	-0.452	-1.183
4	5	4	-1	0	Italy	1.44	6.33	-5.16	0.35	1.48	0.42	-0.080	-0.940
5	6	5	-1	0	France	0.81	5.60	1.68	0.07	3.29	-0.35	-0.122	-1.193

1990 CIP	1995 CIP	1995 CIP*	Change	Change*	*Arranged by 1995*	MVApc AGRate	MXpc AGRate	MHVAsh Change	MVAsh Change	MHXsh Change	MXsh Change	ImWMVA Change	IMWT Change
6	7	6	-1	0	Switzerland	-0.03	4.58	-4.36	0.67	1.99	1.91	-0.054	-0.457
8	8	7	0	1	Belgium	0.23	6.81	26.79	-0.92	2.84	-0.62	-0.055	-0.499
7	9	8	-2	-1	Canada	0.96	8.12	1.99	0.30	1.07	2.78	0.005	-0.093
11	10	9	1	2	Singapore	4.92	11.72	2.69	-1.06	16.34	0.29	0.088	0.340
9	11	10	-2	-1	Netherlands	1.33	6.00	-3.41	-0.20	4.59	1.85	-0.002	-0.565
10	12	11	-2	-1	China, Taiwan Province	3.22	9.36	5.18	-3.75	11.25	-0.22	0.123	0.059
14	13	12	1	2	Republic of Korea	7.19	12.75	5.50	0.42	17.65	-0.51	0.486	0.505
12	14	13	-2	-1	Sweden	3.24	4.25	3.33	2.30	0.76	-5.73	0.058	-0.468
15	15	14	0	1	Ireland	5.43	12.65	4.26	1.72	2.02	1.02	0.060	0.135
13	16	15	-3	-2	Austria	0.86	3.93	2.01	-0.35	1.13	-7.68	-0.011	-0.346
16	17	16	-1	0	Spain	0.33	9.67	-2.42	-0.74	5.74	-0.11	-0.117	0.009
18	18	17	0	1	Finland	1.67	8.05	-0.20	2.48	3.87	-0.49	0.002	-0.061
17	19	18	-2	-1	Denmark	1.71	6.10	-3.66	-0.20	-0.17	-1.73	0.000	-0.157
23	20	19	3	4	Malaysia	8.79	21.32	5.59	2.44	15.01	14.31	0.146	0.786
25	21	20	4	5	Mexico	-0.64	34.49	-3.09	-0.31	11.87	30.39	-0.069	1.126
20	22	21	-2	-1	Israel	-0.11	5.99	3.21	-2.37	1.85	0.69	0.020	-0.003
21	23	22	-2	-1	Australia	-0.70	6.72	-1.55	-1.19	11.39	3.95	-0.065	-0.046
26	24	23	2	3	Thailand	10.83	20.32	9.99	4.40	14.50	6.82	0.280	0.480
19	25	24	-6	-5	Norway	0.13	-0.20	-7.61	-1.68	0.29	-7.38	-0.021	-0.225
	26				China	14.73		0.14	4.61			2.372	
22	27	25	-5	-3	Portugal	-0.59	7.36	-1.01	-1.77	7.21	0.70	-0.041	-0.069
	28				China, Hong Kong SAR	-11.65		5.83	-5.60			-0.128	
24	29	26	-5	-2	Brazil	0.97	6.92	1.63	-0.41	0.38	1.51	0.048	-0.055
	30				Czech Republic	-2.40		-5.96	-1.51			-0.055	
	31				Slovenia	-4.34		0.30	-3.91			-0.025	
27	32	27	-5	0	Turkey	2.62	11.32	1.49	1.19	2.99	9.43	0.101	0.070
	33				Argentina	3.15		2.05	-1.79			0.105	
28	34	28	-6	0	New Zealand	1.69	9.81	0.00	0.08	7.41	7.22	0.009	0.011
	35				Slovakia	-7.59			-5.49			-0.065	
	36				Poland	16.08		-6.49	6.93			0.191	
	37				South Africa	-2.35		1.15	-0.64			-0.041	
	38				Hungary	0.34		-20.13	2.02			-0.012	
33	39	29	-6	4	Indonesia	8.90	17.42	6.76	2.93	10.13	17.23	0.274	0.256
29	40	30	-11	-1	Greece	-1.77	4.34	-0.85	-1.14	5.42	-3.51	-0.035	-0.049
	41				Saudi Arabia	1.61		0.00	0.43			0.025	
35	42	31	-7	4	Venezuela (Bolivarian Republic of)	1.05	28.16	8.71	-0.07	-17.07	34.74	0.021	0.139
34	43	32	-9	2	Chile	5.22	19.47	1.19	-1.50	-0.96	13.47	0.053	0.074
31	44	33	-13	-2	Malta	1.84	10.97	8.60	-2.62	12.93	2.12	0.000	0.004
	45				Croatia	-14.27		3.89	-8.53			-0.082	
	46				Philippines	-0.27		4.47	-0.18			0.000	
37	47	34	-10	3	Tunisia	3.80	10.24	7.29	1.51	-3.46	10.54	0.009	0.012
38	48	35	-10	3	India	4.73	10.04	6.21	1.26	1.31	0.77	0.226	0.068

1990 CIP	1995 CIP	1995 CIP*	Change	Change*	*Arranged by 1995*	MVApc AGRate	MXpc AGRate	MHVAsh Change	MVAsh Change	MHXsh Change	MXsh Change	ImWMVA Change	IMWT Change
	49				Colombia	-4.23		0.61	-6.29			-0.081	
32	50	36	-18	-4	Romania	-4.96	6.21	3.57	-2.10	-11.19	-2.00	-0.043	-0.040
39	51	37	-12	2	Iceland	-0.91	8.91	-0.81	-0.13	4.80	11.58	-0.002	0.000
30	52	38	-22	-8	China, Macao SAR	-13.63	0.81	1.06	-10.33	2.14	-1.50	-0.010	-0.020
	53				Lithuania	-6.34			2.81			-0.017	
36	54	39	-18	-3	Mauritius	3.64	3.50	-0.78	0.05	0.52	0.30	0.002	-0.010
	55				Qatar	-7.04		2.02	-3.06			-0.006	
	56				Estonia	-2.76			1.77			-0.005	
	57				Uruguay	-2.16		-4.16	-4.45			-0.011	
	58				Costa Rica	3.08		2.65	0.09			0.008	
	59				Morocco	0.78		2.41	1.20			0.002	
42	60	40	-18	2	Kuwait	8.78	12.22	3.90	-2.31	3.58	-1.66	0.005	-0.002
41	61	41	-20	0	Pakistan	1.95	6.99	0.20	-0.09	0.70	6.23	0.020	-0.002
	62				Trinidad and Tobago	0.87		17.55	0.07			0.000	
	63				Latvia	-18.63		-12.25	-9.05			-0.036	
	64				Peru	3.44		-1.43	-0.09			0.022	
	65				Egypt	2.43		1.75	0.74			0.027	
	66				Kazakhstan	-5.62			2.30			-0.028	
40	67	42	-27	-2	Cyprus	-0.87	-4.21	0.91	-2.36	10.32	-4.48	-0.001	-0.008
	68				The f. Yugosl. Rep of Macedonia	-12.83		1.08	-9.37			-0.013	
	69				Jamaica	-2.54		-26.92	-3.30			-0.004	
43	70	43	-27	0	Jordan	0.58	7.76	1.43	-0.43	-8.05	12.56	0.003	0.004
	71				El Salvador	3.59		-14.62	-0.56			0.008	
44	72	44	-28	0	Sri Lanka	7.68	16.00	1.84	2.05	-0.06	17.37	0.010	0.029
	73				Guatemala	0.59		0.00	-0.94			0.002	
	74				Oman	6.46	13.90		0.84	11.69	9.20	0.005	0.008
	75				Algeria	-4.85		0.23	-1.36			-0.022	
46	76	45	-30	1	Bangladesh	5.82	14.99	-9.18	2.37	3.51	2.26	0.028	0.022
	77				Barbados	-1.18		17.52	-0.06			0.000	
	78				Côte d'Ivoire	-0.08		-77.67	1.48			0.002	
47	79	46	-32	1	Ecuador	-1.65	17.66	-4.65	-1.63	13.22	6.03	-0.004	0.007
52	80	47	-28	5	Fiji	2.93	1.71	-1.34	0.83	-3.82	3.28	0.000	-0.002
	81				Bolivia (Plurinational State of)	1.84		0.37	0.07			0.002	
	82				Panama	3.87		-3.14	0.30			0.004	
49	83	48	-34	1	Paraguay	0.05	14.06	0.00	-0.97	0.49	19.46	0.001	0.002
48	84	49	-36	-1	Kenya	-0.62	6.95	-1.11	0.51	-11.01	-4.44	0.001	0.000
	85				Suriname	-7.34		1.85	-3.26			-0.001	
	86				Republic of Moldova	-15.88			0.75			-0.008	
45	87	50	-42	-5	Cameroon	-4.97	-1.20	-0.93	-0.35	-12.52	9.02	-0.007	-0.005
	88				Belize	-0.51		13.21	-1.73			0.000	
	89				Honduras	0.84		-1.59	-0.04			0.002	

1990 CIP	1995 CIP	1995 CIP*	Change	Change*	*Arranged by 1995*	MVApc AGRate	MXpc AGRate	MHVAsh Change	MVAsh Change	MHXsh Change	MXsh Change	ImWMVA Change	IMWT Change
	90				Kyrgyzstan	-23.45		-5.38	-11.38			-0.009	
	91				Gabon	-3.08		-11.85	-0.54			0.000	
	92				Nepal	10.75		-0.47	2.61			0.003	
	93				Saint Lucia	-0.41			-0.73			0.000	
	94				Ghana	0.84		5.94	-0.27			0.001	
	95				Zambia	-3.81		5.31	0.08			-0.001	
	96				Sudan	1.56		0.00	-0.30			0.001	
	97				Congo	-4.74		0.00	-0.58			-0.001	
51	98	51	-47	0	Madagascar	-3.17	-1.53	0.00	0.03	-4.08	-3.11	-0.001	-0.001
	99				Central African Republic	-1.71		0.85	0.02			0.000	
52	100	52	48	0	Malawi	-0.69	1.90	3.71	-1.71	-4.19	1.51	0.000	-0.001
50	101	53	51	3	Haiti	-12.62	-32.81	-8.63	-6.08	-12.43	-22.66	-0.007	-0.006
	102				Mozambique	-4.68		-0.91	-1.81			-0.001	
	103				Uganda	8.86		3.77	1.16			0.002	
	104				Burundi	-6.24		-0.13	-0.74			0.000	
	105				Ethiopia	-7.27		2.62	-1.60			-0.003	
	105				Gambia	-2.84		8.04	-0.36			0.000	

Period 1995-2000

The second half of the 1990s (see Table 35) was characterized by the strong emergence of Ireland with double digit AGRs in MVApc and MXpc, and the sustainment of small transition economies such as Czech Republic, Hungary, Slovenia, Slovakia, Estonia, Lithuania and Latvia. While Poland had already experienced a strong catching up phase in the previous five years, the other transition economies inverted the negative trends of the first half of the 1990s and increasingly benefitted from their economic integration within the European Union. Among the high income European economies, the performance of Finland and Sweden was by far the best, only behind Ireland.

Among the top 10 performers, the United States took the lead, registering an AGR of MVApc over the year that was three times higher than Japan's, also capturing 1 percent shares in WMVA and WMT. On the contrary, within only five years, Japan registered a contraction of its share in WMVA of 2.2 percent and of 1.7 percent in WMT. Although less acute, initial signs of a manufacturing contraction were evident in the very modest performance of the United Kingdom and Italy, while France, Belgium, Austria and Netherlands showed a robust AGR of their MVApc of around 3 percent. Germany registered a world record contraction of exports equal to 2 percent shares of WMT. The Republic of Korea maintained its record performance with an AGR of MVApc equal to that registered in the previous five years.

Among the large emerging economies, China had the most remarkable AGR of MVApc equal to 8.7 percent, coupled with an AGR of MXpc of 10.5 percent. These performances resulted in an increase in China's share in WMVA of 1 percent and capturing 1 percent of WMT in five years. Also, Mexico coupled its manufactured exports expansion phase, which started in the first half of the 1990s, with an AGR of MVApc of 6 percent. In Latin America, both Brazil and Argentina registered contractions in almost all dimensions, while Chile also slowed down. India and Indonesia registered a relatively slower AGR of

MVApc and MXpc. In the South East Asia region, Philippines had a spectacular AGR of MXpc of almost 30 percent. However, this performance was not matched by the AGR of MVApc, which was only 1 percent (contrary to Viet Nam where the AGR of MVApc was almost 10 percent). This reveals Philippines' unique form of integration in world global value chains. On the African continent, Egypt, Cameroon, Mozambique, Uganda and Sudan are the economies registering a robust AGR of MVApc. For many of them, the contraction in MXsh revealed the impact of oil exports on MVApc figures.

Table 35: Catching up, forging ahead and falling behind, 1995 – 2000

1995 CIP	2000 CIP	2000 CIP*	Change	Change*	*Arranged by 2000*	MVApc AGRate	MXpc AGRate	MHVAsh Change	MVAsh Change	MHXsh Change	MXsh Change	ImWMVA Change	IMWT Change
1	1	1	0	0	Japan	0.94	1.02	2.30	0.25	1.13	-1.51	-2.292	-1.719
3	2	2	1	1	United States of America	3.42	5.16	0.78	0.12	3.04	3.37	1.078	0.903
2	3	3	-1	-1	Germany	2.04	0.83	5.10	0.19	3.50	0.06	-0.499	-1.984
4	4	4	0	0	United Kingdom	0.99	2.20	0.23	-1.69	2.43	-5.38	-0.479	-0.539
6	5	5	1	1	France	2.92	1.18	-8.03	0.38	4.21	3.16	-0.063	-0.914
9	6	6	3	3	Canada	5.20	6.04	3.07	1.66	4.22	-2.42	0.254	0.433
5	7	7	-2	-2	Italy	1.03	0.67	-0.41	-0.69	1.77	-0.01	-0.460	-0.984
15	8	8	7	7	Ireland	10.34	12.30	10.64	2.35	4.01	6.87	0.153	0.476
8	9	9	-1	-1	Belgium	2.89	2.36	3.50	0.21	0.99	2.85	-0.018	-0.365
12	10	10	2	2	China, Taiwan Province	4.87	5.83	1.52	0.58	8.70	2.22	0.132	0.267
10	11	11	-1	-1	Singapore	3.70	-0.16	6.75	0.49	1.79	1.05	0.056	-0.153
13	12	12	1	1	Republic of Korea	7.10	6.10	5.38	3.89	1.64	1.38	0.426	0.337
14	13	13	1	1	Sweden	7.55	2.86	4.13	3.43	5.99	2.70	0.142	-0.147
7	14	14	-7	-7	Switzerland	0.64	-1.24	0.70	-0.94	3.18	-2.80	-0.107	-0.487
11	15	15	-4	-4	Netherlands	2.70	1.40	-0.65	-0.50	7.18	-6.30	-0.016	-0.444
18	16	16	2	2	Finland	8.42	2.33	9.22	3.85	9.60	0.99	0.103	-0.096
16	17	17	-1	-1	Austria	3.54	1.51	4.78	0.64	4.55	-1.50	0.002	-0.178
17	18	18	-1	-1	Spain	4.43	4.51	-0.71	0.61	0.93	0.58	0.096	0.021
21	19	19	2	2	Mexico	6.06	15.31	3.55	1.94	3.04	4.84	0.332	1.278
20	20	20	0	0	Malaysia	5.67	3.55	1.73	4.67	8.17	0.95	0.098	0.115
19	21	21	-2	-2	Denmark	1.27	0.53	3.82	-0.82	2.91	2.96	-0.039	-0.154
22	22	22	0	0	Israel	3.25	5.71	12.62	0.59	1.04	-8.58	0.033	0.084
26	23	23	3	3	China	8.74	10.56	4.90	1.60	10.12	2.84	1.652	1.276
24	24	24	0	0	Thailand	1.64	3.84	6.90	3.56	9.88	3.49	-0.033	0.013
23	25	25	-2	-2	Australia	0.79	3.39	0.00	-1.44	4.89	-0.49	-0.074	-0.004
30	26	26	4	4	Czech Republic	5.55	7.13	7.03	4.16	11.99	3.94	0.019	0.055
27	27	27	0	0	Portugal	3.90	0.15	6.61	0.07	9.09	-1.28	0.010	-0.109
25	28	28	-3	-3	Norway	0.78	0.29	2.52	-1.11	-2.54	-9.84	-0.032	-0.067
38	29	29	9	9	Hungary	8.99	20.30	26.09	3.88	27.76	8.59	0.035	0.261
	30				Luxembourg	3.52		3.13	-0.59			0.002	
29	31	30	-2	-1	Brazil	-1.24	2.10	-16.17	-1.36	10.00	0.68	-0.303	-0.047
31	32	31	-1	0	Slovenia	5.34	0.86	3.00	1.24	5.48	0.36	0.007	-0.033
36	33	32	3	4	Poland	8.20	8.33	-0.61	1.95	11.11	7.73	0.093	0.085

1995 CIP	2000 CIP	2000 CIP*	Change	Change*	*Arranged by 2000*	MVApc AGRate	MXpc AGRate	MHVAsh Change	MVAsh Change	MHXsh Change	MXsh Change	ImWMVA Change	IMWT Change
32	34	33	-2	-1	Turkey	2.44	3.67	-0.07	0.10	8.65	1.95	0.022	0.016
35	35	34	0	1	Slovakia	4.17	7.63	1.92	0.42	12.88	2.06	0.003	0.030
28	36	35	-8	-7	China, Hong Kong SAR	-5.68	-6.15	6.11	-1.38	-7.37	-0.55	-0.047	-0.280
33	37	36	-4	-3	Argentina	-0.21	2.38	1.34	-1.38	5.71	-2.82	-0.115	-0.016
46	38	37	8	9	Philippines	0.99	29.71	8.30	-0.50	34.16	43.93	-0.009	0.522
	39				Russian Federation	3.07		1.73	1.13			-0.036	
39	40	38	-1	1	Indonesia	1.33	6.38	6.97	2.67	12.04	4.40	-0.035	0.122
34	41	39	-7	-5	New Zealand	0.02	-0.40	0.00	-1.36	1.83	3.25	-0.019	-0.030
37	42	40	-5	-3	South Africa	0.64	0.94	-5.48	-0.27	7.83	13.07	-0.024	-0.038
41	43	41	-2	0	Saudi Arabia	3.20	1.84	0.00	1.44	-6.59	-5.12	0.033	-0.003
42	44	42	-2	0	Venezuela (Bolivarian Republic of)	3.14	2.52	11.07	3.62	-3.15	-10.89	0.027	-0.002
40	45	43	-5	-3	Greece	1.64	-0.42	0.31	-0.59	9.57	1.34	-0.015	-0.042
44	46	44	-2	0	Malta	4.78	4.11	10.55	0.57	4.46	1.08	0.001	0.000
43	47	45	-4	-2	Chile	0.59	2.72	0.00	-1.97	3.93	3.11	-0.020	-0.005
58	48	46	10	12	Costa Rica	5.24	29.71	0.93	2.96	38.34	37.31	0.011	0.058
45	49	47	-4	-2	Croatia	4.38	-0.37	0.00	0.20	4.86	-0.92	0.000	-0.028
60	50	48	10	12	Kuwait	-5.49	53.54	-1.82	-0.89	-46.12	35.27	-0.010	0.143
56	51	49	5	7	Estonia	7.82	17.11	-1.82	0.54	15.20	0.71	0.002	0.028
48	52	50	-4	-2	India	2.77	5.24	-5.19	-0.81	-0.72	4.56	0.054	0.080
50	53	51	-3	-1	Romania	1.73	6.38	-6.00	1.52	-0.66	1.33	-0.010	0.010
53	54	52	-1	1	Lithuania	7.26	8.72	-3.63	1.59	-2.05	3.54	0.004	0.010
47	55	53	-8	-6	Tunisia	4.01	-0.53	2.95	-0.25	4.66	-2.53	0.005	-0.022
49	56	54	-7	-5	Colombia	-3.01	3.87	-3.22	-1.95	7.43	0.87	-0.070	0.005
52	57	55	-5	-3	China, Macao SAR	2.22	0.58	2.49	1.51	-3.09	2.60	0.000	-0.006
51	58	56	-7	-5	Iceland	3.14	-1.27	5.82	-0.40	3.98	-2.57	0.000	-0.004
	59				Ukraine	2.96		0.36	3.01			-0.007	
62	60	57	2	5	Trinidad and Tobago	8.23	15.44	-13.01	1.14	0.71	13.42	0.002	0.027
55	61	58	-6	-3	Qatar	3.73	1.51	-8.54	-1.22	3.01	-14.68	0.003	0.000
59	62	59	-3	0	Morocco	1.28	10.57	-3.00	-0.91	3.95	8.27	-0.005	0.033
54	63	60	-9	-6	Mauritius	4.56	-1.76	-5.28	-0.10	-2.73	-0.36	0.001	-0.009
65	64	61	1	4	Egypt	6.26	10.04	10.54	2.40	5.25	17.10	0.061	0.021
	65				Bulgaria	-5.58		5.57	-6.26			-0.023	
57	66	62	-9	-5	Uruguay	-0.82	2.66	-2.93	-2.06	3.08	3.97	-0.010	-0.002
63	67	63	-4	0	Latvia	5.92	8.36	-9.19	-0.42	-10.36	-0.30	0.001	0.004
61	68	64	-7	-3	Pakistan	0.72	-0.11	4.80	-0.03	0.67	0.00	-0.004	-0.020
64	69	65	-5	-1	Peru	0.14	3.16	-0.69	-0.63	1.55	-0.17	-0.014	0.000
	70				Swaziland	0.44		0.00	-3.75			-0.001	
74	71	66	3	8	Oman	3.90	9.84	0.43	0.64	-4.27	-0.63	0.002	0.011
	72				Viet Nam	9.57			3.31			0.030	
72	73	67	-1	5	Sri Lanka	6.36	10.25	-0.60	1.39	1.62	3.28	0.006	0.009
71	74	68	-3	3	El Salvador	2.84	10.17	12.61	1.87	-6.38	-19.96	0.003	0.005

1995 CIP	2000 CIP	2000 CIP*	Change	Change*	*Arranged by 2000*	MVApc AGRate	MXpc AGRate	MHVAsh Change	MVAsh Change	MHXsh Change	MXsh Change	ImWMVA Change	IMWT Change
68	75	69	-7	-1	The f. Yugosl. Rep of Macedonia	1.78	4.45	-9.13	-0.61	-20.84	11.56	-0.001	0.000
	76				Iran (Islamic Republic of)	7.43		6.10	2.60			0.049	
69	77	70	-8	-1	Jamaica	-3.12	-2.05	16.83	-1.00	2.00	1.63	-0.005	-0.008
75	78	71	-3	4	Algeria	-1.95	17.15	0.82	-1.36	-2.26	0.30	-0.015	0.058
66	79	72	-13	-6	Kazakhstan	5.12	-1.37	-6.12	1.03	-18.43	-22.16	0.000	-0.019
	80				Botswana	-0.15		10.99	-1.33			0.000	
73	81	73	-8	0	Guatemala	0.18	4.42	0.00	-0.94	1.99	-0.03	-0.002	0.003
67	82	74	-15	-7	Cyprus	-1.53	-5.11	0.95	-1.93	7.59	3.67	-0.003	-0.003
	83				Lebanon	-0.11			0.01			-0.004	
76	84	75	-8	1	Bangladesh	3.51	8.81	5.35	0.25	-2.60	3.92	0.011	0.026
78	85	76	-7	2	Côte d'Ivoire	3.41	9.89	0.47	2.87	1.65	16.42	0.004	0.011
70	86	77	-16	-7	Jordan	2.78	-7.49	2.13	1.14	-9.02	8.40	0.001	-0.010
79	87	78	-8	1	Ecuador	-0.90	7.00	-2.29	-0.21	-3.57	6.24	-0.006	0.004
77	88	79	-11	-2	Barbados	0.18	2.27	1.49	-0.77	-5.06	1.30	0.000	0.000
81	89	80	-8	1	Bolivia (Plurinational State of)	0.66	4.71	0.69	-0.41	18.22	6.66	-0.001	0.002
89	90	81	-1	8	Honduras	2.26	27.11	-0.03	1.36	-3.38	23.92	0.001	0.005
80	91	82	-11	-2	Fiji	3.01	-2.84	2.87	1.01	-0.14	-9.90	0.000	-0.005
82	92	83	-10	-1	Panama	-2.40	6.88	-0.54	-2.67	-1.97	5.04	-0.004	0.001
	93				Cambodia	18.11		-0.06	7.17			0.005	
83	94	84	-11	-1	Paraguay	-2.19	-4.22	0.00	0.12	-2.30	-1.73	-0.004	-0.002
88	95	85	-7	3	Belize	3.08	0.77	0.00	-0.07	0.24	-6.06	0.000	0.000
	96				Armenia	3.33		-10.67	-3.09			0.000	
	97				Syrian Arab Republic	-36.95		0.00	-59.55			-0.214	
	98				Albania	8.17		0.03	1.01			0.001	
	99				Senegal	0.20		1.94	-0.78			0.000	
91	100	86	-9	5	Gabon	2.77	3.84	0.00	0.78	-1.25	3.88	0.000	-0.001
87	101	87	-14	0	Cameroon	4.63	-11.50	-3.20	2.09	-1.10	-13.77	0.005	-0.006
84	102	88	-18	-4	Kenya	-2.66	-9.60	-8.40	-1.19	-1.77	-9.27	-0.005	-0.010
	103				Georgia	14.30			2.35			0.002	
86	104	89	-18	-3	Republic of Moldova	-3.87	-9.50	6.36	-2.04	-2.25	-4.67	-0.002	-0.008
	105				Azerbaijan	-16.75		-5.06	-12.51			-0.009	
98	106	90	-8	7	Madagascar	1.12	32.53	-3.90	0.18	-1.78	36.61	0.000	0.007
92	107	91	-15	1	Nepal	3.87	4.45	2.58	0.64	6.31	-20.34	0.001	-0.001
90	108	92	-18	-2	Kyrgyzstan	10.42	-12.34	-8.46	4.65	12.55	-33.50	0.001	-0.004
95	109	93	-14	2	Zambia	1.28	17.02	0.00	0.46	-8.97	22.89	0.000	0.003
94	110	94	-16	0	Ghana	2.21	9.65	0.00	0.15	-0.47	8.59	0.000	0.001
	111				Mongolia	-7.90		-0.20	-4.50			-0.001	
97	112	95	-15	1	Congo	-5.09	0.00	7.20	-0.96	0.00	0.00	-0.001	0.000
101	113	96	-12	4	Haiti	-1.31	16.86	0.25	-1.01	1.53	19.44	-0.001	0.001
	114				United Republic of Tanzania	3.14		0.00	0.57			0.001	
	115				Niger	0.38	-7.12		0.39	7.81	-24.23	0.000	-0.001

1995 CIP	2000 CIP	2000 CIP*	Change	Change*	*Arranged by 2000*	MVApc AGRate	MXpc AGRate	MHVAsh Change	MVAsh Change	MHXsh Change	MXsh Change	ImWMVA Change	IMWT Change
93	116	97	-23	-4	Saint Lucia	-2.44	-15.14	-0.65	-1.07	5.29	3.66	0.000	-0.001
	117				Cape Verde	3.97			0.01			0.000	
102	118	98	-16	3	Mozambique	15.70	3.34	0.52	4.20	1.33	-9.19	0.004	0.000
85	119	99	-34	-14	Suriname	0.93	-49.90	0.00	0.16	32.24	-63.25	0.000	-0.008
100	120	100	-20	-1	Malawi	-2.66	0.07	-13.28	-2.37	4.23	4.38	-0.001	0.000
99	121	101	-22	-3	Central African Republic	-2.96	-0.78	0.00	-1.07	-15.95	30.05	0.000	0.000
	122				Iraq	2.99		2.01	-0.18			0.000	
	123				Nigeria	-2.49		-0.75	-0.55			-0.005	
103	124	102	-21	0	Uganda	9.99	-7.67	-1.04	2.02	-17.08	1.40	0.003	0.000
	125				Eritrea	1.85		-11.03	1.77			0.000	
	126				Rwanda	-0.87			-1.20			0.000	
105	127	103	-22	1	Ethiopia	0.99	-2.97	5.62	-0.17	0.38	-1.94	0.000	0.000
104	127	103	-23	0	Burundi	-0.43	-23.39	0.00	0.85	-6.61	0.95	0.000	0.000
105	127	103	-22	1	Gambia	-2.24	-16.74	0.00	-0.81	7.00	-21.15	0.000	0.000
96					Sudan	7.99	44.51		1.47	7.57	48.12	0.005	0.020

Period 2000-2005

The first half of the 2000s, although confirming some of the main patterns observed in the mid-1990s, also saw the emergence of new players from around the world (see Table 36). First, the unified Germany entered the ranking, immediately jumping to third position in 2000 and second position in 2005. This result was mainly driven by the country's exceptional export performance, as registered by the double digit AGR of MXpc and the gain of 1.5 percent shares in WMT. By contrast, the other four major European industrial economies indicated the beginning of a manufacturing contraction in the mid-half of the 2000s. The AGR of MVApc of Italy and of the United Kingdom turned negative after semi-stagnation in the late 1990s, while France also stagnated, registering an AGR of MVApc equal to 0.6 percent.

In the top quintile of the ranking, other relatively smaller European economies registered a double digit AGR of MXpc. The two most dynamic transition economies, Czech Republic and Hungary followed by Finland, registered the highest AGR of MVApc in Europe. All other transition economies in the upper middle quintile of the ranking continued their fast catching up process and export performance.

The Republic of Korea entered the top 10 of the CIP world ranking for the first time, confirming the outstanding performances registered since 1990, and took fourth position in the world ranking. This result was driven by an exceptional AGR of MVApc, higher than 6 percent for the third quinquennial period, which resulted in an increase of 0.4 percent share in WMVA (while the capacity of capturing WMT share decresead compared to the previous decade). The other two successful East Asian economies, Singapore and China, Taiwan Province, also consolidated their positions among the top 10 most industrially competitive countries.

Despite the brilliant performances of Germany and the Republic of Korea, the most successful country by far in the first half of the 2000s was China. During this quinquennial period, China saw its MVApc grow at nearly 10 percent (AGR), while the annual growth rate of MXpc equal to 25 percent was the

world best performance (with the exclusion of a few African oil exporting economies). The resulting gains in both WMVA and WMT, by far the highest in the world and the best performance by China since 1995, clearly show that the country entered a cumulative self-reinforcing process of industrialization. If we compare China's structural trajectory with that of the United States, the change in their performances in WMT lie at two extremes. The United States' modest annual increases in MVApc and MXpc did not allow the country to maintain its shares in WMT. At the end of the quinquennial period, the cumulate change in WMT was almost equal to 4 percent. Similarly, Japan registered a contraction in WMVA and WMT shares.

The shares lost were not, of course, all taken by China, given the relatively different export baskets and technological complexity of the United States and Japanese economies. However, it is remarkable how China managed to increase its share of medium- and high-tech products in total manufactured exports to 12 percent within only five years. This reveals a fast process of technological deepening and diversification of the overall export basket.

Among the large emerging economies, India registered the highest and most robust AGR of MVApc equal to 5.2 percent and MXpc of 17.8 percent during this quinquennial period. These were the highest AGRs for India since 1990. In the same regional area, the important manufacturing expansion registered in Pakistan and Iran (Islamic Republic of) is also noteworthy, while Viet Nam emerged as the new booming manufacturing country with double digit AGRs of MVApc and MXpc. After five years of relative lower expansion, Indonesia picked up its pace again. For the first time, the Russian Federation showed a robust AGR of MVApc coupled with an AGR of MXpc equal to 18 percent. However, the decrease in MXsh in total exports also revealed the relative higher role played by oil and gas exports in total exports. On the contrary, Brazil and South Africa registered relatively modest performances.

Table 36: Catching up, forging ahead and falling behind, 2000-2005

2000 CIP	2005 CIP	2005 CIP*	Change	Change*	*Arranged by 2005*	MVApc AGRate	MXpc AGRate	MHVAsh Change	MVAsh Change	MHXsh Change	MXsh Change	ImWMVA Change	IMWT Change
1	1	1	0	0	Japan	1.62	4.03	3.04	0.50	-3.04	-1.13	-1.097	-2.187
3	2	2	1	1	Germany	1.10	13.01	2.55	0.61	-0.45	3.60	-0.595	1.564
2	3	3	-1	-1	United States of America	1.72	1.14	-1.92	0.28	-2.65	-1.13	-0.369	-3.884
12	4	4	8	8	Republic of Korea	6.02	10.26	1.64	2.53	4.94	0.99	0.417	0.148
5	5	5	0	0	France	0.64	7.47	-0.88	-0.25	-0.86	0.42	-0.279	-0.411
9	6	6	3	3	Belgium	0.20	12.32	-0.28	-0.81	2.63	0.75	-0.079	0.468
4	7	7	-3	-3	United Kingdom	-0.82	6.17	-0.90	-2.03	-2.35	1.32	-0.610	-0.651
7	8	8	-1	-1	Italy	-1.06	8.47	-0.78	-1.46	0.64	-1.72	-0.608	-0.213
11	9	9	2	2	Singapore	2.69	7.91	2.52	0.30	-7.59	-0.29	0.024	-0.022
10	10	10	0	0	China, Taiwan Province	5.94	4.41	0.00	3.50	-1.11	-0.73	0.240	-0.618
8	11	11	-3	-3	Ireland	1.19	5.91	-5.08	-3.09	-0.47	0.58	-0.003	-0.133
13	12	12	1	1	Sweden	4.49	7.58	3.77	2.15	-3.10	-1.81	0.076	-0.134
14	13	13	1	1	Switzerland	1.43	10.10	0.00	0.51	-0.28	1.51	-0.043	0.052
15	14	14	1	1	Netherlands	0.32	11.04	4.27	-0.33	-0.97	4.02	-0.096	0.260
6	15	15	-9	-9	Canada	-1.27	1.73	-6.17	-2.32	-4.57	-4.39	-0.339	-1.198
17	16	16	1	1	Austria	1.20	13.29	2.87	0.05	1.15	2.70	-0.041	0.215

2000 CIP	2005 CIP	2005 CIP*	Change	Change*	*Arranged by 2005*	MVApc AGRate	MXpc AGRate	MHVAsh Change	MVAsh Change	MHXsh Change	MXsh Change	ImWMVA Change	IMWT Change
16	17	17	-1	-1	Finland	3.68	7.08	1.57	1.54	2.15	-0.52	0.022	-0.096
23	18	18	5	5	China	9.65	25.07	-1.27	0.93	12.18	3.18	2.732	4.609
18	19	19	-1	-1	Spain	-0.42	9.50	-3.10	-1.69	-0.18	-0.15	-0.155	0.125
21	20	20	1	1	Denmark	-1.01	10.94	2.46	-1.30	3.02	1.23	-0.065	0.051
20	21	21	-1	-1	Malaysia	2.61	4.54	-2.54	-0.16	-4.14	-4.05	0.040	-0.252
19	22	22	-3	-3	Mexico	-0.58	3.04	-2.89	-1.35	-0.99	-4.95	-0.235	-0.713
26	23	23	3	3	Czech Republic	5.70	21.60	3.23	2.31	6.61	-1.43	0.031	0.368
24	24	24	0	0	Thailand	5.67	9.46	4.17	2.25	2.28	1.72	0.126	0.025
22	25	25	-3	-3	Israel	-1.93	4.63	-3.22	-1.61	-5.49	1.04	-0.048	-0.074
29	26	26	3	3	Hungary	4.79	17.37	4.99	0.24	2.51	-0.69	0.012	0.198
25	27	27	-2	-2	Australia	0.33	9.89	-4.37	-0.92	-6.06	1.09	-0.061	0.036
33	28	28	5	5	Poland	5.48	23.26	0.81	1.89	6.62	-1.81	0.057	0.429
35	29	29	6	6	Slovakia	10.83	21.49	2.52	6.96	4.55	-1.20	0.048	0.151
28	30	30	-2	-2	Norway	1.74	9.73	-0.90	0.09	-1.85	-1.34	-0.008	0.009
34	31	31	3	3	Turkey	3.10	20.59	1.51	-0.03	8.79	1.87	0.068	0.355
32	32	32	0	0	Slovenia	4.57	14.90	5.39	1.17	5.64	-1.39	0.007	0.044
27	33	33	-6	-6	Portugal	-0.74	6.63	-0.42	-0.73	0.51	-8.95	-0.046	-0.054
31	34	34	-3	-3	Brazil	1.47	13.60	-1.75	0.09	-0.10	-4.31	-0.012	0.234
30	35	35	-5	-5	Luxembourg	0.09	9.00	-1.94	-1.21	-3.41	-0.31	-0.003	0.001
39	36	36	3	3	Russian Federation	6.64	18.33	-8.47	0.00	-8.61	-1.28	0.140	0.347
37	37	37	0	0	Argentina	1.85	9.21	-2.42	0.71	-3.73	3.69	-0.008	0.006
43	38	38	5	5	Saudi Arabia	3.09	18.95	0.00	0.94	3.80	3.22	0.043	0.208
42	39	39	3	3	South Africa	1.96	10.87	-0.39	-0.62	7.59	-0.71	0.000	0.040
38	40	40	-2	-2	Philippines	1.80	-0.61	1.55	-0.76	0.04	-0.62	0.015	-0.247
40	41	41	-1	-1	Indonesia	3.61	3.72	-1.61	0.33	-1.22	-4.86	0.077	-0.176
41	42	42	-1	-1	New Zealand	0.91	8.28	-9.27	-1.19	-0.09	-1.41	-0.006	-0.001
47	43	43	4	4	Chile	2.57	19.59	-14.46	-0.41	-0.86	5.91	0.007	0.112
44	44	44	0	0	Venezuela (Bolivarian Republic of)	-0.81	10.57	0.00	-1.35	2.66	0.40	-0.036	0.031
45	45	45	0	0	Greece	2.08	10.46	-5.34	-0.79	8.45	2.61	-0.008	0.007
54	46	46	8	8	Lithuania	10.88	26.66	1.26	2.17	3.51	0.53	0.014	0.070
50	47	47	3	3	Kuwait	5.32	4.10	12.32	0.93	-0.79	-0.91	0.016	0.001
49	48	48	1	1	Croatia	3.34	13.84	0.00	-0.73	2.12	-2.25	0.002	0.018
51	49	49	2	2	Estonia	11.07	16.05	2.36	1.92	0.43	-3.69	0.007	0.021
53	50	50	3	3	Romania	6.63	22.81	3.21	0.26	7.30	1.88	0.013	0.139
36	51	51	-15	-15	China, Hong Kong SAR	-6.24	-6.74	-9.93	-1.22	-1.49	-11.52	-0.033	-0.243
52	52	52	0	0	India	5.20	17.81	-1.785	-0.034	3.918	3.243	0.230	0.394
48	53	53	-5	-5	Costa Rica	1.28	4.03	-2.048	-0.905	-6.345	2.164	0.001	-0.013
59	54	54	5	5	Ukraine	12.62	20.25	0.282	3.271	-0.979	2.370	0.044	0.130
46	55	55	-9	-9	Malta	-5.52	-0.08	-9.512	-5.199	-6.172	-5.607	-0.004	-0.016
60	56	56	4	4	Trinidad and Tobago	9.09	12.60	9.167	0.498	4.854	-13.885	0.004	0.010
55	57	57	-2	-2	Tunisia	1.92	11.10	-9.748	-1.167	6.583	-0.261	0.000	0.012
56	58	58	-2	-2	Colombia	2.72	10.72	-0.984	0.466	0.461	4.765	0.015	0.014

2000 CIP	2005 CIP	2005 CIP*	Change	Change*	*Arranged by 2005*	MVApc AGRate	MXpc AGRate	MHVAsh Change	MVAsh Change	MHXsh Change	MXsh Change	ImWMVA Change	IMWT Change
65	59	59	6	6	Bulgaria	5.96	20.57	-3.648	-0.149	1.657	0.980	0.004	0.041
58	60	60	-2	-2	Iceland	0.02	9.56	3.087	-1.699	16.744	0.792	-0.002	0.001
61	61	61	0	0	Qatar	4.86	5.33	0.550	0.538	27.737	-6.450	0.007	0.001
67	62	62	5	5	Latvia	8.22	22.67	2.967	-0.382	7.746	-4.849	0.004	0.024
62	63	63	-1	-1	Morocco	2.30	8.16	2.582	-1.089	4.454	3.064	0.002	-0.002
72	64	64	8	8	Viet Nam	10.05	19.20	0.000	3.862	-0.017	7.237	0.049	0.086
69	65	65	4	4	Peru	3.65	24.90	-2.003	0.512	-2.376	11.182	0.012	0.055
74	66	66	8	8	El Salvador	0.83	27.23	0.000	0.080	-10.470	61.509	-0.002	0.022
64	67	67	-3	-3	Egypt	1.48	9.87	-7.151	-0.167	-7.635	-16.886	0.004	0.007
76	68	68	8	8	Iran (Islamic Republic of)	9.31	20.00	-1.617	3.245	8.216	2.188	0.094	0.035
68	69	69	-1	-1	Pakistan	7.98	10.25	-4.061	3.548	-2.215	1.912	0.067	0.019
79	70	70	9	9	Kazakhstan	8.88	24.35	1.733	-0.817	2.042	-1.509	0.018	0.040
66	71	71	-5	-5	Uruguay	2.45	4.84	-1.949	1.515	-8.691	-7.858	-0.001	-0.005
86	72	72	14	14	Jordan	7.73	27.79	-0.252	3.110	-12.097	3.466	0.009	0.021
83	73	73	10	10	Lebanon	2.54	22.13	0.000	0.007	6.048	7.364	0.001	0.009
63	74	74	-11	-11	Mauritius	-1.55	-2.28	-0.165	-3.435	-1.262	-10.718	-0.003	-0.013
81	75	75	6	6	Guatemala	-0.07	20.89	0.000	-0.372	-9.942	22.639	-0.001	0.022
70	76	76	-6	-6	Swaziland	0.16	5.08	0.000	-1.398	0.679	0.712	-0.001	-0.003
57	77	77	-20	-20	China, Macao SAR	-7.77	-5.09	-4.558	-4.939	-2.067	-1.934	-0.003	-0.021
75	78	78	-3	-3	The f. Yugosl. Rep of Macedonia	-0.25	9.87	-0.464	-1.185	4.125	4.243	-0.002	0.000
	79				Serbia	-0.32			-5.675			-0.004	
73	80	79	-7	-6	Sri Lanka	2.13	2.27	1.052	-0.987	0.946	-2.700	-0.001	-0.024
84	81	80	3	4	Bangladesh	4.83	9.35	0.000	1.005	0.651	1.082	0.024	0.008
80	82	81	-2	-1	Botswana	2.36	8.58	0.000	-0.333	0.235	-0.067	0.000	0.000
71	83	82	-12	-11	Oman	8.85	-7.60	6.578	1.853	-26.508	-9.406	0.007	-0.021
85	84	83	1	2	Côte d'Ivoire	-4.12	15.89	0.000	-2.526	26.191	6.721	-0.009	0.015
77	85	84	-8	-7	Jamaica	-1.97	3.39	0.000	-1.398	-1.007	4.041	-0.003	-0.006
78	86	85	-8	-7	Algeria	0.79	4.07	0.000	-0.829	-0.465	-10.025	-0.002	-0.022
	87				Bosnia and Herzegovina	5.93		0.000	0.701			0.002	
82	88	86	-6	-4	Cyprus	-0.65	2.40	-7.167	-1.114	14.116	-2.118	-0.002	-0.002
87	89	87	-2	0	Ecuador	3.63	10.82	2.632	-0.352	2.694	-3.079	0.003	0.003
96	90	88	6	8	Armenia	8.89	35.76	-2.052	-3.454	8.089	11.049	0.002	0.006
97	91	89	6	8	Syrian Arab Republic	13.68	14.41	0.000	4.887	10.056	9.748	0.019	0.006
93	92	90	1	3	Cambodia	11.84	14.35	0.000	3.565	-0.299	-1.367	0.007	0.008
90	93	91	-3	-1	Honduras	3.74	7.13	0.000	1.150	8.498	7.147	0.004	0.000
	94				Sudan	0.79	23.84		-0.927	-7.619	14.918	0.000	0.025
91	95	92	-4	-1	Fiji	0.71	0.91	-1.244	-0.623	3.309	1.369	0.000	-0.002
89	96	93	-7	-4	Bolivia (Plurinational State of)	1.03	-0.14	0.146	-0.025	-18.160	-24.082	0.000	-0.005
103	97	94	6	9	Georgia	11.42	23.19	-0.741	1.218	9.000	0.230	0.002	0.004
102	98	95	4	7	Kenya	0.42	24.39	0.142	-0.281	0.037	20.835	0.000	0.014
88	99	96	-11	-8	Barbados	-6.33	-0.44	0.000	-1.390	-1.528	-9.706	-0.001	-0.001

2000 CIP	2005 CIP	2005 CIP*	Change	Change*	*Arranged by 2005*	MVApc AGRate	MXpc AGRate	MHVAsh Change	MVAsh Change	MHXsh Change	MXsh Change	ImWMVA Change	IMWT Change
99	100	97	-1	2	Senegal	0.42	19.06	-17.933	-0.951	10.656	15.315	0.000	0.005
101	101	98	0	3	Cameroon	2.89	15.91	9.190	1.511	-1.000	11.107	0.004	0.003
94	102	99	-8	-5	Paraguay	-1.07	6.69	9.483	-1.212	7.441	-6.550	-0.002	0.000
105	103	100	2	5	Azerbaijan	9.98	21.90	2.081	-0.654	7.808	4.043	0.002	0.010
100	104	101	-4	-1	Gabon	3.34	10.52	0.000	0.674	5.121	-1.367	0.000	0.001
104	105	102	-1	2	Republic of Moldova	9.85	15.24	-0.473	0.892	0.197	6.420	0.001	0.001
92	106	103	-14	-11	Panama	-3.06	-8.09	-0.599	-2.277	-1.072	-16.173	-0.004	-0.003
95	107	104	-12	-9	Belize	0.19	-3.12	0.000	-1.191	-0.243	-7.581	0.000	-0.001
98	108	105	-10	-7	Albania	3.74	-10.38	9.373	-0.546	23.986	-19.447	0.000	-0.003
109	109	106	0	3	Zambia	3.05	9.20	0.000	0.097	1.644	-5.533	0.001	0.000
111	110	107	1	4	Mongolia	7.96	12.49	2.170	0.803	1.209	-11.013	0.000	0.001
110	111	108	-1	2	Ghana	2.22	15.15	-12.127	-0.212	1.612	6.748	0.001	0.004
123	112	109	11	14	Nigeria	6.14	55.58	0.000	0.481	14.098	2.260	0.009	0.009
	113				Tajikistan	9.19	0.00		0.536	0.000	0.000	0.002	0.000
107	114	110	-7	-3	Nepal	-1.50	0.84	3.688	-1.143	-2.948	14.882	-0.001	-0.001
108	115	111	-7	-3	Kyrgyzstan	-1.53	11.07	-4.317	-3.462	-24.265	11.863	-0.001	0.000
119	116	112	3	7	Suriname	12.29	34.23	0.000	3.290	-3.309	2.867	0.001	0.000
106	117	113	-11	-7	Madagascar	-0.36	-2.87	-3.528	0.120	2.004	-3.895	0.000	-0.003
118	118	114	0	4	Mozambique	11.93	24.84	0.000	3.334	5.801	-4.756	0.006	0.001
112	119	115	-7	-3	Congo	9.72	0.00	2.742	1.626	0.000	0.000	0.001	0.000
114	120	116	-6	-2	United Republic of Tanzania	5.34	14.49	-8.247	0.430	2.518	-0.940	0.004	0.001
	121				Yemen	1.00		-1.878	-0.045			0.000	
113	122	117	-9	-4	Haiti	-1.37	0.00	0.000	0.385	0.000	0.000	-0.001	0.000
116	123	118	-7	-2	Saint Lucia	1.94	5.49	0.000	0.245	-0.752	15.623	0.000	0.000
115	124	119	-9	-4	Niger	-0.03	6.23	-25.757	-0.136	5.913	1.795	0.000	0.000
124	125	120	-1	4	Uganda	2.79	27.59	0.000	-0.194	3.055	8.988	0.001	0.001
117	126	121	-9	-4	Cape Verde	3.85	-1.96	0.000	0.565	-4.076	-33.308	0.000	0.000
121	127	122	-6	-1	Central African Republic	-2.02	5.98	0.000	0.185	-1.510	3.011	0.000	0.000
120	128	123	-8	-3	Malawi	-7.91	10.17	-3.294	-3.685	7.415	6.980	-0.001	0.000
126	129	124	-3	2	Rwanda	5.48	34.08	0.000	0.143	1.981	24.735	0.001	0.000
127	130	125	-3	2	Ethiopia	2.23	3.94	-5.476	-0.359	0.890	-3.353	0.001	0.000
127	131	126	-4	1	Burundi	0.54	22.03	0.000	0.674	28.091	1.274	0.000	0.000
127	132	127	-5	0	Gambia	-8.40	-18.02	1.154	-3.139	1.832	-6.600	0.000	0.000
122	132	127	-10	-5	Iraq	-14.42	-19.25	-5.731	0.179	-39.002	40.168	0.000	0.000
125	132	127	-7	-2	Eritrea	0.61	-6.90	0.000	-0.276	4.100	-0.318	-0.002	-0.002

Period 2005-2010

The financial crisis that started in the United States in the middle of this quinquennial period (late 2007) had a massive impact on world industrial production, both on total output and on output distribution between mature industrial economies and developing countries. AGR data and the cumulative changes in all the CIP index's sub-indicators reflect the structural break in the data caused by the financial crisis (see

Table 37). For the top large industrial economies in Europe and North America, but also Japan, the financial crisis seems to have accelerated and reinforced some of the structural trends registered since 1990. Although to different degrees, all these economies registered negative AGRs in their MVApc, up to -4 percent (AGR) in the cases of Ireland, Canada and Spain, while Italy, France and the United Kingdom lost production capacity at around 3 percent (AGR) within five years. Overall, the United Kingdom lost most positions in the world ranking, namely 7, within only five years. By contrast, the larger three top leaders, Japan, Germany and the United States, contained their contraction in MVApc and maintained their positions in the world ranking.

The three strong East Asian economies confirmed their performance over the quinquennial period, although the speed at which their capacity to produce and export competitively (measured by AGR) slightly declined for the Republic of Korea and Singapore, while it slightly increased in the case of China, Taiwan Province. While the Republic of Korea maintained its fourth position in the world ranking, Singapore and China, Taiwan Province gained 3 and 5 positions, respectively. Similarly, the new members of the European Union registered very positive results in all sub-indicators. The Czech Republic, Poland and Slovakia, in particular, experienced a sustained increase in MVA as well as processes of technological deepening, as testified by the changes in MHVAsh.

For the first time, China entered the top 10 of the world industrial competitiveness ranking and gained 11 positions. The AGR of MVApc was even higher than that registered in the first half of the decade and reached 11 percent. China's capacity to export also increased substantially and resulted in a cumulative gain of WMT shares of 4.7 perccent. Taken as a whole, China gained almost 10 percent shares of WMT within only one decade. Among the other large economies, India also registered good performances in MVApc and MXpc, while Brazil and South Africa showed modest results.

Among the emerging industrial economies in the top and upper middle quintile were Viet Nam, Argentina, Thailand and Indonesia. Viet Nam is the country that gained most positions in the world ranking over the last two decades, half of them in the last quinquennial period. The annual growth rate of MVApc increased by 8 percent, the second world top result only after China, while Viet Nam's MXpc was among the highest in the first two quintiles. This resulted in a substantial gain of WMT shares, which is particularly significant if we consider the relatively smaller size of the country in comparison to other top performers in the ImWMT indicator, that is, China and India. In Latin America, in contrast to the other major economies, Argentina confirmed a robust increase in its production and export capacity. The annual growth rate of MVApc was almost 5 percent, while MXpc almost doubled.

Table 37: Catching up, forging ahead and falling behind, 2005 - 2010

2005 CIP	2010 CIP	2010 CIP*	Change	Change*	*Arranged by 2010*	MVApc AGRate	MXpc AGRate	MHVAsh Change	MVAsh Change	MHXsh Change	MXsh Change	ImWMVA Change	IMWT Change
1	1	1	0	0	Japan	-1.95	4.80	-0.24	-2.27	-2.59	-2.24	-2.684	-0.669
2	2	2	0	0	Germany	-1.51	4.44	0.26	-2.69	-0.19	-4.38	-0.885	-1.272
3	3	3	0	0	United States of America	-1.31	3.46	3.45	-1.01	-8.06	-9.35	-2.315	-0.953
4	4	4	0	0	Republic of Korea	4.42	9.85	-0.74	1.33	0.51	-0.79	0.473	0.602
10	5	5	5	5	China, Taiwan Province	4.99	6.05	17.80	1.74	2.10	-0.66	0.337	-0.043
9	6	6	3	3	Singapore	3.86	5.75	-3.31	-1.57	-3.76	-4.04	0.083	0.012

2005 CIP	2010 CIP	2010 CIP*	Change	Change*	*Arranged by 2010*	MVApc AGRate	MXpc AGRate	MHVAsh Change	MVAsh Change	MHXsh Change	MXsh Change	ImWMVA Change	IMWT Change
18	7	7	11	11	China	11.28	15.34	-0.91	1.12	2.85	1.41	5.931	4.744
13	8	8	5	5	Switzerland	1.68	7.36	0.00	0.08	2.50	-2.52	0.021	0.070
6	9	9	-3	-3	Belgium	-0.82	3.76	-1.09	-1.37	-1.19	-0.95	-0.060	-0.479
5	10	10	-5	-5	France	-2.78	2.64	0.93	-1.95	-0.26	-0.81	-0.525	-0.809
8	11	11	-3	-3	Italy	-3.36	3.30	3.18	-2.33	-0.11	-1.10	-0.626	-0.668
14	12	12	2	2	Netherlands	-0.53	6.44	-2.37	-1.08	-4.87	-1.48	-0.072	-0.029
12	13	13	-1	-1	Sweden	-0.44	3.45	-5.99	-1.43	-3.53	-0.33	-0.065	-0.197
7	14	14	-7	-7	United Kingdom	-3.09	-0.20	0.99	-1.89	-4.15	-3.52	-0.630	-1.127
11	15	15	-4	-4	Ireland	-4.19	-0.39	4.49	-3.80	-3.53	-0.40	-0.090	-0.301
16	16	16	0	0	Austria	1.03	3.78	0.15	-0.11	-0.07	-0.37	-0.003	-0.159
15	17	17	-2	-2	Canada	-4.91	-1.74	0.27	-3.66	-2.55	-7.44	-0.466	-0.945
17	18	18	-1	-1	Finland	0.90	0.40	1.35	0.12	-8.45	-3.49	-0.007	-0.204
19	19	19	0	0	Spain	-4.43	3.58	4.63	-3.13	-3.61	-2.58	-0.355	-0.236
23	20	20	3	3	Czech Republic	3.84	10.84	2.27	1.53	3.84	-1.07	0.032	0.185
21	21	21	0	0	Malaysia	0.17	4.75	-5.62	-3.60	-8.81	-1.87	0.010	-0.022
22	22	22	0	0	Mexico	-0.70	5.28	-1.22	-1.10	3.55	-1.43	-0.084	-0.039
24	23	23	1	1	Thailand	3.31	10.59	4.20	0.77	-0.06	-3.12	0.109	0.282
20	24	24	-4	-4	Denmark	-0.39	2.03	-10.22	-0.13	-3.83	-3.52	-0.026	-0.161
28	25	25	3	3	Poland	9.23	12.69	7.93	4.15	3.72	2.24	0.236	0.291
25	26	26	-1	-1	Israel	2.13	7.53	1.16	-0.22	17.04	12.11	0.035	0.057
29	27	27	2	2	Slovakia	3.27	15.13	7.22	-1.55	10.47	0.77	0.015	0.174
27	28	28	-1	-1	Australia	0.41	14.54	0.52	-0.76	-14.01	2.69	-0.003	0.294
26	29	29	-3	-3	Hungary	0.36	8.26	0.36	0.77	2.15	-3.27	-0.012	0.038
31	30	30	1	1	Turkey	2.06	7.15	0.77	0.19	1.74	-2.74	0.094	0.069
30	31	31	-1	-1	Norway	-0.25	5.75	-4.40	-0.25	6.11	2.08	-0.014	-0.007
32	32	32	0	0	Slovenia	-0.76	6.13	3.76	-2.78	3.03	-1.22	-0.009	-0.007
34	33	33	1	1	Brazil	0.93	7.79	1.87	-1.49	-11.86	-5.02	0.059	0.125
33	34	34	-1	-1	Portugal	-2.36	5.52	-2.11	-1.74	-3.21	3.56	-0.043	-0.018
37	35	35	2	2	Argentina	4.67	8.98	0.00	-0.80	12.61	-2.73	0.182	0.046
36	36	36	0	0	Russian Federation	1.12	10.11	0.69	-2.55	-3.20	-1.81	-0.044	0.157
38	37	37	1	1	Saudi Arabia	2.58	3.86	-1.37	1.17	11.98	-0.49	0.064	-0.015
41	38	38	3	3	Indonesia	3.20	10.17	4.89	-1.68	-4.12	-4.26	0.132	0.167
47	39	39	8	8	Kuwait	7.96	9.97	-1.20	2.50	5.03	1.09	0.033	0.069
	40				Belarus	9.01	9.75		0.91	3.65	-1.74	0.034	0.021
39	41	40	-2	-1	South Africa	0.38	7.91	-1.88	-1.71	-1.91	-0.76	-0.011	0.034
35	42	41	-7	-6	Luxembourg	-4.48	0.15	-10.88	-2.28	-1.09	-1.78	-0.007	-0.034
52	43	42	9	10	India	8.22	14.89	-1.97	0.79	5.64	-1.70	0.660	0.614
40	44	43	-4	-3	Philippines	0.81	2.07	6.45	-2.37	-1.82	-2.29	0.023	-0.064
43	45	44	-2	-1	Chile	-0.08	6.84	17.14	-1.84	-1.18	-7.22	-0.007	0.015
50	46	45	4	5	Romania	2.85	11.82	9.65	-0.06	21.01	-3.82	0.004	0.077
46	47	46	-1	0	Lithuania	0.52	10.95	2.04	-0.99	2.18	-4.55	-0.003	0.025
42	48	47	-6	-5	New Zealand	-1.72	4.91	0.90	-1.43	-5.20	-3.50	-0.015	-0.006
45	49	48	-4	-3	Greece	0.69	3.34	1.25	0.07	0.81	-3.52	-0.006	-0.025

2005 CIP	2010 CIP	2010 CIP*	Change	Change*	*Arranged by 2010*	MVApc AGRate	MXpc AGRate	MHVAsh Change	MVAsh Change	MHXsh Change	MXsh Change	ImWMVA Change	IMWT Change
48	50	49	-2	-1	Croatia	1.10	6.27	0.00	0.08	5.05	0.23	-0.002	-0.003
44	51	50	-7	-6	Venezuela (Bolivarian Republic of)	0.95	-0.61	0.00	-0.68	-6.73	-4.77	0.020	-0.065
49	52	51	-3	-2	Estonia	-2.39	9.60	6.77	-2.23	-5.51	0.03	-0.004	0.011
54	53	52	1	2	Ukraine	2.46	8.89	-1.81	0.66	6.36	-1.68	0.001	0.022
64	54	53	10	11	Viet Nam	8.33	21.76	0.00	3.04	6.55	15.35	0.072	0.238
68	55	54	13	14	Iran (Islamic Republic of)	2.94	30.57	1.07	0.12	-2.43	22.02	0.048	0.171
53	56	55	-3	-2	Costa Rica	0.74	2.72	-0.14	-2.08	-1.30	-1.92	0.002	-0.008
61	57	56	4	5	Qatar	0.03	26.18	-4.64	-3.19	-32.06	7.22	0.001	0.058
57	58	57	-1	0	Tunisia	3.77	7.55	-0.51	0.28	13.61	-2.53	0.011	0.010
59	59	58	0	1	Bulgaria	3.78	10.80	1.42	0.29	6.93	-6.37	0.003	0.018
56	60	59	-4	-3	Trinidad and Tobago	4.89	3.72	3.07	0.83	-2.98	11.09	0.003	-0.009
55	61	60	-6	-5	Malta	-3.40	8.68	9.62	-3.33	-18.76	1.18	-0.002	0.003
67	62	61	5	6	Egypt	4.47	19.71	-6.21	-0.29	14.11	4.90	0.082	0.073
65	63	62	2	3	Peru	4.59	15.22	1.56	-0.93	-0.11	2.25	0.034	0.059
58	64	63	-6	-5	Colombia	0.46	4.13	0.00	-1.89	-1.97	-13.95	0.003	-0.008
60	65	64	-5	-4	Iceland	2.20	0.32	0.00	1.50	2.95	-10.86	0.001	-0.004
63	66	65	-3	-2	Morocco	1.43	8.02	-0.49	-1.50	10.64	-1.31	0.006	0.014
51	67	66	-16	-15	China, Hong Kong SAR	-4.50	-14.15	3.01	-0.64	18.12	-27.70	-0.014	-0.138
62	68	67	-6	-5	Latvia	-4.37	9.67	6.13	-2.30	11.96	-6.45	-0.006	0.007
83	69	68	14	15	Oman	6.52	29.26	0.91	0.96	12.63	8.75	0.010	0.031
70	70	69	0	1	Kazakhstan	2.33	12.33	-0.02	-2.19	13.02	-2.31	0.006	0.028
66	71	70	-5	-4	El Salvador	0.13	3.72	0.00	-0.30	-0.01	-1.63	0.000	-0.003
72	72	71	0	1	Jordan	3.11	7.73	2.77	0.47	18.24	1.93	0.007	0.008
71	73	72	-2	-1	Uruguay	6.68	5.59	2.73	0.50	5.24	-7.53	0.015	0.003
69	74	73	-5	-4	Pakistan	2.61	2.21	-0.67	0.30	1.87	-6.35	0.038	-0.022
73	75	74	-2	-1	Lebanon	1.09	13.49	9.12	-2.20	13.38	-10.19	0.001	0.008
79	76	75	3	4	Serbia	2.08	15.18	-3.75	-0.65	7.57	-5.59	0.001	0.023
75	77	76	-2	-1	Guatemala	-0.14	6.29	-6.67	-0.77	0.90	-1.71	0.002	0.005
81	78	77	3	4	Bangladesh	6.65	5.99	0.00	1.67	0.36	-1.59	0.056	0.006
74	79	78	-5	-4	Mauritius	1.84	0.16	0.14	-1.47	-0.69	8.53	0.001	-0.004
80	80	79	0	1	Sri Lanka	5.49	4.22	1.62	-0.26	1.68	-4.95	0.010	-0.006
91	81	80	10	11	Syrian Arab Republic	6.86	21.52	0.00	2.83	6.20	18.17	0.019	0.025
86	82	81	4	5	Algeria	1.56	11.68	0.00	0.17	-1.29	8.70	0.005	0.035
87	83	82	4	5	Bosnia and Herzegovina	5.03	13.84	0.00	0.94	-5.09	-3.24	0.002	0.009
78	84	83	-6	-5	The f. Yugosl. Rep of Macedonia	4.97	-1.29	0.52	1.56	-2.10	-25.46	0.002	-0.004
76	85	84	-9	-8	Swaziland	1.50	-2.57	0.00	-0.13	14.65	-1.20	0.000	-0.005
82	86	85	-4	-3	Botswana	2.91	-0.57	0.00	0.25	0.49	-2.31	0.001	-0.014
89	87	86	2	3	Ecuador	3.30	12.26	-0.41	0.40	4.42	1.22	0.006	0.009
88	88	87	0	1	Cyprus	-2.63	8.52	8.12	-1.45	13.99	5.66	-0.002	0.001
84	89	88	-5	-4	Côte d'Ivoire	-1.59	-3.00	0.00	-1.75	-3.85	-18.32	-0.002	-0.016
92	90	89	2	3	Cambodia	4.69	7.50	0.00	0.24	6.93	-11.91	0.005	0.004

2005 CIP	2010 CIP	2010 CIP*	Change	Change*	*Arranged by 2010*	MVApc AGRate	MXpc AGRate	MHVAsh Change	MVAsh Change	MHXsh Change	MXsh Change	ImWMVA Change	IMWT Change
93	91	90	2	3	Honduras	-0.24	10.86	0.00	-1.79	6.48	-6.23	0.000	0.004
96	92	91	4	5	Bolivia (Plurinational State of)	3.49	23.13	0.00	0.47	-4.53	7.75	0.004	0.014
85	93	92	-8	-7	Jamaica	-2.61	-4.53	0.00	-0.95	2.48	-2.73	-0.002	-0.008
108	94	93	14	15	Albania	7.96	51.58	-2.62	1.72	-15.12	3.18	0.003	0.009
112	95	94	17	18	Nigeria	6.61	91.32	0.00	0.43	-67.40	18.34	0.016	0.156
97	96	95	1	2	Georgia	7.43	7.92	2.81	0.67	8.50	-4.24	0.002	0.000
101	97	96	4	5	Cameroon	-0.13	12.78	0.00	-1.07	6.35	6.94	0.001	0.004
90	98	97	-8	-7	Armenia	-0.39	-3.17	-1.66	-3.59	-10.75	-19.30	-0.001	-0.004
102	99	98	3	4	Paraguay	0.02	14.53	0.00	-2.28	-0.19	-5.63	0.000	0.003
119	100	99	19	20	Congo	3.87	62.54	-10.73	0.22	77.12	21.31	0.001	0.019
100	101	100	-1	0	Senegal	-1.23	6.03	5.25	-1.22	-17.52	2.18	0.000	0.001
98	102	101	-4	-3	Kenya	1.80	2.15	-5.50	-0.02	9.79	-9.29	0.004	-0.002
104	103	102	1	2	Gabon	1.33	1.80	0.00	0.04	2.14	1.63	0.000	0.000
99	104	103	-5	-4	Barbados	-2.61	3.72	0.00	-0.39	8.74	7.69	0.000	0.000
95	105	104	-10	-9	Fiji	-1.01	-3.46	-1.76	-0.05	4.57	-17.39	0.000	-0.002
120	106	105	14	15	United Republic of Tanzania	5.92	42.24	-2.52	0.81	3.73	29.78	0.008	0.014
103	107	106	-4	-3	Azerbaijan	5.12	3.63	-5.57	-1.75	-4.72	-30.91	0.002	-0.003
116	108	107	8	9	Suriname	0.58	46.49	0.00	-1.60	-19.60	10.92	0.000	0.002
110	109	108	1	2	Mongolia	5.93	16.29	0.60	0.17	-1.18	11.44	0.001	0.005
106	110	109	-4	-3	Panama	1.70	0.23	0.00	-1.48	3.74	10.77	0.001	-0.001
109	111	110	-2	-1	Zambia	3.87	19.33	0.00	-0.27	6.72	-9.68	0.001	0.006
77	112	111	-35	-34	China, Macao SAR	1.62	-41.02	0.00	-1.14	5.03	-54.46	0.001	-0.021
107	113	112	-6	-5	Belize	7.81	-7.53	0.00	3.59	0.04	-26.65	0.001	-0.001
105	114	113	-9	-8	Republic of Moldova	-5.50	-0.76	-1.34	-5.81	2.20	-17.00	-0.001	-0.003
113	115	114	-2	-1	Tajikistan	4.92	0.00	-0.13	-0.96	0.00	0.00	0.002	0.000
117	116	115	1	2	Madagascar	1.73	6.13	0.67	0.95	0.17	12.68	0.001	0.001
115	117	116	-2	-1	Kyrgyzstan	-1.77	4.51	2.18	-3.15	-2.46	-14.37	0.000	0.000
111	118	117	-7	-6	Ghana	1.18	-11.33	0.00	-1.36	16.88	-22.79	0.001	-0.008
114	119	118	-5	-4	Nepal	-0.29	-0.26	-10.23	-0.94	11.55	-9.79	0.000	-0.004
125	120	119	5	6	Uganda	4.36	23.33	0.00	-0.08	-0.90	17.72	0.003	0.002
121	121	120	0	1	Yemen	3.08	1.70	0.59	0.47	3.47	0.90	0.002	-0.001
118	122	121	-4	-3	Mozambique	1.74	-5.47	0.00	-2.12	-18.44	-4.02	0.002	-0.001
123	123	122	0	1	Saint Lucia	0.65	12.34	0.00	0.03	14.75	3.98	0.000	0.000
126	124	123	2	3	Cape Verde	2.14	18.68	-3.50	-1.02	-0.73	-0.04	0.000	0.000
128	125	124	3	4	Malawi	8.32	15.58	6.37	1.55	-4.10	2.31	0.001	0.001
94	126	125	-32	-31	Sudan	3.30	-42.21	0.00	-0.68	4.71	-84.22	0.004	-0.046
122	127	126	-5	-4	Haiti	-1.10	0.00	0.00	-0.12	0.00	0.00	0.000	0.000
124	128	127	-4	-3	Niger	-3.39	6.01	0.00	-1.40	-1.34	9.03	0.000	0.000
129	129	128	0	1	Rwanda	2.42	13.85	0.00	-0.69	2.72	7.31	0.001	0.000
130	130	129	0	1	Ethiopia	6.39	18.92	3.15	-0.19	30.29	0.65	0.003	0.001
127	131	130	-4	-3	Central African Republic	0.71	-22.30	0.00	-0.11	6.43	-50.16	0.000	-0.001
131	132	131	-1	0	Burundi	-2.47	12.08	0.00	-1.03	-8.61	8.13	0.000	0.000

2005 CIP	2010 CIP	2010 CIP*	Change	Change*	*Arranged by 2010*	MVApc AGRate	MXpc AGRate	MHVAsh Change	MVAsh Change	MHXsh Change	MXsh Change	ImWMVA Change	IMWT Change
132	133	132	-1	0	Iraq	3.71	20.32	0.00	0.04	-54.88	0.06	0.000	0.001
132	133	132	-1	0	Eritrea	-8.77	0.00	-2.80	-1.65	0.00	0.00	0.000	0.000
132	133	132	-1	0	Gambia	0.78	29.47	0.00	-0.32	-7.83	-25.79	0.000	0.000

5.3 Structural trajectories of industrial competitiveness

Over the last two decades, the world manufacturing landscape has transformed quite significantly. The longitudinal analysis highlights countries' individual industrial competitive performances within regions and within different quintiles of the CIP world ranking. The particularly successful performances of China, Viet Nam, the Republic of Korea, China, Taiwan Province and Singapore, but also to a lesser extent of India and a few new members of the European Union have been contrasted with the generalized loss of industrial competitiveness in traditional industrialized high income countries in Europe and North America. Among them, Germany is the only economy that did not lose any positions and actually gained one over the last two decades.

The longitudinal analysis at the country level is complemented by the consideration of country groups' structural trajectories over a longer period of time. In order to highlight differences in industrial competitiveness performance *across* different regions as well as *across* country groups, we considered a ten-year period. A number of structural trajectories for different country groups were plotted, taking the average value into account, which the same country groups registered in five structural economic variables. These are:

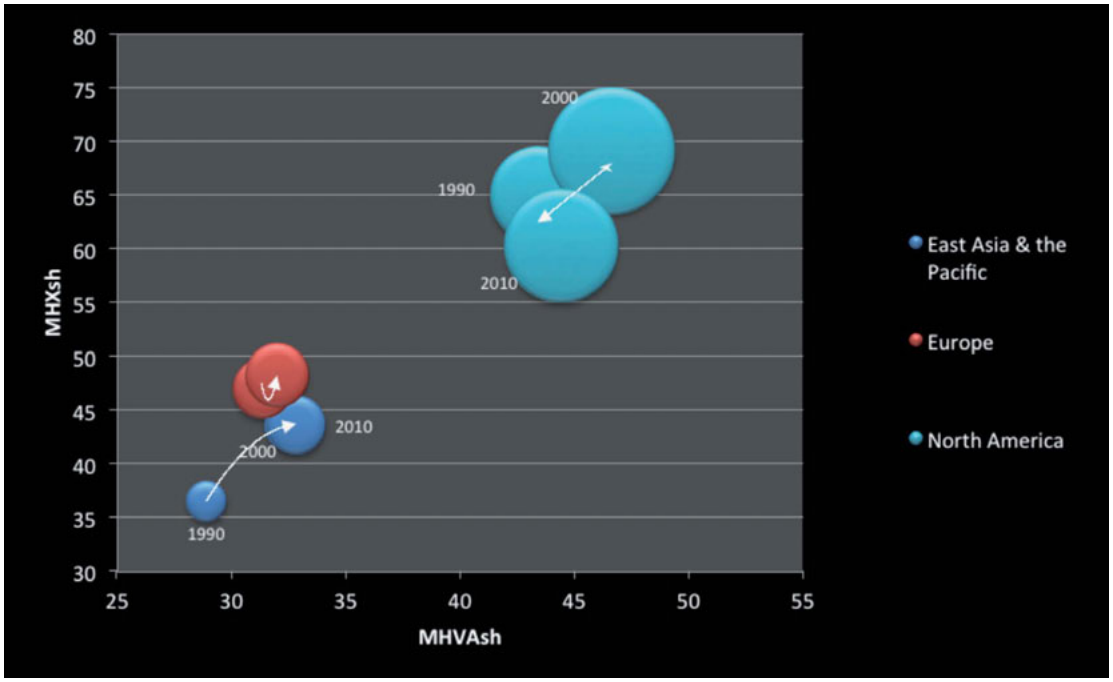
- MVApc as the main indicator of industrial development
- MHVAsh and MHXsh as the main indicators for capturing the technological evolution of industries (*qualitative* transformations)
- ImWMVA and ImWMT which proxy the quantitative redistribution of manufacturing shares in the world (*quantitative* transformations).

If we look at the technological evolution of industry by regional country groups (see Figures 6, 7 and 8), a number of structural trajectories emerge:

- The North America region, which includes the United States and Canada, registered an expansionary cycle throughout the 1990s, both in qualitative and quantitative terms. The main feature of the structural trajectory followed by the region is the overall technological advancements in both produced goods (46.6 percent were MHT) and in the export basket (69.1 percent were MHT). The sustained capacity to add value to manufactured goods was reflected in the MVApc almost equal to US$ 4.800 at the end of the first decade (it was US$ 3.600 in 1990), and the important gains in WMVA and WMT. The second decade inverted this positive trend. The region entered a phase of manufacturing contraction whose effect was remarkable for the WMT shares which went from 17 percent to 10 percent (it was 16 percent in 1990). The technological complexity of exports decreased and MVApc contracted to around US$ 500.

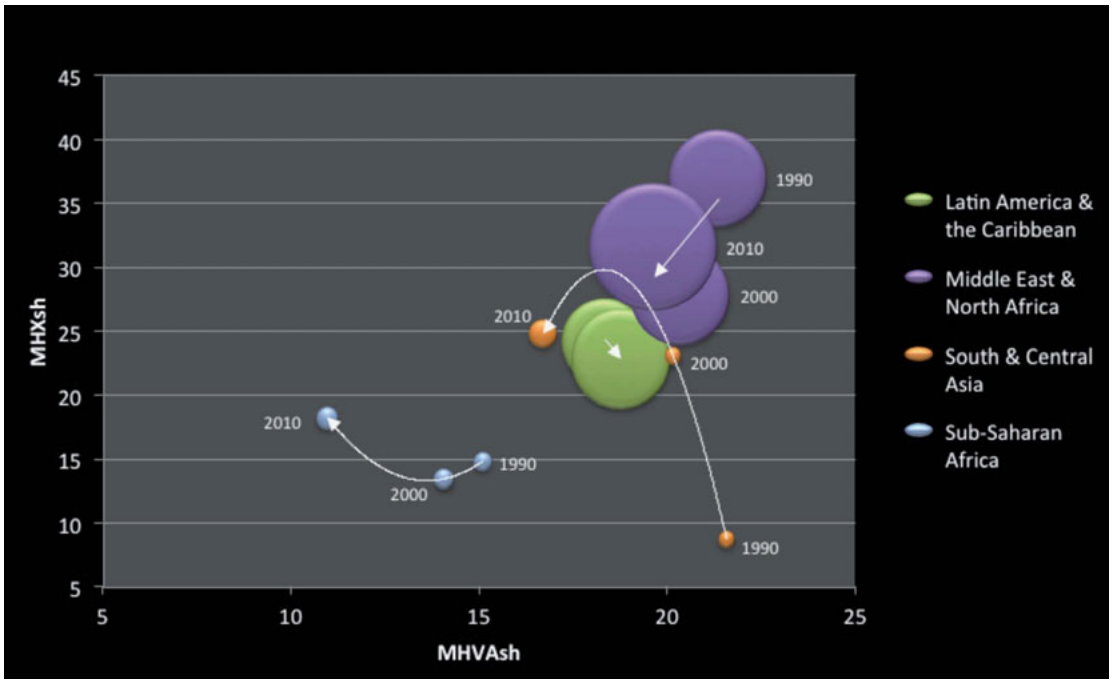
- Taken as a whole, Europe's structural performance remained almost unchanged throughout the two decades. According to the longitudinal analysis, the manufacturing loss of traditional industrial economies at the country level was counterbalanced by the very dynamic small European countries, especially by a few transition economies.

Figure 6: The technological evolution of industry across regional country groups, 1990 – 2000 – 2010



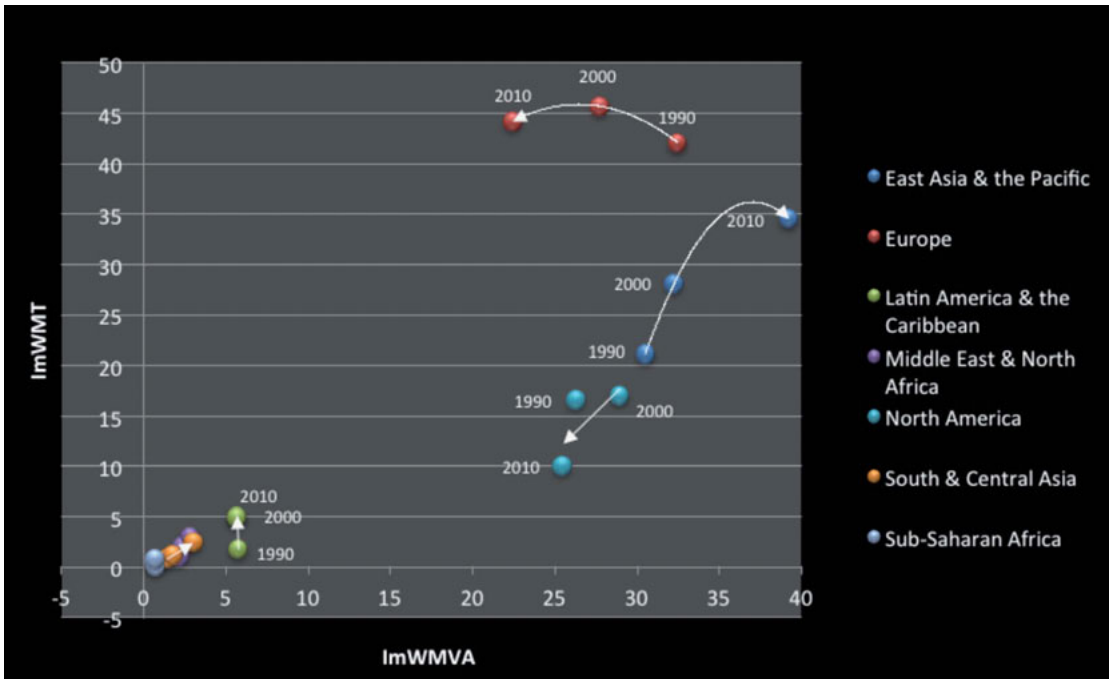
Note: Bubble size indicates the average regional MVApc, 1990 – 2000 – 2010

Figure 7: The technological evolution of industry across regional country groups, 1990 – 2000 – 2010



Note: Bubble size indicates the average regional MVApc, 1990 – 2000 – 2010

Figure 8: The impact of regional countries in world manufacturing value added and in world manufactures trade



- The East Asia and Pacific region has been the engine of world industrial development growth over the last two decades. The average MVApc increased by one half, moving from roughly US$ 1.500 to 2.200 per capita, while the overall technological structures upgraded significantly to the point that the MHVAsh figures managed to catch up with the Europe region in 2010. This is a remarkable achievement considering that the region includes China, a country at a relatively lower stage of development and with a massive population size. The quantitative transformations in WMVA and WMT shares do not only reflect China's outstanding performance, but also the fast catching up processes of a few other economies in both the top and upper middle quintile of the ranking.

- The Latin America region did not show any significant technological transformation, although the MVApc increased over the period. The only transformation was a quantitative increase in WMT which was not matched by any increases in WMVA shares, given the relatively slow speed in MVApc increases.

- The South and Central Asia region's structural trajectory essentially reflects India's performance, both in qualitative and quantitative terms. Although the trajectory followed by the region suggests a certain strong 'vertical tendency' in the MHXsh for the first decade, there is no sign of technological upgrading at the level of MHVAsh. Overall, MVApc witnessed some growth, but given the high population density in the region, the per capita figures are quite modest.

- The Middle East and North Africa region, on the contrary, shows a small increase in MVApc, but no signs of any significant diversification of the economies which mainly remain oil exporters. Few countries in the region, Turkey and Israel, in particular, are exceptions.

- The sub-Saharan Africa region shows a clear structural trajectory over the last two decades. After one decade of technological contraction, the region registered some signs of improvements in terms of the complexity of its export basket. However, the fact that the MHVAsh indicator decreased by one-third within 20 years reveals an overall reduction of the region's capacity to capture manufacturing value.

Some of the world regions considered tend to be quite heterogeneous. Thus, average performances in the five structural indicators considered might be obscured by many compensatory effects. To deal with these problems, we plot the same structural trajectories for more homogenous country groups.

If we look at the technological evolution of an industry by income or industrial country group, that is, groups of countries at a similar stage of economic or industrial development, a different set of trajectories emerges (see Figures 9, 10 and 11; see also Table 38):

- High income economies' structural trajectories are characterized by two opposite dynamics. On the one hand, MHXsh and MHVAsh registered a positive cumulative change of 8 percent and 3 percent, respectively, over the last two decades. On the other hand, taken as a whole, high income OECD countries lost around 16 percent of WMVA and 10 percent of WMT. High income non-OECD economies, on the contrary, mainly driven by China, Taiwan Province and Singapore, entered a sustained path of technological deepening and upgrading, registered by an overall increase in MHVAsh of 7 percent.

- The structural trajectories experienced by the group of upper middle income economies was driven by China, especially in terms of quantitative improvements. Within only two decades, upper middle income countries taken as a whole doubled their share in WMVA and increased their share in WMT sixfold, jumping to 25.8 percent and 26.4 percent, respectively. If we match these results with those obtained by the group of high income OECD countries, we obtain a clear sign of industrial convergence (see Figure 10). If the quantitative transformations have a clear positive and constant sign over the last two decades, the qualitative transformations that the technological structures have undergone over the last 20 years seem less clear and affected by countries' compensations.

- The group of lower middle income economies followed a clear export-led expansionary trajectory (especially in the first decade) registered by the fourfold increase in the shares of WMT and the increasing complexity of the export basket, registered by MHTsh, which reached 22 percent in 2010, exactly double that in 1990. Finally, while the quantitative transformations among the low income countries were positive but relatively insignificant, a clear sign of reduction of MHVAsh matched by a slight improvement in the technological complexity of exports was registered.

Figure 9: The technological evolution of industry across income comparators for country groups, 1990 – 2000 – 2010

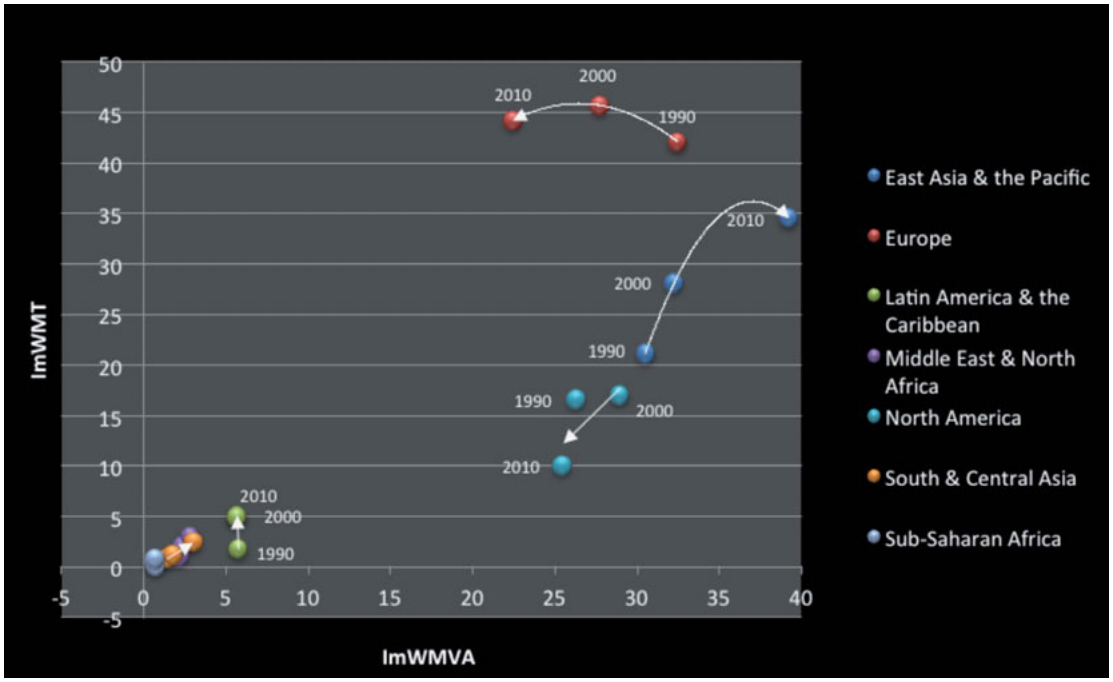


Figure 10: The impact of country groups by income comparators in world manufacturing value added and in world manufactures trade

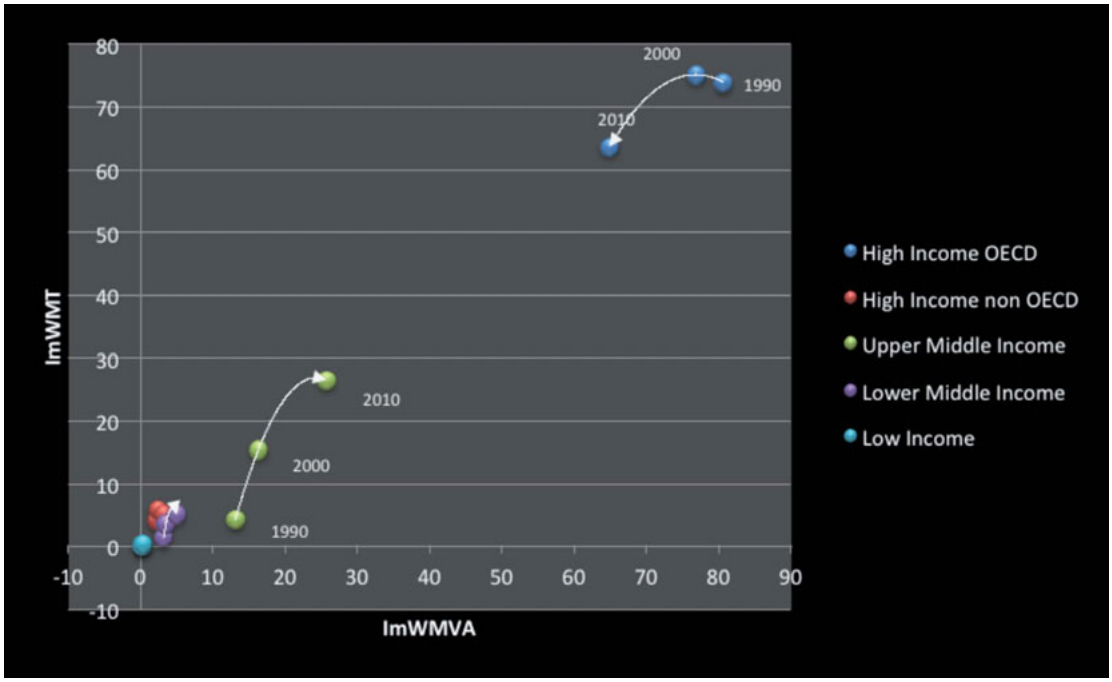


Table 38: Country income groups' structural trajectories

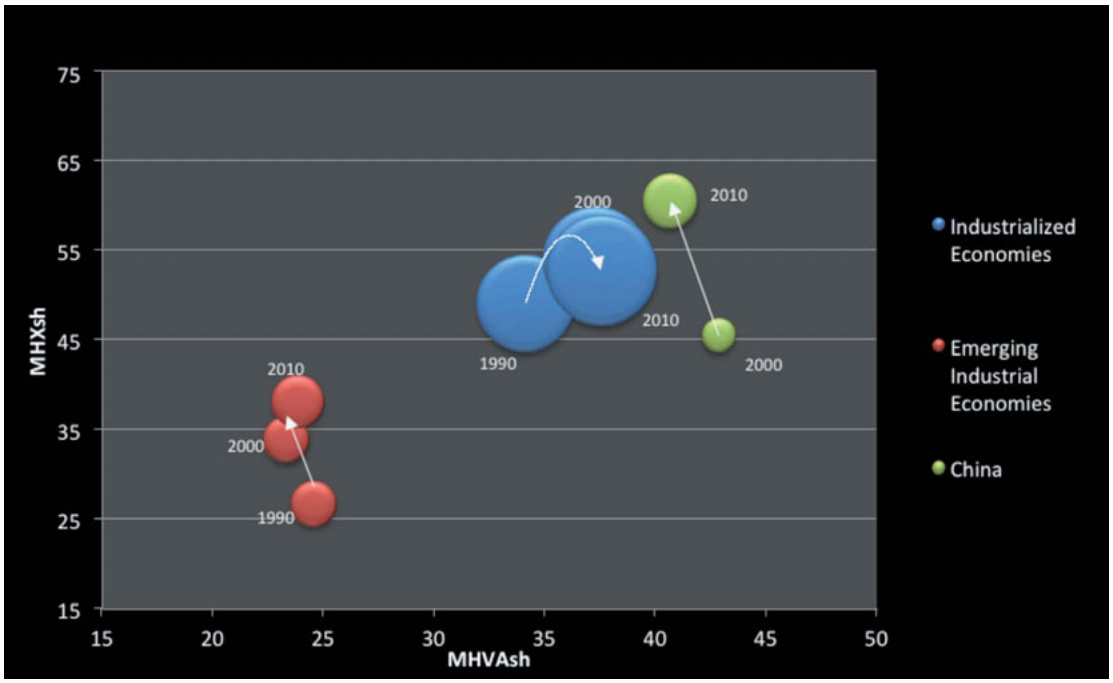
Country income groups' structural trajectories		Quantitative transformations		Qualitative transformations	
Country group	Year	ImWMVA	ImWMT	MHVAsh	MHXsh
High Income OECD	1990	80.636	73.825	35.052	47.797
	2000	76.950	75.002	37.709	55.454
	2010	64.957	63.523	38.155	55.709
High Income Non-OECD	1990	2.220	4.161	26.206	42.537
	2000	2.408	5.742	30.719	39.575
	2010	3.219	4.979	33.180	41.921
Upper Middle Income	1990	13.177	4.208	22.674	32.048
	2000	16.357	15.302	21.039	28.367
	2010	25.817	26.437	21.149	31.539
Lower Middle Income	1990	3.162	1.357	17.676	11.137
	2000	3.468	3.443	17.794	19.962
	2010	5.059	4.945	16.646	22.397
Low Income	1990	0.217	0.089	11.751	12.845
	2000	0.233	0.176	10.970	15.523
	2010	0.357	0.226	7.358	16.598

Finally, if we take groups of countries at different stages of industrial development into consideration, two patters emerge (see Figure 11):

- Firstly, emerging industrial economies (excluding China) significantly increased their export performance during the 1990s, while this trend has decelerated in the last decade. The medium- and high-tech component of MVA registered almost the same value as 1990, around 25 percent of total MVA. On the contrary, during the same period, industrialized economies experienced an increase in MVApc and in the technological complexity of produced manufactures.

- Secondly, by comparing the performances of China with the group of emerging industrial economies over the last decade, it is clearly observable that China's technological transformation as well as its MVApc expansion proceeded much faster. For the other emerging industrial economies, the increase in medium- and high-tech products in total manufactured exports was not immediately matched by an increase of MHVAsh. However, China's MHVAsh in 2000 was almost double that shown on average by the other emerging industrial economies.

Figure 11: The technological evolution of industry across industrial comparators for country groups, 1990 – 2000 – 2010



Note: Bubble size indicates the average regional MVApc, 1990 – 2000 – 2010

5.4 The BRICS' competitiveness models: A comparison among large emerging economies

Over the last 20 years or so, a group of economies known today as the BRICS (Brazil, Russian Federation, India, China and South Africa) have emerged as new strong economies in the international manufacturing landscape. By 2010, the BRICS countries accounted for a quarter of world total GDP in purchasing power parity, one-fifth of world manufacturing value added and almost one-fifth of world manufactures trade (see Table 39; see also UNIDO, 2012).

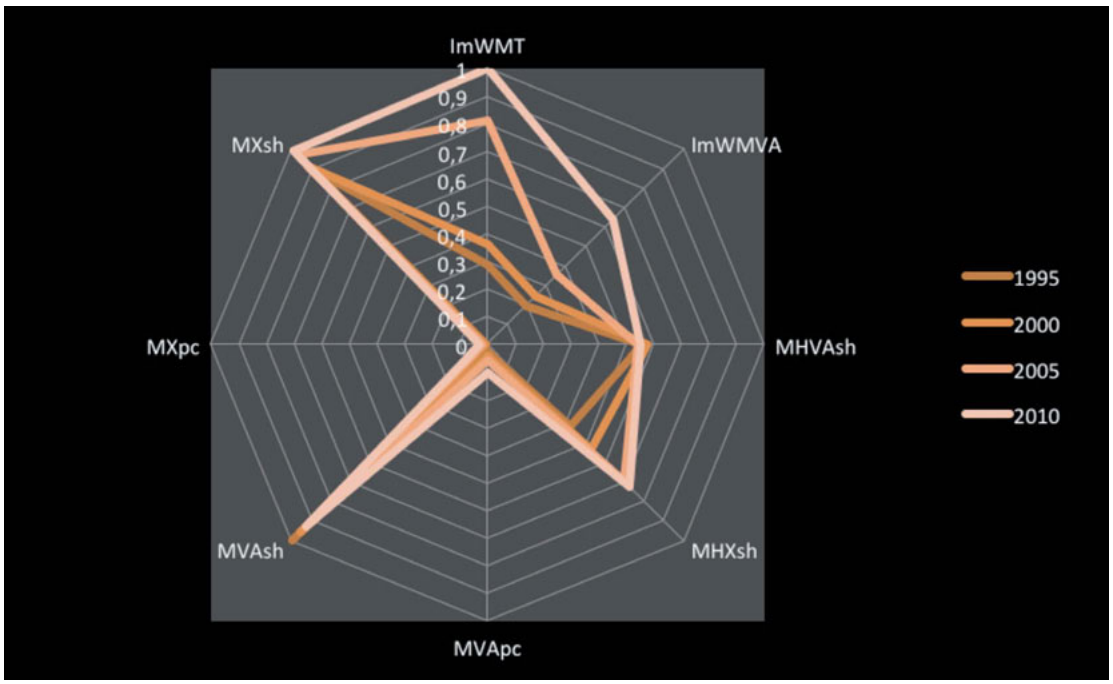
The BRICS countries share many common features such as their large geographical size, large population, fast economic growth and industrial capabilities accumulation, their role as significant sources of regional demand and production as well as their role as regional economic leaders in their respective areas (Brazil in Latin America, China in East Asia, India in South Asia and South Africa in Africa). Despite these similarities, these countries differ substantially with respect to their income levels, their degree of openness, their industrial and trade structures as well as their technological deepening. In fact, the structural trajectories experienced by these economies have differed profoundly in scope and speed over the last 20 years (see Table 39).

Different models of industrial competitiveness have emerged among this country group (see Figures 12, 13, 14, 15 and 16). At first glance, while the manufacturing sector has been the main engine of growth and of structural transformation in China, services have played a relatively more important role in India and, more recently, in Brazil. On the contrary, the Russian Federation, South Africa and to a lesser extent Brazil have increasingly made use of their abundant natural resources to drive their economic growth. As a result of these different structural trajectories, the countries have achieved important results in terms of structural economic change and poverty reduction, although not all to the same degree (UNIDO, 2012; European Commission, 2009; Szirmai, Naudé and Alcorta, 2013).

The most rapid economic growth has been observed in those countries whose competitiveness model was based on expansion and deepening of the manufacturing sector. China experienced the deepest structural transformation and, in turn, the highest growth rates and highest increases in MVApc and MXpc despite its population size. Over the last 15 years, manufacturing has accounted for one-third of the overall economy and the share of medium- and high-tech activities in total manufacturing have remained above 40 percent, the latter being a clear sign of substantial technological efforts. Also, China experienced a shift from an export basket dominated by labour intensive and low-tech products (such as food and textiles) towards more medium- and high-tech products accounting for more than half of total manufactured exports (including metal products, machinery and electrical equipment).

The massive expansion of the manufacturing base was mainly absorbed and stimulated by external demand. However, China's growth recovery following the 2008 financial crisis was increasingly triggered by domestic consumption, investments and productivity growth. As a result of this fast and deep industrialization process, China gained 10 percent of WMVA share and 11 percent of WMT share within only 15 years (see Figure 12).

Figure 12: China's industrial competitiveness model over time (normalized figures)



Contrary to China, manufacturing industries in the Indian economy have played a relatively less important role (see Figure 13). This is reflected in the quite modest performance in the main structural economic variables reported in Table 39. Services have been the main driver of Indian growth and a big part of its exports (in particular, IT services). This notwithstanding, India's export basket increasingly included more technologically complex products such as chemicals and other manufactures. The MHX share increased from 19 percent to 28 percent, while the MHVA share remained the second highest over the last 15 years, only behind China.

Figure 13: India's industrial competitiveness model over time (normalized figures)

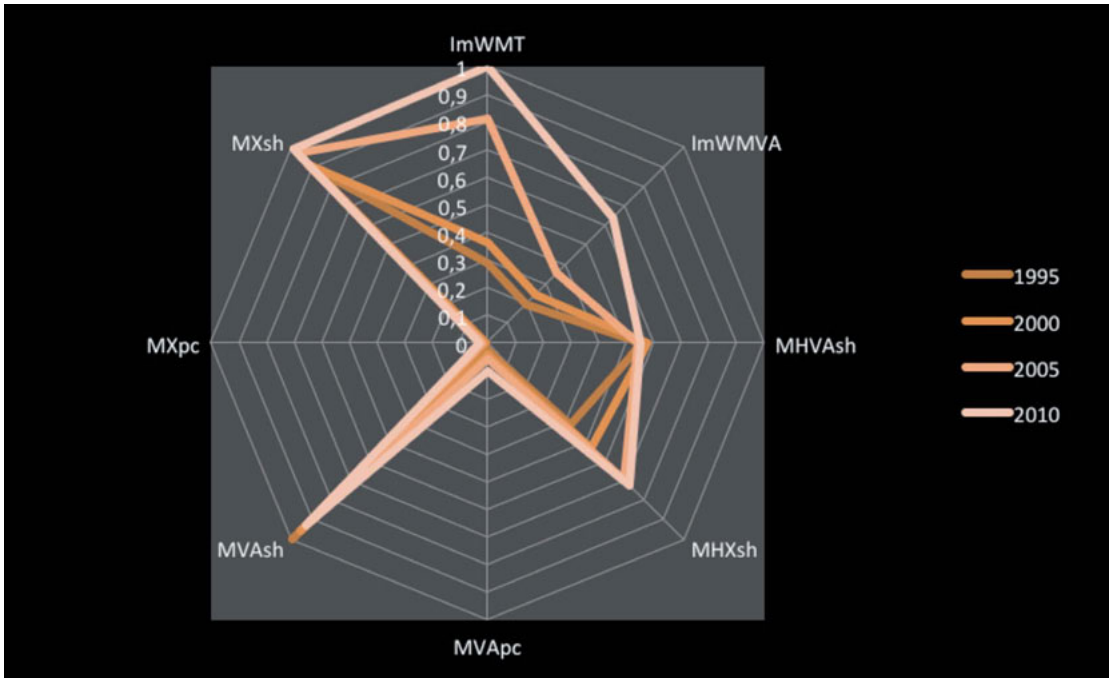
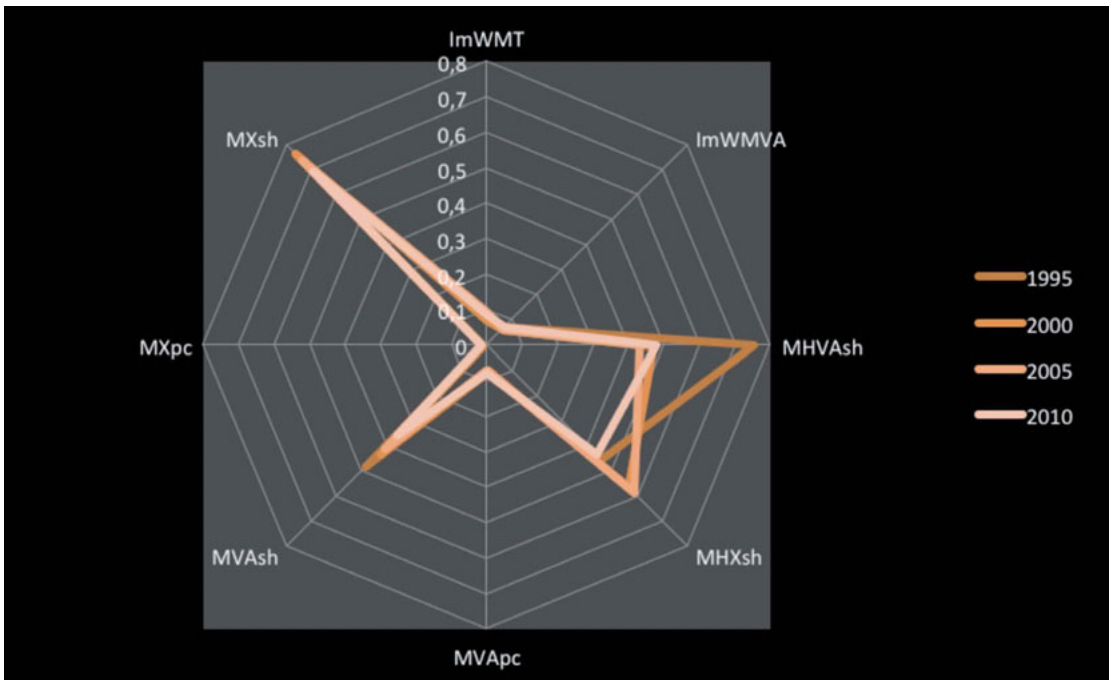


Table 39: BRICS' competitiveness models: A comparison over 15 years

Country	MVApc	MXpc	MHVAsh	MVAsh	MHXsh	MXsh	ImWMVA	ImWMT
1995								
Brazil	587.738	218.541	51.022	16.275	38.253	75.948	1.968	0.918
Russian Federation (1996)	289.403	235.967	32.832	18.651	37.615	39.617	0.866	0.872
India	54.833	26.221	46.217	15.097	19.396	79.060	1.084	0.650
China	199.363	108.867	37.978	30.522	35.368	88.813	5.015	3.434
South Africa	489.104	385.800	28.995	17.528	32.156	56.729	0.421	0.416
media	324.088	195.079	39.409	19.615	32.557	68.033	1.871	1.258
median	289.403	218.541	37.978	17.528	35.368	75.948	1.084	0.872
Total							9.354	6.289
2000								
Brazil	552.163	242.523	34.852	14.916	48.257	76.631	1.665	0.871
Russian Federation	345.577	273.875	30.926	19.617	36.186	39.164	0.882	0.833
India	62.848	33.854	41.029	14.289	18.680	83.618	1.139	0.730
China	303.113	179.853	42.877	32.119	45.491	91.655	6.666	4.710
South Africa	505.011	404.321	23.516	17.254	39.982	69.798	0.397	0.379
media	353.742	226.885	34.640	19.639	37.719	72.173	2.150	1.504
median	345.577	242.523	34.852	17.254	39.982	76.631	1.139	0.833
Total							10.749	7.522
2005								
Brazil	593.939	458.808	33.101	15.003	48.158	72.320	1.653	1.105
Russian Federation	476.630	635.455	22.453	19.620	27.574	37.886	1.022	1.180
India	80.985	76.840	39.244	14.254	22.598	86.861	1.369	1.124
China	480.448	550.373	41.611	33.048	57.672	94.839	9.398	9.319
South Africa	556.506	677.224	23.125	16.636	47.570	69.088	0.397	0.419
media	437.701	479.740	31.907	19.712	40.714	72.199	2.768	2.629
median	480.448	550.373	33.101	16.636	47.570	72.320	1.369	1.124
Total							13.839	13.146
2010								
Brazil	622.099	667.545	34.972	13.512	36.295	67.304	1.712	1.230
Russian Federation	503.997	1028.697	23.141	17.073	24.372	36.077	0.978	1.337
India	120.185	153.827	37.275	15.044	28.241	85.159	2.028	1.738
China	820.018	1123.620	40.696	34.165	60.522	96.249	15.329	14.063
South Africa	567.274	991.148	21.241	14.930	45.655	68.325	0.387	0.452
media	526.715	792.968	31.465	18.945	39.017	70.623	4.087	3.764
median	567.274	991.148	34.972	15.044	36.295	68.325	1.712	1.337
Total							20.434	18.820

Compared to its Asian competitors, Brazil has not experienced a constant and sustained process of manufacturing development (see Figure 14). Also, the rapid economic growth experienced in recent years has mainly been driven by other sectors than manufacturing. Despite the relatively modest increases in MVApc and MXpc, Brazil experienced a significant technological contraction in terms of medium- and high-tech activities in total MVA and in total MX. Brazil has been successful in exporting natural resources as well as certain categories of manufactured products. A growth in petroleum and chemical sub-sectors as well as transport equipment, machinery and electrical equipment has been registered.

Figure 14: Brazil's industrial competitiveness model over time (normalized figures)



The Russian Federation has experienced an overall process of deindustrialization over the last 15 years, characterized by an increasing reliance on primary resource extraction and export, mainly of oil and gas (see Figure 15). In 2009, the share of mining and utilities in the Russian Federation (but also in South Africa) was equal to 12 percent of GDP (UNIDO, 2012). As a result, the Russian manufacturing export basket has increasingly consisted of refined petroleum products. However, manufacturing still plays an important role in boosting technological activities and providing more stable employment (see Table 39).

A similar model has been followed by South Africa where manufacturing growth has been quite moderate and the country has primarily relied on commodity and resource exports (see Figure 16). However, contrary to the Russian Federation, South Africa registered an increase in MHX shares driven by exports of transport equipment, machinery and electrical equipment. Thus, high skill sectors are gaining greater importance, although the service sector has become dominant.

Figure 15: Russian Federation's industrial competitiveness model over time (normalized figures)

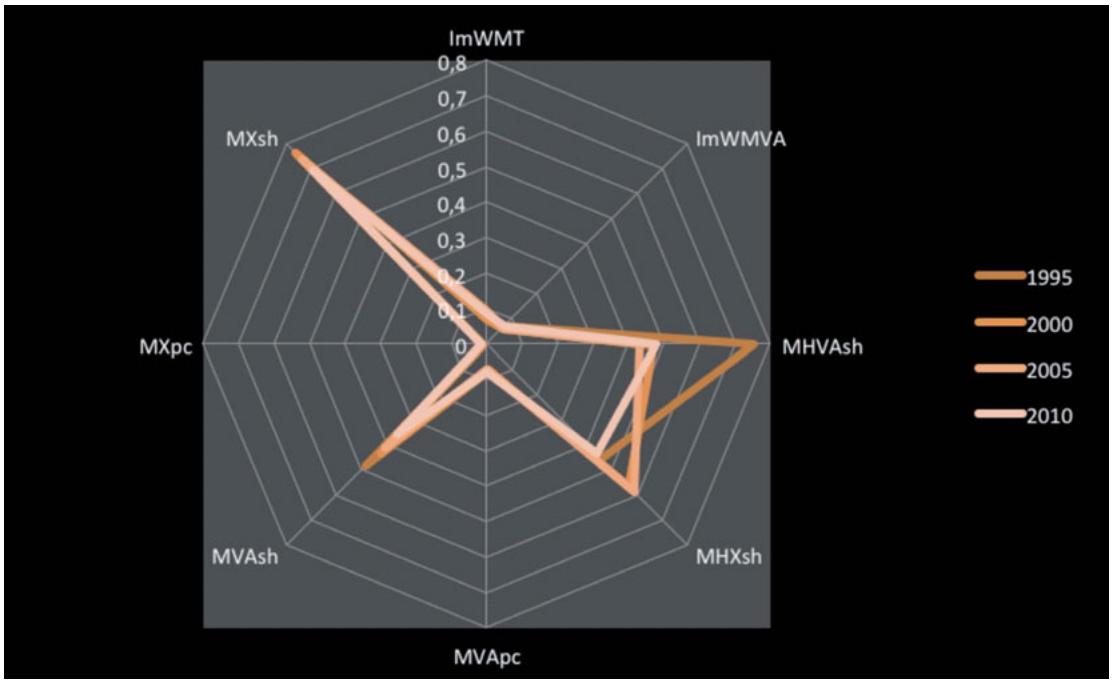
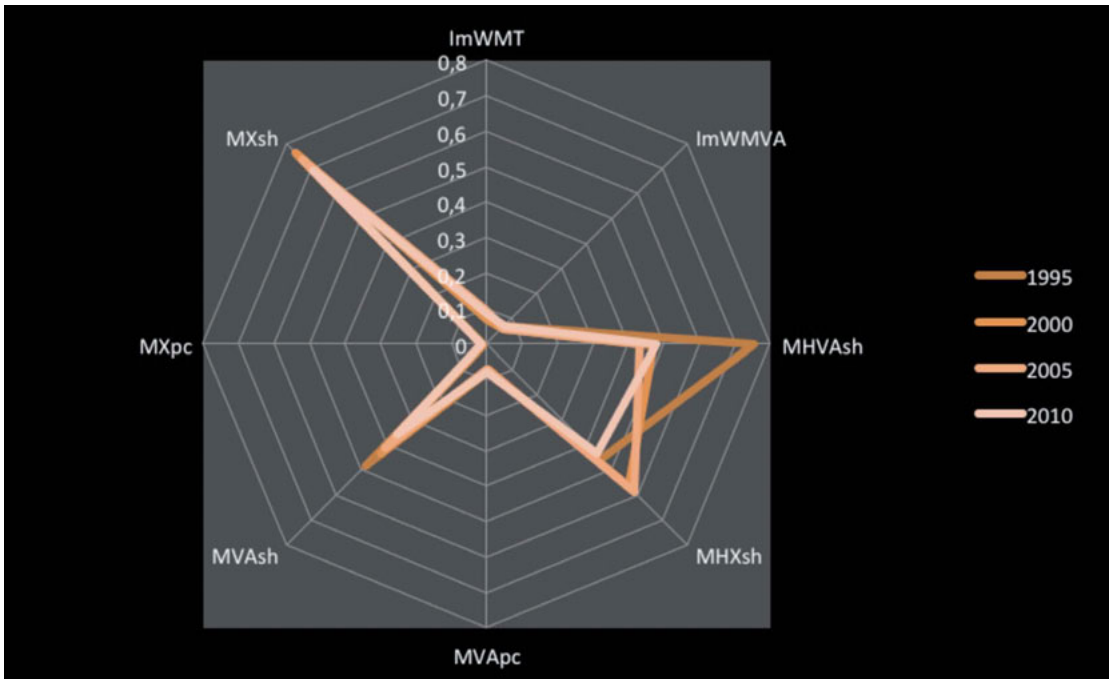


Figure 16: South Africa's industrial competitiveness model over time (normalized figures)



Conclusion

Over the last two decades, industrial policies have gradually re-entered the policy debate of development economists and policymakers in both developed and developing countries. This process has been described by Dani Rodrik as a process of normalizing industrial policies' (Rodrik, 2008). On the one hand, industrial policies are back on the government agenda of developed economies, especially as a result of their difficulties in finding new paths to sustained growth. On the other hand, developing economies are increasingly looking at the possibility of implementing industrial policies as a way of driving structural change and catch-up processes.

While the main focus of the debate throughout the 1990s was the theoretical and historical evidence in support of and against industrial policies, this has now changed. More recently, academics and international actors such as UNIDO have begun focusing on the specific problems connected with the design, implementation and evaluation of context-specific policies for manufacturing development. In other words, the debate around industrial policies is increasingly moving from the 'why' to the 'what', 'when' and 'how' of effective industrial policy design and implementation.

The possibility for governments to achieve a certain set of macro policy goals resides in their capacity to understand, monitor and benchmark their industrial competitive performance and, thus, in their capacity and willingness to influence countries' structural trajectories and underlying production and technological capabilities dynamics.

The CIP index has been an extremely useful tool for UNIDO in moving from analysis of performances to policy recommendations as well as in providing countries with a package of industrial diagnostics. The CIP index performs three main functions. It works as:

(i) a focusing device for problem identification. Benchmarks are needed because it is difficult to assess national industrial performance on the basis of a priori norms. By comparing countries' relative performances, it is possible to indentify relative strengths and absolute weaknesses which call for appropriate and selective policy interventions. Wherever competitive performance can be improved, benchmarking is a useful tool.

(ii) an awareness raising tool for deepening countries' appreciation of the main dimensions of industrial competitiveness, that is, their capacity to produce and export competitively, their technological deepening and upgrading and finally, their impact on global manufacturing production and export.

(iii) a policy tool for policy ownership. Given its non-normative character, the CIP index provides policymakers information on the structural features of different economic systems. The CIP index does not make any implicit normative assumptions or prescriptions at the institutional level and leaves countries full ownership of their development model.

Industrial competitiveness benchmarks at the national level such as the CIP index should be seen as preliminary indicators of countries' relative industrial competitive performance. Despite being a useful tool, the CIP index is not sufficient for industrial policy design. In fact, in order to design an integrated set of selective industrial policies operating at different levels of the economic system, the industrial competitiveness analysis based on the CIP index will have to be complemented by detailed analyses by country and activity.

Benchmarking can be conducted at more disaggregated levels such as sector, industries, production tasks, enterprises, institutions, government or government department. Also, it can focus on more or less specific matters, such as capital and labour costs, infrastructure, technology, innovation, skills or the environment. The opportunity of relying on a multiple informational space and of analysing the relationship between input, output and mediating factors into a consistent causal structure are recognized as fundamental starting points for the design of industrial policies.

The industrial competitiveness analysis based on the CIP index provides the overall framework within which these analyses can be systematically developed and interdependences among policy measures may be revealed.

Annexes

TABLES ANNEX: Top 20 performers over 20 years, 1990 - 2010

Table 40: Top 20 performers in Manufacturing Value Added per capita (MVApc) over 20 years, 1990 - 2010

Ranking	1990	MVApc	1995	MVApc	2000	MVApc	2005	MVApc	2010	MVApc5
1	Japan	7753.029	Japan	7768.466	Japan	8140.258	Japan	8822.508	Singapore	8198.274
2	Switzerland	5959.621	Switzerland	5950.340	Ireland	7595.597	Ireland	8058.400	Japan	7993.985
3	Germany	4651.604	Singapore	4953.263	Switzerland	6143.590	Singapore	6784.409	Switzerland	7168.375
4	United States of America	4145.335	Ireland	4643.583	Singapore	5940.765	Sweden	6706.237	Finland	6795.266
5	Singapore	3895.010	United States of America	4578.686	Finland	5422.676	Switzerland	6596.515	Sweden	6559.365
6	United Kingdom	3703.565	Germany	4311.093	United States of America	5416.752	Finland	6496.297	Ireland	6506.683
7	Luxembourg	3673.505	Luxembourg	3936.884	Sweden	5384.741	United States of America	5899.053	China, Taiwan Province	6153.097
8	Denmark	3596.747	Denmark	3915.534	Germany	4768.299	Germany	5036.238	United States of America	5522.091
9	Ireland	3564.556	Sweden	3742.777	Luxembourg	4679.387	China, Taiwan Province	4823.819	Austria	4869.479
10	Austria	3509.587	United Kingdom	3670.625	Austria	4359.674	Luxembourg	4700.491	Republic of Korea	4782.695
11	Belgium	3355.973	Austria	3663.197	Canada	4218.803	Austria	4626.500	Germany	4666.907
12	Norway	3343.008	Finland	3619.944	Denmark	4170.249	Denmark	3963.028	Iceland	4007.826
13	Finland	3331.865	Belgium	3394.189	Belgium	3914.328	Canada	3958.289	Denmark	3887.018
14	Iceland	3221.273	Italy	3384.388	United Kingdom	3855.585	Belgium	3952.913	Belgium	3793.781
15	Sweden	3190.455	Norway	3365.082	China, Taiwan Province	3614.573	Republic of Korea	3852.322	Norway	3766.775
16	Italy	3151.611	Canada	3274.091	Iceland	3591.510	Norway	3813.282	Luxembourg	3737.346
17	Canada	3121.350	Iceland	3076.723	Italy	3562.200	United Kingdom	3700.023	Netherlands	3324.625
18	Netherlands	2752.955	Netherlands	2941.637	Norway	3498.733	Iceland	3594.924	Israel	3235.619
19	Israel	2751.827	China, Taiwan Province	2849.811	Netherlands	3360.259	Netherlands	3414.894	United Kingdom	3162.344
20	France	2676.609	France	2786.144	France	3217.795	Italy	3377.584	Canada	3077.729
	Mean	3767.474		3991.323		4742.789		5108.886		5060.464
	Median	3432.780		3666.911		4289.239		4663.496		4724.801
	standard dev	1192.051		1184.258		1384.336		1629.862		1675.034

Table 41: Top 20 performers in Manufactured Exports per capita (MXpc) over 20 years, 1990 - 2010

Ranking	1990	MXpc	1995	MXpc	2000	MXpc	2005	MXpc	2010	MXpc
1	Singapore	10684.730	Singapore	18597.550	Singapore	18448.320	Belgium	28379.600	Singapore	35709.080
2	Belgium	10164.370	Belgium	14127.840	Ireland	18338.530	Singapore	26994.950	Belgium	34137.530
3	Switzerland	8717.607	Switzerland	10906.920	Belgium	15876.240	Ireland	24437.910	Luxembourg	24557.200
4	Netherlands	6673.294	Ireland	10265.820	Luxembourg	15840.080	Luxembourg	24374.410	Ireland	23959.500
5	Sweden	6350.682	Netherlands	8930.359	Switzerland	10247.540	Switzerland	16578.840	Switzerland	23651.560
6	Ireland	5660.081	Sweden	7820.309	Netherlands	9573.106	Netherlands	16163.750	Netherlands	22081.020
7	Austria	5084.372	Finland	7445.770	Sweden	9004.021	Sweden	12976.430	Sweden	15375.640
8	Finland	5056.310	Denmark	6733.216	Finland	8356.186	Austria	12400.980	Austria	14926.310
9	Denmark	5008.304	Austria	6165.152	Denmark	6912.180	Finland	11762.610	Germany	13397.430
10	China, Macao SAR	4496.670	Germany	5612.932	Canada	6679.495	Denmark	11613.590	Denmark	12839.140
11	Norway	3499.568	Canada	4982.614	Austria	6645.272	Germany	10780.620	Finland	12001.190
12	Canada	3372.083	China, Taiwan Province	4899.335	China, Taiwan Province	6502.771	Slovenia	8239.313	Czech Republic	11816.280
13	France	3183.218	China, Macao SAR	4682.263	Germany	5848.431	China, Taiwan Province	8069.373	Slovakia	11125.340
14	China, Taiwan Province	3132.366	China, Hong Kong SAR	4565.385	Malta	5569.349	Canada	7278.819	Slovenia	11094.260
15	Italy	2794.612	Malta	4554.545	China, Macao SAR	4818.630	Czech Republic	7064.315	China, Taiwan Province	10825.160
16	United Kingdom	2724.681	France	4180.162	France	4431.625	France	6354.512	Republic of Korea	9280.327
17	Malta	2706.917	Slovenia	3941.155	Israel	4287.521	Italy	5896.647	Qatar	8817.292
18	Israel	2428.437	Italy	3798.611	Slovenia	4113.607	Republic of Korea	5801.508	Malta	8406.836
19	Japan	2254.200	United Kingdom	3523.145	Italy	3927.740	Norway	5593.132	Estonia	8360.444
20	Iceland	1735.431	Norway	3464.860	United Kingdom	3927.685	Hungary	5575.848	Hungary	8291.955
	Mean	4786.397		6959.897		8467.416		12816.858		16032.675
	Median	3998.119		5297.773		6662.384		11197.105		12420.165
	standard dev	2605.839		3949.694		4846.569		7590.979		8423.300

Table 42: Top 20 performers in Medium- and High-tech Manufacturing Value Added share (MHVAsh) over 20 years, 1990 - 2010

Ranking	1990	MHVAsh	1995	MHVAsh	2000	MHVAsh	2005	MHVAsh	2010	MHVAsh
1	Côte d'Ivoire	92.190	Singapore	67.446	Singapore	74.200	Singapore	76.720	Singapore	73.409
2	Singapore	64.759	Ireland	54.018	Ireland	64.655	Ireland	59.576	Ireland	64.070
3	France	51.712	France	53.394	Israel	57.659	Germany	56.498	China, Taiwan Province	61.880
4	Japan	50.873	Brazil	51.022	Germany	53.945	Israel	54.442	Germany	56.759
5	Ireland	49.762	United States of America	49.222	Republic of Korea	52.501	Republic of Korea	54.145	Israel	55.606
6	Brazil	49.391	Germany	48.849	Japan	50.902	Japan	53.941	Japan	53.704
7	United States of America	48.654	Japan	48.603	Niger	50.529	Hungary	53.110	Hungary	53.472
8	United Kingdom	44.757	Malaysia	48.198	United States of America	49.998	Sweden	52.944	Republic of Korea	53.408
9	Malaysia	42.609	Republic of Korea	47.119	Malaysia	49.924	United States of America	48.078	United States of America	51.524
10	Italy	42.499	India	46.217	Sweden	49.172	Malaysia	47.382	Sweden	46.958
11	Saudi Arabia	42.483	Sweden	45.045	Hungary	48.119	France	44.481	Thailand	46.157
12	Netherlands	42.233	Israel	45.043	France	45.361	China, Taiwan Province	44.077	Slovenia	45.518
13	Hungary	42.162	China, Taiwan Province	42.559	Malta	44.813	Finland	44.006	France	45.413
14	Mexico	42.097	Saudi Arabia	42.483	China, Taiwan Province	44.077	Belgium	43.370	Finland	45.355
15	Israel	41.830	United Kingdom	41.673	Belgium	43.654	Saudi Arabia	42.483	Philippines	45.313
16	Sweden	41.713	Canada	40.168	Canada	43.242	Netherlands	42.443	Malta	44.924
17	Republic of Korea	41.615	Belgium	40.157	China	42.877	Czech Republic	42.346	Czech Republic	44.616
18	India	40.005	Trinidad and Tobago	40.153	Mexico	42.563	Thailand	41.955	Slovakia	43.319
19	Switzerland	38.558	Mexico	39.009	Saudi Arabia	42.483	Slovenia	41.754	Belgium	42.280
20	Canada	38.177	Netherlands	38.820	Finland	42.432	China	41.611	United Kingdom	41.987
	Mean	47.404		46.460		49.655		49.268		50.784
	Median	42.491		45.631		48.645		45.931		46.557
	standard dev	12.192		6.801		8.186		8.703		8.346

Table 43: Top 20 performers in Manufacturing Value Added share in total GDP (MVAsh) over 20 years, 1990 - 2010

Ranking	1990	MVAsh	1995	MVAsh	2000	MVAsh	2005	MVAsh	2010	MVAsh
1	Syrian Arab Republic	48.678	Syrian Arab Republic	66.205	Thailand	33.592	Thailand	35.842	Thailand	36.608
2	Bulgaria	37.630	Swaziland	36.251	Swaziland	32.504	China	33.048	China	34.165
3	Swaziland	36.434	Tajikistan	33.088	China	32.119	Belarus	32.041	Belarus	32.948
4	Tajikistan	34.348	China	30.522	Malaysia	30.864	Tajikistan	31.374	Swaziland	30.973
5	Armenia	27.822	Thailand	30.035	Tajikistan	30.837	Swaziland	31.106	Tajikistan	30.416
6	China, Taiwan Province	27.783	Ireland	27.643	Ireland	29.994	Malaysia	30.704	China, Taiwan Province	29.866
7	The f. Yugosl. Rep of Macedonia	27.292	Malaysia	26.198	Indonesia	27.745	Slovakia	28.974	Republic of Korea	29.091
8	Slovakia	27.088	Singapore	25.250	Belarus	27.044	China, Taiwan Province	28.123	Czech Republic	28.149
9	Singapore	26.306	Indonesia	25.074	Singapore	25.741	Indonesia	28.076	Slovakia	27.427
10	Ireland	25.919	Philippines	24.968	Republic of Korea	25.227	Republic of Korea	27.756	Malaysia	27.102
11	China	25.915	Armenia	24.960	China, Taiwan Province	24.621	Ireland	26.903	Indonesia	26.396
12	Thailand	25.635	Serbia	24.718	Philippines	24.467	Czech Republic	26.615	Viet Nam	25.466
13	Slovenia	25.177	China, Taiwan Province	24.036	Czech Republic	24.305	Singapore	26.040	Finland	24.721
14	Croatia	25.165	Bosnia and Herzegovina	23.550	El Salvador	23.075	Finland	24.598	Singapore	24.468
15	Philippines	25.148	Belarus	22.871	Finland	23.060	Philippines	23.712	Ireland	23.107
16	Kyrgyzstan	24.826	Japan	21.902	Costa Rica	23.060	Slovenia	23.669	El Salvador	22.851
17	Serbia	24.664	Bulgaria	21.637	Slovenia	22.504	El Salvador	23.155	Poland	22.513
18	Belarus	23.984	Slovakia	21.600	Serbia	22.302	Japan	22.660	Philippines	21.339
19	Germany	23.943	Republic of Korea	21.341	Japan	22.155	Viet Nam	22.424	Hungary	21.076
20	Malaysia	23.762	Slovenia	21.263	Slovakia	22.018	Costa Rica	22.155	Slovenia	20.893
	Mean	28.376		27.656		26.362		27.449		26.979
	Median	25.917		24.964		24.924		27.330		26.749
	standard deviation	6.255		9.949		3.921		3.970		4.541

Table 44: Top 20 performers in Industrialization intensity (INDint) over 20 years, 1990 - 2010

Ranking	1990	INDint	1995	INDint	2000	INDint	2005	INDint	2010	INDint
1	Singapore	0.958	Singapore	0.904	Ireland	0.881	Singapore	0.861	Singapore	0.831
2	Ireland	0.825	Ireland	0.847	Singapore	0.880	Thailand	0.773	China, Taiwan Province	0.828
3	China, Taiwan Province	0.777	China	0.778	Malaysia	0.795	Ireland	0.761	Thailand	0.814
4	Japan	0.754	Malaysia	0.777	China	0.766	Republic of Korea	0.738	Republic of Korea	0.759
5	Malaysia	0.706	Thailand	0.716	Thailand	0.755	Malaysia	0.736	Ireland	0.749
6	Republic of Korea	0.617	Japan	0.702	Republic of Korea	0.726	China	0.731	China	0.743
7	Thailand	0.582	China, Taiwan Province	0.695	Japan	0.668	China, Taiwan Province	0.678	Czech Republic	0.686
8	United Kingdom	0.572	Republic of Korea	0.681	Germany	0.666	Japan	0.664	Slovakia	0.667
9	Italy	0.572	Germany	0.678	China, Taiwan Province	0.660	Germany	0.661	Malaysia	0.652
10	Brazil	0.561	Brazil	0.618	Indonesia	0.643	Czech Republic	0.645	Hungary	0.648
11	Israel	0.520	Philippines	0.610	Finland	0.625	Sweden	0.641	Finland	0.644
12	Malta	0.515	Indonesia	0.601	Czech Republic	0.621	Slovakia	0.638	Japan	0.640
13	Switzerland	0.513	France	0.594	Hungary	0.617	Finland	0.627	Germany	0.636
14	United States of America	0.508	United States of America	0.590	Israel	0.614	Hungary	0.625	Indonesia	0.615
15	Mexico	0.505	Slovenia	0.576	Sweden	0.613	Indonesia	0.604	Philippines	0.596
16	France	0.501	Italy	0.572	Philippines	0.612	Slovenia	0.599	Slovenia	0.591
17	Indonesia	0.482	Slovakia	0.569	Malta	0.591	Philippines	0.581	Sweden	0.589
18	Austria	0.462	Sweden	0.566	Slovenia	0.575	Israel	0.545	Belarus	0.577
19	Spain	0.459	United Kingdom	0.562	United States of America	0.561	United States of America	0.530	Israel	0.562
20	Canada	0.447	India	0.561	Mexico	0.555	Austria	0.525	United States of America	0.548
										0.669
	Mean	0.592		0.660		0.671		0.658		0.669
	Median	0.541		0.614		0.634		0.643		0.646
	standard dev	0.140		0.102		0.098		0.087		0.089

Table 45: Top 20 performers in Medium- and High-tech manufactured Exports share in total manufactured exports (MHXsh) over 20 years, 1990 - 2010

Ranking	1990	MHXsh	1995	MHXsh	2000	MHXsh	2005	MHXsh	2010	MHXsh
1	Japan	83.155	Japan	84.256	Japan	85.388	Japan	82.345	Congo	83.423
2	United States of America	72.506	Singapore	78.551	Philippines	81.442	Philippines	81.482	Japan	79.752
3	United Kingdom	65.853	Malta	76.630	Malta	81.095	Iraq	80.002	Philippines	79.664
4	Malta	63.696	Mexico	73.109	Singapore	80.342	Hungary	75.847	Mexico	78.712
5	Switzerland	62.271	United States of America	72.416	Malaysia	76.443	Republic of Korea	75.338	Hungary	77.994
6	Singapore	62.209	Germany	69.471	Mexico	76.148	Mexico	75.158	Republic of Korea	75.848
7	Mexico	61.236	Republic of Korea	68.759	Iraq	75.902	Malta	74.923	China, Taiwan Province	72.395
8	France	59.382	Malaysia	68.270	United States of America	75.454	Nigeria	74.871	Germany	72.335
9	Jordan	58.228	United Kingdom	67.293	Hungary	73.336	United States of America	72.805	Switzerland	69.666
10	Sweden	57.569	Switzerland	64.263	Germany	72.973	Singapore	72.747	Singapore	68.991
11	Canada	57.549	China, Taiwan Province	62.703	China, Taiwan Province	71.400	Germany	72.525	Czech Republic	67.944
12	Spain	54.524	France	62.675	Republic of Korea	70.398	Malaysia	72.302	Tajikistan	66.305
13	Malaysia	53.263	Oman	60.861	United Kingdom	69.727	China, Taiwan Province	70.294	Slovakia	66.260
14	Austria	53.211	Spain	60.260	Switzerland	67.444	United Kingdom	67.373	France	65.769
15	Ireland	51.812	Canada	58.620	France	66.890	Switzerland	67.162	United States of America	64.744
16	Kuwait	51.755	Sweden	58.328	Costa Rica	66.585	Tajikistan	66.305	Malaysia	63.488
17	China, Taiwan Province	51.455	Kuwait	55.334	Tajikistan	66.305	France	66.033	United Kingdom	63.221
18	Republic of Korea	51.114	Austria	54.345	Sweden	64.315	Czech Republic	64.107	Slovenia	62.960
19	Norway	50.196	Ireland	53.834	Canada	62.845	Thailand	61.880	Thailand	61.820
20	Italy	50.156	Netherlands	53.670	Spain	61.193	Sweden	61.216	China	60.522
	Mean	58.557		65.182		72.281		71.736		70.091
	Median	57.559		63.483		72.186		72.636		68.467
	standard dev	8.358		8.754		6.737		6.116		6.985

Table 46: Top 20 performers in Manufactured Exports share in total exports (MXsh) over 20 years, 1990 - 2010

Ranking	1990	MXsh	1995	MXsh	2000	MXsh	2005	MXsh	2010	MXsh
1	China, Macao SAR	98.763	Mauritius	98.141	China, Macao SAR	99.865	China, Macao SAR	97.931	Republic of Korea	96.852
2	Mauritius	97.839	China, Macao SAR	97.268	Mauritius	97.780	Republic of Korea	97.644	China	96.249
3	Japan	97.048	Portugal	96.832	Malta	97.472	China, Taiwan Province	96.674	Israel	96.212
4	Portugal	96.134	Japan	96.502	China, Taiwan Province	97.404	Botswana	96.009	China, Taiwan Province	96.011
5	Republic of Korea	95.785	Malta	96.393	Republic of Korea	96.658	Philippines	95.581	Mauritius	95.594
6	China, Taiwan Province	95.402	Switzerland	95.300	Philippines	96.205	Jamaica	95.307	Slovakia	93.801
7	Sweden	94.872	Republic of Korea	95.275	Botswana	96.076	China	94.839	Botswana	93.704
8	Finland	94.608	China, Taiwan Province	95.180	Portugal	95.556	Finland	94.587	Philippines	93.296
9	Malta	94.278	China, Hong Kong SAR	94.611	Finland	95.109	Romania	94.185	Malta	93.043
10	Italy	94.040	Italy	94.455	Japan	94.994	Swaziland	94.058	Swaziland	92.856
11	Austria	93.834	Finland	94.118	Italy	94.443	Switzerland	94.011	Jamaica	92.576
12	Switzerland	93.390	Croatia	93.363	Slovakia	94.229	Japan	93.865	Bangladesh	91.736
13	Romania	92.982	Slovenia	93.091	Singapore	94.093	Singapore	93.800	Ireland	91.646
14	Singapore	92.753	Singapore	93.042	China, Hong Kong SAR	94.066	Bangladesh	93.331	Japan	91.624
15	Israel	90.949	Nepal	92.474	Czech Republic	93.486	Slovakia	93.030	Italy	91.618
16	Haiti	86.190	Latvia	92.455	Slovenia	93.446	Italy	92.723	Switzerland	91.492
17	Bangladesh	86.069	Slovakia	92.172	Swaziland	93.346	Czech Republic	92.059	Barbados	91.111
18	Spain	86.002	Barbados	91.830	Barbados	93.127	Slovenia	92.053	Finland	91.101
19	France	86.002	Israel	91.640	Cape Verde	92.610	Ireland	92.046	Czech Republic	90.987
20	Belgium	85.348	Romania	90.984	Switzerland	92.498	Malta	91.865	Slovenia	90.832
	Mean	92.614		94.256		95.123		94.280		93.117
	Median	93.937		94.286		94.719		94.034		92.716
	standard dev	4.342		2.070		1.976		1.816		2.027

Table 47: Top 20 performers in Manufactured Exports Quality (MXQual) over 20 years, 1990 - 2010

Ranking	1990	MXQual	1995	MXQual	2000	MXQual	2005	MXQual	2010	MXQual
1	Japan	0.991	Japan	0.991	Japan	0.976	Philippines	0.983	Philippines	0.959
2	Malta	0.855	Malta	0.945	Malta	0.963	Japan	0.979	Republic of Korea	0.955
3	Switzerland	0.841	Singapore	0.939	Philippines	0.958	Republic of Korea	0.956	Japan	0.951
4	United States of America	0.840	Republic of Korea	0.893	Singapore	0.941	Malta	0.924	China, Taiwan Province	0.930
5	Singapore	0.837	Switzerland	0.866	China, Taiwan Province	0.905	Hungary	0.922	Hungary	0.917
6	Sweden	0.820	China, Taiwan Province	0.856	Republic of Korea	0.896	Singapore	0.921	Switzerland	0.890
7	United Kingdom	0.813	Germany	0.855	Malaysia	0.894	China, Taiwan Province	0.920	Mexico	0.885
8	Austria	0.788	United States of America	0.853	Hungary	0.885	Germany	0.906	Germany	0.882
9	China, Taiwan Province	0.785	Malaysia	0.852	Mexico	0.878	Switzerland	0.888	Slovakia	0.881
10	Republic of Korea	0.785	Mexico	0.845	United States of America	0.878	United States of America	0.882	Czech Republic	0.877
11	France	0.783	United Kingdom	0.840	Germany	0.865	Malaysia	0.874	Singapore	0.877
12	Italy	0.770	France	0.805	Switzerland	0.858	Mexico	0.872	China	0.860
13	Spain	0.753	Sweden	0.798	Sweden	0.836	Czech Republic	0.859	France	0.850
14	Ireland	0.723	Spain	0.792	France	0.836	France	0.856	Slovenia	0.846
15	Finland	0.721	Italy	0.786	United Kingdom	0.817	China	0.834	Israel	0.831
16	Belgium	0.720	Slovenia	0.762	Czech Republic	0.804	Slovenia	0.834	Malta	0.817
17	Canada	0.704	Austria	0.758	Finland	0.799	United Kingdom	0.833	Malaysia	0.810
18	Israel	0.698	Finland	0.749	Ireland	0.796	Finland	0.832	Sweden	0.809
19	Romania	0.690	Ireland	0.746	Spain	0.791	Sweden	0.831	Austria	0.808
20	Malaysia	0.680	China, Hong Kong SAR	0.745	Slovenia	0.785	Thailand	0.820	Thailand	0.804
	Mean	0.780		0.834		0.868		0.886		0.872
	Median	0.784		0.842		0.872		0.878		0.877
	standard deviation	0.074		0.070		0.060		0.051		0.051

Table 48: Top 20 performers in World MVA share (ImWMVA) over 20 years, 1990 - 2010

Ranking	1990	ImWMVA	1995	ImWMVA	2000	ImWMVA	2005	ImWMVA	2010	ImWMVA
1	United States of America	24.345	United States of America	25.643	United States of America	26.720	United States of America	26.351	United States of America	24.036
2	Japan	21.964	Japan	20.200	Japan	17.907	Japan	16.810	China	15.329
3	Germany	8.473	Germany	7.296	China	6.796	China	9.398	Japan	14.126
4	United Kingdom	4.861	China	5.015	Germany	6.666	Germany	6.201	Germany	5.317
5	Italy	4.099	United Kingdom	4.409	United Kingdom	3.930	United Kingdom	3.321	Republic of Korea	3.220
6	France	3.482	Italy	4.019	France	3.559	France	3.019	United Kingdom	2.691
7	China	2.642	France	3.361	Italy	3.298	Italy	2.951	France	2.494
8	Canada	1.983	Canada	1.988	Republic of Korea	2.330	Republic of Korea	2.747	Italy	2.325
9	Brazil	1.920	Brazil	1.968	Canada	2.242	Canada	1.903	India	2.028
10	Russian Federation	1.916	Republic of Korea	1.904	Mexico	1.856	Brazil	1.653	China, Taiwan Province	1.968
11	Spain	1.715	Spain	1.597	Spain	1.693	China, Taiwan Province	1.631	Brazil	1.712
12	Mexico	1.593	Mexico	1.524	Brazil	1.665	Mexico	1.622	Mexico	1.538
13	Republic of Korea	1.418	China, Taiwan Province	1.258	China, Taiwan Province	1.391	Spain	1.539	Canada	1.437
14	China, Taiwan Province	1.135	India	1.084	India	1.139	India	1.369	Spain	1.183
15	Australia	0.988	Netherlands	0.942	Turkey	0.927	Russian Federation	1.022	Turkey	1.088
16	Netherlands	0.944	Argentina	0.927	Netherlands	0.927	Turkey	0.994	Indonesia	1.002
17	Switzerland	0.934	Australia	0.923	Russian Federation	0.882	Sweden	0.903	Argentina	0.986
18	India	0.858	Russian Federation	0.918	Australia	0.850	Indonesia	0.870	Russian Federation	0.978
19	Argentina	0.822	Turkey	0.905	Sweden	0.827	Thailand	0.840	Thailand	0.949
20	Turkey	0.804	Switzerland	0.880	Argentina	0.812	Netherlands	0.831	Sweden	0.838
	Mean	4.345		4.338		4.321		4.299		4.262
	Median	1.816		1.751		1.775		1.642		1.840
	standard dev	6.703		6.643		6.562		6.454		6.194
	Total	86.898		86.762		86.418		85.973		85.245

Table 49: Top 20 performers in World Manufactures Trade share (ImWMT) over 20 years, 1990 - 2010

Ranking	1990	ImWMT	1995	ImWMT	2000	ImWMT	2005	ImWMT	2010	ImWMT
1	United States of America	12.714	Germany	11.911	United States of America	12.811	Germany	11.490	China	14.063
2	Japan	11.588	United States of America	11.908	Germany	9.926	China	9.319	Germany	10.219
3	France	7.515	Japan	11.107	Japan	9.388	United States of America	8.927	United States of America	7.974
4	Italy	6.596	France	6.322	France	5.409	Japan	7.201	Japan	6.532
5	United Kingdom	6.490	Italy	5.656	United Kingdom	4.768	France	4.998	France	4.189
6	Belgium	4.201	United Kingdom	5.306	China	4.710	Italy	4.459	Republic of Korea	4.183
7	Netherlands	4.152	Canada	3.794	Italy	4.673	United Kingdom	4.117	Italy	3.791
8	Canada	3.887	Belgium	3.702	Canada	4.227	Belgium	3.805	Netherlands	3.374
9	China, Taiwan Province	2.653	Netherlands	3.587	Republic of Korea	3.434	Republic of Korea	3.581	Belgium	3.326
10	Republic of Korea	2.591	China	3.434	Belgium	3.337	Netherlands	3.403	United Kingdom	2.989
11	Switzerland	2.479	Republic of Korea	3.096	Netherlands	3.143	Canada	3.029	China, Taiwan Province	2.318
12	Sweden	2.262	China, Taiwan Province	2.712	China, Taiwan Province	2.979	China, Taiwan Province	2.361	Mexico	2.212
13	Spain	1.991	Switzerland	2.022	Mexico	2.965	Mexico	2.252	Canada	2.084
14	Austria	1.635	Spain	2.000	Spain	2.021	Spain	2.146	Spain	1.910
15	Singapore	1.341	Sweden	1.794	Malaysia	1.807	Switzerland	1.587	India	1.738
16	Denmark	1.071	Malaysia	1.692	Sweden	1.646	Malaysia	1.555	Switzerland	1.657
17	Finland	1.049	Mexico	1.687	Switzerland	1.535	Sweden	1.512	Malaysia	1.533
18	Brazil	0.973	Singapore	1.681	Singapore	1.528	Singapore	1.506	Singapore	1.519
19	Malaysia	0.906	Austria	1.289	Ireland	1.438	Austria	1.326	Thailand	1.518
20	Ireland	0.828	Thailand	1.198	Thailand	1.211	Ireland	1.306	Russian Federation	1.337
	Mean	3.846		4.295		4.148		3.994		3.923
	Median	2.535		3.265		3.240		3.216		2.654
	standard dev	3.482		3.486		3.157		2.986		3.357
	Total	76.924		85.900		82.957		79.883		78.467

Technical Annex: Data Source, Technological Classifications and Missing Value Treatment

Value Added Data

Total manufacturing value added (MVA) or manufacturing output.

Data source: UNIDO database.

Value added of branches within the manufacturing sector.

Source: UNIDO Industrial Statistics database.

To compute the share of MHT activities in MVA, we used the OECD technological classification according to the International Standard Industrial Classification of All Economic Activities, Third Revision (ISIC Rev. 3).

Technology classification of manufacturing value added according to ISIC Rev. 3	
Type of activity	ISIC division, major groups or groups
Resource based manufacturing	15, 16, 17, 18, 19, 20, 21, 22, 36, 37
Low-technology manufacturing	23, 25, 26, 27, 28, 351
Medium- and high-technology manufacturing	24, 29, 30, 31, 32, 33, 34, 35 (excl. 351)

Note that medium- and high-tech (MHT) products were combined in one category. The sectoral shares of value added were then calculated in relation to the total for manufacturing sub-sectors.

International Trade Data

Data source: UN Commodity Trade Statistics (COMTRADE database).

The technological classification of trade is based on the Standard International Trade Classification (SITC), Revision 3.

Technology classification of exports according to SITC Rev. 3	
Type of export	SITC sections
Resource based exports	016, 017, 023, 024, 035, 037, 046, 047, 048, 056, 058, 059, 061, 062, 073, 098, 111, 112, 122, 232, 247, 248, 251, 264, 265, 281, 282, 283, 284, 285, 286, 287, 288, 289, 322, 334, 335, 342, 344, 345, 411, 421, 422, 431, 511, 514, 515, 516, 522, 523, 524, 531, 532, 551, 592, 621, 625, 629, 633, 634, 635, 641, 661, 662, 663, 664, 667,689
Low-technology exports	611, 612, 613, 642, 651, 652, 654, 655, 656, 657, 658, 659, 665, 666, 673, 674, 675, 676, 677, 679, 691, 692, 693, 694, 695, 696, 697, 699, 821, 831, 841, 842, 843, 844, 845, 846, 848, 851, 893, 894, 895, 897, 898, 899
Medium-technology exports	266, 267, 512, 513, 533, 553, 554, 562, 571, 572, 573, 574, 575, 579, 581, 582, 583, 591, 593, 597, 598, 653, 671, 672, 678, 711, 712,713,714, 721, 722, 723, 724, 725, 726, 727, 728, 731, 733, 735, 737, 741, 742, 743, 744, 745, 746, 747, 748, 749, 761, 762, 763, 772, 773, 775, 778, 781, 782, 783, 784, 785, 786, 791, 793, 811, 812, 813, 872, 873, 882, 884, 885
High-technology exports	525, 541, 542, 716, 718, 751, 752, 759, 764, 771, 774, 776, 792, 871, 874, 881, 891

Missing value treatment in the CIP index (by indicators and year)

MVA Indicators

For 2010, data from the following years were used in place of missing values:

MVA per capita

2009: China, Macao SAR.

Share of MVA in GDP

2009: China, Macao SAR.

Share of medium- and high-technology activities in: MVA

1991: Bosnia and Herzegovina, Burundi; 1992: Belize, Croatia; 1993: Central African Republic; 1994: Zambia; 1995: Gabon, Swaziland, Syrian Arab Republic; 1996: Algeria, Honduras, Jamaica, Nigeria, Switzerland; 1997: Barbados, Botswana, Côte d'Ivoire, Iraq, Saint Lucia; 1998: Bangladesh, El Salvador, Venezuela (Bolivarian Republic of); 1999: Rwanda; 2000: Cambodia, Uganda, Viet Nam; 2001: Bolivia

(Plurinational State of), Panama, Sudan; 2002: Argentina, Cameroon, Niger, Paraguay; 2003: Ghana; 2004: Gambia; 2005: China, Macao SAR, Colombia, Iceland; 2006: Australia, China, Taiwan Province, Egypt, Madagascar, Pakistan, Philippines, Qatar, Saudi Arabia, Thailand, Trinidad and Tobago, Tunisia, Yemen; 2007: Brazil, China, Czech Republic, Greece, Japan, Kenya, Lebanon, Mauritius, Mexico, Oman, Peru, United Republic of Tanzania; 2008: Canada, Chile, Denmark, Ecuador, Fiji, India, Iran (Islamic Republic of), Israel, Malaysia, Malta, Mongolia, Nepal, Netherlands, New Zealand, Norway, Republic of Korea, Sri Lanka, Turkey, United States of America, Uruguay; 2009: Albania, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Cape Verde, China, Hong Kong SAR, Congo, Costa Rica, Cyprus, Eritrea, Estonia, Ethiopia, Finland, France, Georgia, Germany, Hungary, Indonesia, Ireland, Italy, Jordan, Kuwait, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Malawi, Morocco, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, Senegal, Serbia, Singapore, Slovakia, Slovenia, South Africa, Spain, Sweden, The f. Yugosl. Rep of Macedonia, United Kingdom; Armenia, Guatemala, Haiti, Kazakhstan, Mozambique, Suriname, Tajikistan, Ukraine.

Output (when MVA data is missing)
1993: Suriname; 1997: Haiti; 1998: Guatemala, Mozambique; 2007: Kazakhstan; 2008: Tajikistan; 2009: Armenia, Ukraine.

Share in world MVA
2009: China, Macao SAR.

Export Indicators
For 2010, data from the following years were used in place of missing values:

Exports per capita
1997: Haiti; 2000: Tajikistan; 2003: Eritrea; 2007: Bangladesh, Mongolia, Swaziland; 2008: Saint Lucia; 2009: Gabon, Honduras, Iraq, Kuwait, Qatar, Sudan, The f. Yugosl. Rep of Macedonia, Uruguay.

Share of manufactured exports in total exports
1997: Haiti; 2000: Tajikistan; 2003: Eritrea; 2007: Bangladesh, Mongolia, Swaziland; 2008: Saint Lucia; 2009: Gabon, Honduras, Iraq, Kuwait, Qatar, Sudan, The f. Yugosl. Rep of Macedonia, Uruguay;

Share of medium- and high-technology products in manufactured exports
1997: Haiti; 2000: Tajikistan; 2003: Eritrea; 2007: Bangladesh, Mongolia, Swaziland; 2008: Saint Lucia; 2009: Cape Verde, China, Macao SAR, Gabon, Honduras, Iraq, Kuwait, Qatar, Sudan, The f. Yugosl. Rep of Macedonia, Uruguay.

Share in world manufactured exports
1997: Haiti; 2000: Tajikistan; 2003: Eritrea; 2007: Bangladesh, Mongolia, Swaziland; 2008: Saint Lucia; 2009: Gabon, Honduras, Iraq, Kuwait, Qatar, Sudan, The f. Yugosl. Rep of Macedonia, Uruguay;

When net export data (gross exports minus re-exports) is not available, gross export figures are used as provided by UN Commodity Trade Statistics (Comtrade).

Statistical Annex: Sensitivity Analysis

Introduction

The UNIDO Competitive Industrial Performance (CIP) index is a composite index designed to compare the competitiveness of national industries across countries. It is defined as a non-linear combination of eight component indicators: Manufacturing Value Added per capita, Manufactured Exports per capita, Medium- and High-tech manufacturing Value Added share, Medium- and High-tech manufactured Exports share in total manufactured exports, Manufacturing Value Added share in total GDP, Manufactured Exports share in total exports, Impact of a country on World Manufacturing Value Added and Impact of a country on World Manufactures Trade. Such a combination of sub-indicators is needed, as a single sub-indicator is insufficient to capture the complex reality of the degree of competitiveness of a country's industrial performance.

The construction of the CIP is the result of several stages that involved subjective decisions. A sensitivity analysis is therefore useful to assess the robustness of the CIP calculation to variations on the decisions made and to analyse how much each source of uncertainty contributes to the total uncertainty of the CIP index.

One central issue that arises when using the CIP index is the impact of changing the relative importance of each sub-indicator on the rankings produced by the CIP index. This will be analysed in this appendix, together with other important methodological choices made in the construction of the CIP index. In particular, we will evaluate the sensitivity of the rankings to the weights, treatment of missing and/or outlying values, the choice of normalization method and the choice of aggregation method.

If different assumptions are found to have a strong impact on the order of countries, it follows that the original order is not unambiguous or robust.

This statistical annex first briefly reviews the important building blocks of the CIP and the different modeling choices associated with them. Section 2 describes the design of the sensitivity study. Section 3 introduces the data. The results are presented in section 4. The main results and recommendations are summarized in the conclusion of section 5.

1. Construction of the CIP

The CIP index is a composite index aggregating eight sub-indicators into a unique measure for the industrial performance of a country. Crucial ingredients in the construction of the CIP index are the selected sub-indicators, the methods used for handling missing and outlying data, the method used for normalization and the aggregation technique. The next paragraphs discuss these briefly.

1.1 List of sub-indicators

We consider the list of sub-indicators determined by UNIDO as fixed, but will examine various weighting schemes that may exclude some of the sub-indicators.

The first two basic indicators aggregated in the CIP index are Manufacturing Value Added per capita (MVApc) and Manufactured Exports per capita (MXpc).

While providing information about the country's capacity to produce and export manufactures, these indicators do not allow to distinguish between industrial (or export) structures based on genuine technological capabilities. For this reason, the CIP index also considers the Medium- and High-tech manufacturing Value Added share (MHVAsh) and the Medium- and High-tech manufactured Exports share in total manufactured exports (MHXsh). These additional indicators capture the technological complexity of manufacturing and exports, thereby grouping medium- and high-tech activities.

Further, the Manufacturing Value Added share in total GDP (MVAsh) and the Manufactured Exports share in total exports (MXsh) are included as a measure for the relative importance of manufacturing in the entire economy and exports, respectively.

Finally, the global impact of a country's manufacturing and export sector is measured by the share of a country's MVA in world MVA (ImWMVA) and the share of a country's manufactured exports in world manufactured exports (ImWMT).

Finally, it is important to note that in the construction of the CIP, MHVA and MVAsh are equally weighted, grouped in a new sub-indicator called Industrial intensity (INDint), and the average of MHXsh and MXsh is called Manufactured Exports Quality (MXQual).

1.2 Technology classification of sectors

To compute the share of medium- and high-technology activities in manufacturing value added, the OECD International Standard Industrial Classification (ISIC) is used. The MHT sectors are those with ISIC codes 24, 29, 30, 31, 32, 33, 34 and 35 (excluding 351).

An alternative classification is that proposed by Sanjaya Lall, which is based on the 3-digit ISIC level. For Lall, the MHT sectors are 233, 241, 242,243, 252, 271, 291, 292, 293, 300, 311, 312, 313, 314, 315, 319, 321, 322, 323, 331, 332, 333, 341, 342, 343, 351, 352, 353 and 359.

The 'original sin' of these classifications is attributable to the fact that they attempt to capture an inherently dynamic object in a static way. Since industries are continuously transforming, what was high-tech yesterday may well be low-tech tomorrow. In fact, the problem is more serious than simply the changing nature of particular sectors. There is also no simple way of aggregating sectors such that their complexity level is homogenous. Thus, within the same technology groups and the same division (e.g. the manufacture of electrical machinery and apparatuses), there might be production tasks of extremely different technological complexity. Additionally, the most cutting edge and innovative firms tend to not fit into any existing category by their very nature and are not easily tracked in government statistics, if they appear at all.

1.3 Missingness

The sub-indicator data may have missing values. If not all observations are missing in the series, information from the available data can be extracted to impute values to the missing observations. Dealing with missingness through imputation takes place before normalization and aggregation.

Only univariate time series methods are considered for imputation. By default, missing observations are filled in with the last available observation prior to the missing observation. An alternative that we consider is to use linear interpolation between the last available observation before the missing observation, followed by imputation of the remaining missing observations with the last one available.

One could also consider to not do any imputation, but this has the disadvantage in the Monte Carlo analysis to study that the set of CIP values can have a different size and the values can therefore not be compared in a straightforward manner. For an example of cross-sectional imputation, see Cherchye et al. (2011).

1.4 Outlier cleaning

The sub-indicator data can have outlying values that distort the CIP measurement of the country's industrial performance. There are several approaches to handling outliers.

As an alternative to the default choice of ignoring outliers, we investigate the sensitivity of the index by applying a simple but effective univariate outlier cleaning rule. The rule is as follows. Observations that are more than 3 (resp. minus 3) times the median absolute deviation from the median are winsorized and replaced by the median plus (resp. minus) 3 times the median absolute deviation. To account for time variation in the location and scale of the data, the median is computed on a local window of 5 observations. With the two-sided approach, this is the window [-2,2] around each observation (excluding 2 observations at the beginning of the sample, and 2 observations at the end of the sample). Under the one-sided approach, this is [-4,0], excluding 4 observations at the beginning of the sample.

1.5 Normalization technique

Normalization is required prior to any data aggregation, as the indicators have different measurement units. To place all indicators on a common basis, the data are normalized using a rescaling technique.

Among the various rescaling techniques available, the CIP index adopts the Min-Max technique which normalizes indicators to have an identical range [0, 1] by subtracting the minimum value and dividing it by the range of the indicator values.[36] The general formula follows:

$$I_{ijt} = \frac{X_{ijt} - Min_j\left(X_{ijt}\right)}{Max_j\left(X_{ijt}\right) - Min_j\left(X_{ijt}\right)} \tag{1}$$

where Iijt is the index value i for country j in period t, Xijt is the indicator value i for country j in period t, and min (resp. max) are the minimum (resp. maximum) operators returning the smallest (resp. largest) value in the sample. As a result, the top country in the sample is assigned the value 1, while the worst performer is given the value 0.

The rescaling by means of the Min-Max normalization method also has a few drawbacks. Clearly, on the one hand, extreme values/or outliers could distort the transformed indicator; on the other hand, Min-Max normalization could widen the range of indicators lying within a small interval, increasing the effect on the composite indicator more than the z-score transformation.

In the sensitivity analysis, we therefore also consider the standard z-score transformation as well as the robust one:

$$I_{ijt} = \frac{X_{ijt} - Mean_j\left(X_{ijt}\right)}{StdDev_j\left(X_{ijt}\right)} \tag{2}$$

[36] Recall that all indicators are defined such that higher values are indicators of a better industrial performance.

and

$$I_{ijt} = \frac{X_{ijt} - Median_j\left(X_{ijt}\right)}{Mad_j\left(X_{ijt}\right)}, \tag{3}$$

where mean, median, StdDev and Mad are the sample mean and median location estimators, and the sample standard deviation and median absolute deviation scale estimators, respectively. In some cases, the scale estimates were close to zero, leading to an explosion of the sub-indicators. We therefore truncate the z-score normalized indicators at [-3,+3].

1.6 Weighting scheme

Each indicator receives a certain weight. These weights are based on equal weighting important dimensions in the construction of the CIP index. An alternative technique is the Data Envelopment Analysis of Cherchye et al. (2008), but this is beyond the scope of the report.[37]

In the past, the CIP index has been constructed using either four, six or eight indicators and a linear weighting scheme. See Table 50 for an overview of the weights associated with these approaches.

$$I_{ijt} = \frac{Max_j\left(X_{ijt}\right) - X_{ijt}}{Max_j\left(X_{ijt}\right) - Min_j\left(X_{ijt}\right)} \tag{4}$$

(Cherchye et al., 2011).

In general, an equal weight approach is taken, with the exception that in the six and eight indicator approach, the average of MHVA and MVAsh (called Industrial intensity) and the average of MHXsh and MXsh (Manufactured Exports Quality) is used.

Recently, a major change was made in the weighting, whereby the CIP is computed as the equal weighted geometric average of MVApc, MXpc, INDint, MXQual, ImWMVA and ImWMT.

Table 50: Weights to the indicators for the four indicator, six indicator and eight indicator approach to constructing the CIP index

	MVApc	MXpc	MHVAsh	MVAsh	MHXsh	MXsh	ImWMVA	ImWMT
CIP.4 (linear)	1/4	1/4	1/4	1/4				
CIP.6 (linear)	1/4	1/4	1/8	1/8	1/8	1/8		
CIP.8 (linear)	1/6	1/6	1/12	1/12	1/12	1/12	1/6	1/6
Default (geometric)	1/6	1/6	Averaged into INDint 1/6		Averaged into MXQual 1/6		1/6	1/6

[37] See also Decanq and Lugo (2012) for an overview.

1.7 Aggregation method

Two aggregation methods are available: linear and geometric aggregation. Under the linear aggregation method, the CIP index is constructed as a weighted average of the q sub-indicators:

$$CIP_{jt} = \sum_{i=1}^{q} w_i I_{ijt}, \tag{5}$$

with w_j being the weight of indicator i (i=1,..,q), and the requirement that all weights should be positive adds up to 1.

Under the geometric aggregation method, the CIP index is constructed as a weighted geometric average of the q sub-indicators:

$$CIP_{jt} = \prod_{i=1}^{q} I_{ijt}^{w_i}, \tag{6}$$

with w_i being the weight of indicator i, and the requirement that all weights should be positive and add up to 1. The weights we use are those of Table 1. The type of aggregation problem faced by composite indicators relates to the choice of aggregating different components under the implicit assumption that they are substitutable.

Additive aggregations imply full compensability among variables. In other words, poor performance in one sub-indicator can be compensated for by high values in other sub-indicators. In contrast, geometric aggregation is better suited if we want to maintain a certain degree of non-compensability between individual sub-indicators (OECD, 2008). Moreover, while linear aggregation rewards base indicators proportionally to the weights (so compensability is constant), geometric aggregation rewards countries with higher scores (so compensability is lower for the composite indicators with low values).

Given these considerations and the advantage offered by the geometric mean in avoiding factor substitutability, the CIP index adopts a non-linear aggregation technique. The weighting schema remains one of simple equal weights, provided that disaggregated statistics included in each composite indicator are also shown and the transparency of the composite is maintained.

2. Design of the sensitivity analysis

We fully focus on the impact of changes in the design of the CIP index on the ranks implied by the CIP values, as the ranks are more important than the values themselves.

We study the impact on the values and rankings of the composite index due to a change in:

a) Weights and in particular the eight, versus six, versus four indicator method
b) Normalization method
c) Imputation method of missing data
d) Linear versus geometric weighting.

Several comparison methods are used to summarize the impact of a change in one or more of the assumptions defining the CIP index. We describe the metrics for measuring the impact on ranking when changing

one assumption in subsection 2.1 In subsection 2.2, the Monte Carlo analysis to study the sensitivity to joint changes in the assumptions is presented.

2.1 Metrics for measuring the aggregate impact on rankings due to changing a single assumption in the design of the CIP index

These methods also feature the analysis of Saisana et al. (2005), as well as the OECD (2008) handbook on composite indices.

The first criterion that we consider is the Spearman rank correlation between the original CIP values and the CIP values under a different definition. Suppose we have M countries and let CIPjt and CIPjt* be the CIP index of country j in year t using two different definitions, then the rank correlation between the two methods is defined as:

$$\rho RANKS_t = CORR(Rank(CIP^*_{jt}), Rank(CIP_{jt})). \quad (7)$$

The second criterion that we consider is the average absolute shift in the rank of the CIP index due to a change in method (also known as Spearman's footrule). Suppose we have M countries and let CIPjt and CIPjt* be the CIP index of country j in year t using two different definitions, then the average absolute rank shift is defined as:

$$\Delta RANKS_t = \frac{1}{N}\sum_{j=1}^{N} | Rank(CIP^*_{jt}) - Rank(CIP_{jt}) |. \quad (8)$$

2.2. Impact on the distribution of CIP

We subsequently study the impact of joint changes in the assumptions underlying the CIP calculation on the distribution of the CIP values and CIP ranks.

For this, we follow the Monte Carlo approach of Saisana et al. (2005) whereby a distribution is generated based on a set of randomly chosen variations on the definition of the CIP index. This leads to a so-called "Monte Carlo CIP": a complete distribution of the CIP per country as generated by the random draws from the distribution of the uncertainty factors in the calculation of the CIP index. We take 250 draws. The uncertainty factors are described in Table 51, together with their associated probability distribution function (PDF).

The resulting distribution of the CIP index-implied rankings across the range of calculation methods will be visualized via a boxplot, with whiskers that extend to the minimum and maximum of the data.

Table 51: Input factors for Monte Carlo analysis of CIP construction method

Input factor	Definition	PDF
Method	Four indicators, six indicators or eight indicators approach	Discrete, Uniform on [1,2,3]
Aggregation	Linear or geometric	Discrete, Uniform on [1,2]
Normalization	Min-Max, z-score and robust z-score*	Discrete, Uniform on [1,2,3]
Weights	Either deterministic as a function of method (see Table) or random uniform	Discrete, Uniform on [1,2]
Action on missing data	Last price or linear interpolation	Discrete, Uniform on [1,2]
Outlier cleaning	Cleaning of the outlying observations in the indicator data. Possible values are no cleaning, two-sided and one-sided local winsorization using the median and mean absolute deviation.	Discrete, Uniform on [1,3]
Technology classification	OECD or Lall	Discrete, Uniform on [1,2]

*[38]

3. *Data availability and summary statistics*

The initial data is unbalanced, with observations for 125 countries and the years 1996 till 2010.

Table 52 shows the number of available observations per year for each of the eight indicators. Note that the total number of variables is 9 because for MHVAsh, we consider the one computed using the OECD classification (MHVAsh) and the one under Lall's classification (MHVAsh_Lall).

Except for MHVAsh_Lall, all variables have a sufficient and relatively stable coverage over the years.

Table 52: Number of observations per year

	MVApc	MXpc	MHVAsh	MVAsh	MHXsh	MXsh	ImWMVA	ImWMT	MHVAsh_Lall
1996	125	104	85	125	104	104	125	104	50
1997	125	109	102	125	109	109	125	109	53
1998	125	110	108	125	110	110	125	110	63
1999	125	113	110	125	113	113	125	113	61
2000	125	120	115	125	120	120	125	120	70
2001	125	120	117	125	120	120	125	120	73
2002	125	119	118	125	119	119	125	119	71
2003	125	120	120	125	120	120	125	120	76
2004	125	118	121	125	118	118	125	118	77
2005	125	118	124	125	118	118	125	118	81
2006	125	120	124	125	120	120	125	120	83
2007	125	118	124	125	117	118	125	118	72
2008	125	115	125	125	115	115	125	115	62
2009	125	118	125	125	118	118	125	118	42
2010	124	112	125	124	110	112	124	112	0

[38] In case of the z-score or robust z-score, the aggregation method is restricted to be linear, to avoid having to raise negative numbers to a fractional power.

Table 53 reports the summary statistics on the input data. The distribution of the input data for MVApc, MXpc, ImWMVA and ImWMT is extremely skewed to the right.

Table 53 Summary statistics of input data

	Minimum	Q1	Median	Mean	Q3	Maximum
MVApc	4.33	108.61	371.89	1236.13	1173.42	9452.30
MXpc	0.44	105.10	546.03	2782.90	2646.41	39871.77
MHVAsh	0.25	10.83	21.39	24.10	34.91	78.35
MVAsh	0.64	9.55	14.38	14.65	17.91	36.99
MHXsh	0.00	14.85	31.66	34.56	52.38	85.39
MXsh	0.08	42.22	75.21	65.37	88.02	99.90
ImWMVA	0.00	0.01	0.05	0.79	0.33	27.18
ImWMT	0.00	0.01	0.10	0.86	0.55	14.06
MHVAsh_Lall	0.26	18.11	34.48	33.73	45.35	86.09

If we normalize the data with the Min-Max of each individual series, we see in Table 54 that the skewness in the MVApc, MXpc, ImWMVA and ImWMT remains. We additionally add the normalized indicators for the INDint and MXQual.

Table 54 5-year average of average and median of normalized data using the Min-Max method

	Median	Mean
MVApc	0.04	0.15
MXpc	0.02	0.10
MHVAsh	0.29	0.32
MVAsh	0.40	0.41
MHXsh	0.36	0.41
MXsh	0.76	0.65
ImWMVA	0.00	0.03
ImWMT	0.01	0.07
MHVAsh_Lall	0.38	0.39
INDint	0.34	0.37
MXQual	0.51	0.53

The higher the correlation between the normalized sub-indicators, the smaller the impact of changing the weights (Foster et al., 2012). The year-average correlation between the normalized indicators is shown in Table 55. We see that the correlation between all sub-indicators is rather high, except for ImWMVA which has a low correlation with MXpc, MVAsh and MXsh, and between MVAsh and MVApc.

Table 55 Correlation between the Min-Max normalized sub-indicators

	MVApc	MXpc	MHVAsh	MVAsh	MHXsh	MXsh	ImWMVA	ImWMT	MHVAsh_Lall	INDint	MXQual
MVApc	1.00	0.79	0.66	0.32	0.63	0.37	0.46	0.57	0.65	0.58	0.60
MXpc	0.79	1.00	0.57	0.26	0.50	0.38	0.08	0.32	0.53	0.49	0.53
MHVAsh	0.66	0.57	1.00	0.50	0.73	0.48	0.37	0.55	0.97	0.88	0.73
MVAsh	0.32	0.26	0.50	1.00	0.49	0.43	0.19	0.31	0.59	0.86	0.55

	MVApc	MXpc	MHVAsh	MVAsh	MHXsh	MXsh	ImWMVA	ImWMT	MHVAsh_ Lall	INDint	MXQual
MHXsh	0.63	0.50	0.73	0.49	1.00	0.38	0.37	0.53	0.78	0.71	0.82
MXsh	0.37	0.38	0.48	0.43	0.38	1.00	0.20	0.32	0.47	0.53	0.84
ImWMVA	0.46	0.08	0.37	0.19	0.37	0.20	1.00	0.82	0.37	0.34	0.34
ImWMT	0.57	0.32	0.55	0.31	0.53	0.32	0.82	1.00	0.54	0.51	0.51
MHVAsh_ Lall	0.65	0.53	0.97	0.59	0.78	0.47	0.37	0.54	1.00	0.88	0.73
INDint	0.58	0.49	0.88	0.86	0.71	0.53	0.34	0.51	0.88	1.00	0.74
MXQual	0.60	0.53	0.73	0.55	0.82	0.84	0.34	0.51	0.73	0.74	1.00

4. Results

4.1. Impact of individual changes construction method on the ranks of CIP

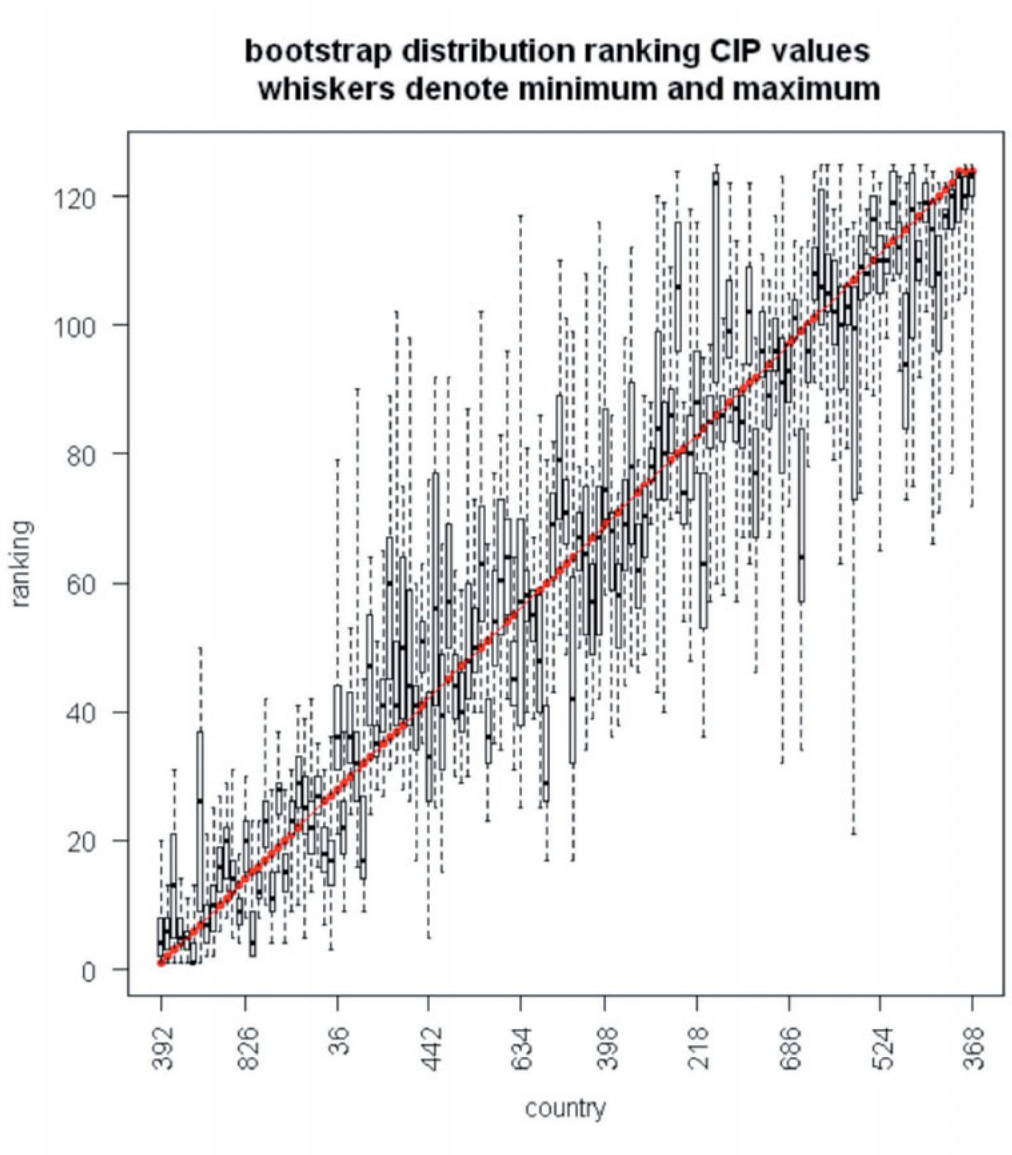
We now consider the impact on the country rankings due to a change in one of the implementation choices, keeping all others fixed. Table 56 reports the year-average of the average absolute difference in ranks between the perturbed and default method, as well as the correlation.

For all changes, the correlation in ranks is substantially high (89 percent or higher), indicating that, on average, countries with a high CIP value under one method will also have a high CIP value under a different method. Given that we are ranking around 125 countries, the average shift in ranks is also rather modest.

Table 56 Impact on ranks due to changing a single assumption, keeping all other assumptions fixed

Change	Year-average of average absolute difference in ranks between the modified and default method	Year-average of correlation between ranks of new method and default method
Use 6 sub-indicators (instead of 8)	13.82	0.8968
Use 4 sub-indicators (instead of 8)	13.71	0.9006
Use linear aggregation (instead of geometric)	13.21	0.9141
Use z-score to normalize (instead of Min-Max, together with linear aggregation)	12.81	0.923
Use robust z-score to normalize (instead of Min-Max, together with linear aggregation)	11.77	0.9537
Use linear interpolation (instead of last price interpolation)	9.932	0.9724
Use two-sided outlier cleaning (instead of no cleaning)	9.891	0.973
Use one-sided outlier cleaning (instead of no cleaning)	9.891	0.973
Use Lall's technology classification (instead of OECD)	5.732	0.9752

4.2. Impact of changes in construction method on distribution CIP



5. Conclusion

The UNIDO Competitive Industrial Performance (CIP) index is a composite index designed to compare the competitiveness of the national industries across countries. It is defined as a non-linear combination of eight component indicators and its construction is a result of several stages that involved subjective decisions. We performed a sensitivity analysis to assess the robustness of the CIP calculation to variations on the decisions made and to analyse how much each source of uncertainty contributes to the total uncertainty of the CIP index. All factors seemed to have a considerable impact on the country rankings, and the rankings should be considered as estimates with standard errors of non-negligible magnitude. Overall, the correlation between the default CIP ranking and the alternatives is relatively high, indicating the qualitative robustness of the proposed methodology to rank countries in terms of their competitive industrial performance.

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