6. Measuring Competitiveness in Small States: Introducing the SSMECI

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1. Introduction

Policymakers in small states are increasingly focusing on economic competitiveness in the wake of globalisation. The process of world economic integration – associated with falling trade barriers, increasing technological progress, inflows of foreign direct investment and demanding international markets – poses unprecedented adjustment challenges for small states and enterprises within them (see Commonwealth Secretariat, 1997; Wignaraja, 1997; Peretz, Faruqi and Kisanga, 2001; and Gounder and Xayavong, 2001). Policymakers are deeply concerned about the prospect of declining domestic enterprises and even industrial marginalisation in an open, integrated world economy. They also want to reap the positive aspects of globalisation, notably access to new markets and new technologies, for enterprise development. These issues have fuelled a search for appropriate policy responses to globalisation in small states.

This chapter seeks to contribute to the process of new policy development in small states by measuring their industrial competitiveness record, in quantitative terms, and benchmarking them against each other. Benchmarking exercises of this type allow governments in small states to assess their country's performance in relation to:

- countries at a similar level of development, or of similar characteristics, which they would like to outperform; and
- countries at a higher level of development, whose performance they wish to emulate, and whose policy strategies they could learn from in order to achieve it.

Section 2 explores other efforts to benchmark competitiveness and highlights the lack of coverage of small economies in these exercises. Section 3 attempts to remedy this gap by constructing a small states manufactured export competitiveness index (SSMECI) and presents the results. Section 4 provides some explanations for the competitiveness record in small states, and Section 5 concludes.

2. Current benchmarking initiatives and their appropriateness for small states

Benchmarking of the type being undertaken here on competitiveness performance across countries has been the focus of increasing interest in recent years. Current benchmarking initiatives include the following:

- The World Economic Forum's (WEF) Global Competitiveness Report;
- The International Institute for Management Development's (IMD) World Competitiveness Yearbook;
- The United Nations Industrial Development Organisation's (UNIDO) World Industrial Development Report; and
- Wignaraja and Taylor (2003).

Table 6.1 summarises the key features of these four initiatives.

The work of the WEF and the IMD, both based in Switzerland, has largely dominated the global competitiveness benchmarking industry. Annual rankings of competitiveness in developed and developing countries have been produced for 24 years by the WEF's *Global Competitiveness Report* and for 13 years by the IMD's *World Competitiveness Yearbook*. Both indices focus on the micro-level business perspective, and examine the extent to which nations provide an environment in which enterprises can compete. In line with this, rather than focusing on trying to calculate a measure of *actual* competitive performance, both adopt an approach of looking at a wide range of factors that could *affect* national competitiveness. To this end they use a large basket of variables (160 for WEF and 321 for IMD in 2003), which include both 'hard' published statistics and 'soft' data from surveys of businessmen. The sample size of these surveys is rapidly increasing with 7,741 responses to the WEF 'Executive Opinion Survey' in 2003, as opposed to 4,600 in 2001.

Both indices are widely used, gaining widespread media attention. They have also generated a wealth of empirical data. What light, then, can they shed on the competitiveness of small states? Unfortunately the answer is very little. Despite increasing its coverage from 80 to 102 countries, the WEF index only includes eight countries that are amongst the 47 small states in our study. The situation with the IMD index is even worse, with no small states amongst the 59 countries included. The precise reasons for this lack of coverage are unknown, and without discussion with the institutions involved any attempts to determine such reasons remain simple guesses. However, one of the most significant factors is likely to be that the very complexity of both the indices means that the data requirements simply cannot be met in small states. With small populations and often under-developed institutions there is simply not the capacity or demand to collect the data required.

The specific issues of small states may also mean that the general theory of competitiveness espoused by both the WEF and IMD is perhaps inappropriate for the measure-

ment of competitiveness in the small states context. In small, developing economies, focus on the basic economic fundamentals (e.g. macroeconomic stability, outward-oriented trade policies, high levels of human capital, and efficient infrastructure) is perhaps more appropriate than worrying about the 200 sub-complexities found in the sophisticated multi-sectoral economies of the developed world.

Quite apart from the lack of attention given to small states, the WEF and IMD competitiveness indices have attracted criticism on technical grounds. Lall (2001, pp.1501-25) provides a comprehensive analysis of the WEF index of 2000 and finds flaws in its definition of competitiveness, model specification, choice of variables, identification of casual relations, and the use of data. He goes on to offer some insights into the construction of competitiveness indices, and whilst not writing with small states in mind, his comments are perhaps particularly relevant in the context of small states:

'To be analytically acceptable, however, all such efforts should be more limited in coverage, focusing on particular sectors rather than economies as a whole and using a smaller number of critical variables rather than putting in everything the economics, management, strategy and other disciplines suggest. They should also be more modest in claiming to quantify competitiveness: the phenomenon is too multifaceted and complex to permit easy measurement' (Lall, 2001, p.1520).

Wignaraja and Taylor (2003) also offers a critique of the theory and methodology used by WEF and the IMD, including a detailed exploration of the IMD index of 2001. In summary they find that the IMD rankings have:

- *Ambiguous theoretical basis* – The theoretical linkages between the input determinants and national competitiveness are weak. The 'fundamentals' of the IMD 2001 index (pp.43-49) which details the 'four fundamental forces of competitiveness' are more of a schema than a theory.
- *Problems of index construction* – The justification for the weightings given to each of the indicators is sometimes weak and often non-transparent. There also seems to be a lack of distinction between variables that indicate competitiveness and those that determine it, with both types used. This leads to problems in interpreting the results, and applying lessons to other countries.
- *Ad hoc data and proliferation of components* – The use of survey data can be problematic in that the perceptions of businessmen in one country cannot be directly compared with the views of businessmen in another country without some kind of moderation. The justification of the recent proliferation of indicators is also weak, with no explanation as to what is gained by their addition.

Building on this critique, and the argument that such indices need to be less ambitious and analytically simpler, recent work by UNIDO (2002) and Wignaraja and Taylor (2003) have emphasised the industrial competitiveness performance of developing countries.[1] This is a departure from the somewhat broader (and more vague) concept of national competitiveness implicit in the WEF and IMD work. The two newer indicies were developed from a general developing country perspective, rather than being small

Table 6.1. Features of recent competitiveness indices

Publication	*World Economic Forum (2003)*	*Institute of Management Development (2003)*	*UNIDO (2002)*	*Wignaraja and Taylor (2003)*
Name of index	'Growth Competitiveness Index'	'World Competitiveness Scoreboard'	'Competitiveness Industrial Performance Index'	'Manufactured Export Competitiveness Index'
Concept	Business school approach to measuring national-level competitiveness, using both performance and explanatory variables.	Business school approach to measuring national-level competitiveness, using both performance and explanatory variables.	Focused on industrial performance and national ability to produce manufactures competitively.	Focused on industrial performance and national ability to produce manufactures competitively.
Number of variables	160	321	4	3
Weighting system	Two-tier approach based on a concept of 'core' or 'non-core' innovator countries. Different aggregations and weightings apply to each group in the final index.	20 categories each weighted at 5%	Four variables, equally weighted	Three variables weighted at 30%, 30% and 40% (with technology intensity of exports weighted higher).
Data source type	Published data and entrepreneur surveys (7,741 responses)	Published data and entrepreneur surveys (over 4000 responses)	Published data	Published data
Country coverage (including small states)	Covers 102 countries (eight small states)	Covers 59 countries (0 small states)	Covers 87 countries (three small states)	Covers 80 countries (11 small states)
First published/ frequency	Yearly since 1979	Yearly since 1990	2002 and henceforth periodically	2003

states specific, but come closer to the methodology appropriate for the focus of this study, and in the context of data-sparse small states.

The UNIDO Competitive Industrial Performance Index focuses on the national ability to produce manufactures competitively, and is constructed from four basic indicators of industrial performance (see UNIDO, 2002).

- manufacturing value added (MVA) per capita;
- manufactured exports per capita;
- share of medium- and high-tech activities in MVA; and
- share of medium- and high-tech products in manufactured exports.

The UNIDO index provides valuable insights into the industrial record of the developing world. Unfortunately out of 87 countries listed in the index, only three are small states, as defined in our study. Again, the reasons are unclear, but perhaps even such a simplified index still poses data availability problems.

Wignaraja and Taylor (2003) have similar analytical underpinning to the UNIDO work and constructed a Manufactured Export Competitiveness Index (MECI) of 80 developing countries using three variables:

- manufacturing exports per capita (1999);
- average manufactured export growth per annum (1980–99); and
- technology-intensive exports (such as electronics, petrochemicals and chemicals, iron and steel, engineering, plastics and industrial ceramics) as percentage of total merchandise exports (1998).[1]

Of the 80 countries in the MECI, 11 are small states. The results for these economies are shown in Table 6.2 below. The top and bottom three results in the overall MECI are also shown in order to give put in context the data and index values for small states.

The 11 small states are fairly evenly spread through the middle section of the index, but even the highest performers have MECI values substantially below the East Asian tiger economies (such as Singapore, Malaysia and Taiwan) at the top of the rankings, putting the performance of small states into perspective. One of the reasons for this is perhaps the universally low level of high technology exports in the small states (whether due to lack of such productive capacity, or lack of data). Whilst the share of high-technology exports was an appropriate variable for the study of 80 developing countries, its applicability for work which focuses on small states exclusively is questionable, as it is either not available or not distinctive enough amongst a small states sample.

Significant differences in the performance of individual small states are visible. Trinidad and Tobago, Mauritius and Cyprus stand out among the sample of 11 small states in the MECI rankings. In contrast, smaller Caribbean economies (St Kitts and Nevis, Grenada, Belize and Guyana) and Tonga in the Pacific have performed poorly compared to the three leading small states.

Table 6.2 Summary of results from MECI

Overall rank	Country	MECI index value	*Manufactured* exports per capita, 1999 (current $US)		*Average* manufactured export growth % per year (1980–1999)		*Technology*-intensive exports (% of total merchandise exports), 1998	
			Rank	*Value*	*Rank*	*Value*	*Rank*	*Value*
1	Singapore	0.93	1	25,039	13	13.4	1	70
2	Malaysia	0.82	5	2,988	3	19.2	4	55
3	Taiwan	0.79	3	5,477	31	9.4	3	58
15	Trinidad and Tobago	0.52	16	645	37	7.7	14	23
24	Mauritius	0.45	12	984	15	12.8	43	3
26	Cyprus	0.45	15	684	62	3.1	23	17
30	Bahrain	0.42	13	953	19	11.6	65	0
38	Dominica	0.38	21	393	34	9.2	65	0
45	Jamaica	0.35	22	377	64	2.8	43	3
50	St Kitts and Nevis	0.33	26	300	57	3.8	65	0
55	Grenada	0.31	52	45	42	7.2	65	0
58	Belize	0.29	41	86	69	0.4	49	2
61	Guyana	0.27	53	37	67	0.9	43	3
67	Tonga	0.24	72	6	50	5.9	65	0
78	Congo, DR	0.15	76	1	74	-2.1	58	1
79	Nigeria	0.13	80	1	71	-1.2	58	1
80	Yemen, Republic of	0.00	78	1	80	-18.0	65	0

Source: Wignaraja and Taylor (2003)

3. A small-states-specific competitiveness index

Bearing in mind the limited coverage of small states in the mainstream competitiveness literature and the specific issues surrounding measurement of their performance, efforts to benchmark the export performance of small states requires a new small states specific index. As many of the existing methodologies are inappropriate for small states, the design of such an index and the interpretation of its results need to be handled with care. Building on the empirical work of Wignaraja and Taylor (2003), a simple, transparent small state manufactured export competitiveness index (SSMECI) was developed. The key features of this index are highlighted in Box 6.1 while the rest of the section presents the results by country and various aggregate categories.

3.1 Country-level findings

Country-level rankings of competitiveness generate considerable interest in academic and policy circles. Of particular interest are the top performers. Before considering the composite SSMECI rankings, it is useful to start with a brief look at the component variables. Table 6.3 shows the top ten performers for each of the three component variables in the SSMECI. It is noticeable that there is considerable difference in the ranking of the three tables, and that top performers in one component are not necessarily top in others. However, some countries rank consistently high, for example Estonia, which ranks 3rd, 3rd and 4th respectively. The Seychelles also figures in all three lists, albeit at the bottom end. Some countries which figure highly in two of the components, such as Mauritius in 'per capita manufactured exports' and 'manufacturing value added as a % of GDP', do not figure well in the third, 'average growth', and this ultimately leads to a lower overall ranking in overall SSMECI. At the same time, a particularly high ranking on a single variable can push up a country on the overall SSMECI rankings. Swaziland, which comes top of 'share of manufacturing in GDP', is a case in point.[2]

Table 6.4 shows the full SSMECI ranking for the 40 small states, with the component indices, the ranking in each individual variable, and the underlying data values.

As might have been expected two European countries, Malta and Estonia, occupy the first two places in the ranking, perhaps reflecting both their greater access to markets and the positive effect of sustained competitive pressure from their large European neighbours. (Calculations were also done for Singapore, Taiwan and Costa Rica, in order to check the robustness of the theory, and to put into context the SSMECI

Table 6.3. Country rankings for the three separate variables

Manufactured exports per capita 2001 (current $US)*			*Average manufactured export growth % per year (1990–2001)*			*Manufacturing value added as % of GDP (1999*)*		
Rank	*Country*	*Value*	*Rank*	*Country*	*Value*	*Rank*	*Country*	*Value*
1	Malta	4469	1	Brunei	19.50	1	Swaziland	31.69
2	Botswana	2891	2	Maldives	17.07	2	Mauritius	24.56
3	Estonia	2203	3	Estonia	16.86	3	Namibia	15.45
4	Trinidad & Tobago	1666	4	Lesotho	15.70	4	Estonia	15.43
5	Qatar	1331	5	Trinidad & Tobago	13.25	5	Lesotho	15.13
6	Bahrain	1080	6	Bahamas	12.89	6	Belize	14.81
7	Mauritius	940	7	Fiji Islands	12.75	7	Fiji Islands	14.11
8	Brunei	773	8	Grenada	12.48	8	Jamaica	13.93
9	Cyprus	605	9	Seychelles	11.19	9	Seychelles	13.73
10	Seychelles	576	10	Suriname	10.36	10	Malta	12.03

Sources: See Table 6.4 for full description of sources and notes

Table 6.4. Overall SSMECI ranking

Overall rank	*Country*	*SSMECI index value*	*Manufactured exports per capita 2001[1] (current $US)*		*Average manufactured export growth % (1990-2001)[2]*		*Manufacturing value added as % of GDP (1999)[3]*	
			Rank	*Value*	*Rank*	*Value*	*Rank*	*Value*
1	Malta	0.72	1	4,469	16	5.36%	10	12.03
2	Estonia	0.71	3	2,203	3	16.86%	4	15.43
3	Swaziland	0.69	17	299	12	7.10%	1	31.69
4	Mauritius	0.65	7	940	22	3.14%	2	24.56
5	Trinidad and Tobago	0.59	4	1,666	5	13.25%	22	7.99
6	Brunei	0.58	8	773	1	19.50%	19	8.42
7	Seychelles	0.57	10	576	9	11.19%	9	13.73
8	Lesotho	0.56	24	113	4	15.70%	5	15.13
9	Botswana	0.55	2	2,891	25	2.25%	34	4.97
10	Fiji Islands	0.55	18	266	7	12.75%	7	14.11
11	Namibia	0.51	14	398	26	2.15%	3	15.45
12	Bahrain	0.51	6	1,080	21	3.25%	15	9.88
13	Qatar	0.49	5	1,331	28	1.73%	23	7.30
14	Guyana	0.49	19	207	11	10.02%	14	10.15
15	Grenada	0.49	16	319	8	12.48%	24	7.26
16	Maldives	0.49	23	116	2	17.07%	26	6.46
17	St. Kitts and Nevis	0.48	11	514	20	3.82%	13	10.33
18	Jamaica	0.48	26	105	18	4.51%	8	13.93
19	Bahamas	0.47	12	508	6	12.89%	38	3.20
20	Barbados	0.46	13	468	23	2.82%	16	9.32
21	Belize	0.46	22	122	30	0.00%	6	14.81
22	Bhutan	0.46	28	59	14	6.86%	11	11.56
23	Cyprus	0.46	9	605	31	-1.68%	12	10.54
24	Dominca	0.45	15	357	19	3.94%	17	8.48
25	Suriname	0.43	30	21	10	10.36%	21	8.12
26	St.Vincent/ Grenadines	0.41	25	111	17	5.16%	25	6.54
27	Gabon	0.39	29	48	13	6.89%	32	5.16
28	Solomon Islands	0.39	21	148	27	1.89%	33	5.12
29	Samoa	0.37	34	9	15	5.53%	28	6.02
30	Vanuatu	0.34	33	9	29	0.53%	27	6.35

Overall rank	Country	SSMECI index value	Manufactured exports per capita 2001[1] (current $US)		Average manufactured export growth % (1990-2001)[2]		Manufacturing value added as % of GDP (1999)[3]	
			Rank	Value	Rank	Value	Rank	Value
31	Papua New Guinea	0.32	32	10	33	-5.37%	20	8.28
32	Tonga	0.31	35	4	24	2.33%	36	3.89
33	St. Lucia	0.31	27	83	34	-9.79%	29	5.96
34	Cape Verde	0.30	31	21	36	-10.96%	18	8.45
35	Antigua and Barbuda	0.27	20	197	37	-13.97%	39	2.25
36	São Tomé and Príncipe	0.24	39	0	32	-3.65%	35	4.52
37	Djibouti	0.22	37	2	35	-10.90%	37	3.60
38	Gambia, The	0.20	36	2	38	-16.74%	30	5.60
39	Comoros	0.13	38	1	39	-26.09%	31	5.43
40	Kiribati	0.00	40	0	40	-29.07%	40	0.99

Sources: Data primarily from ITC, using COMTRADE Database, *World Development Indicators* (2001, 2002, 2003), and other regional and national sources. See Annex 1 for full details of data sources and methodology.

1 In some cases where data from 2001 was not available, 2000 or 1999 data was used. See Annex 1 for full details

2 Where data was not available for 1990 or 2001, the nearest available year was used. Growth rates were calculated using a compound method, adjusting for length of time period as appropriate. See Annex 1 for full details.

3 Where 1999 data was not available, 1998 or 2000 was used. See Annex 1 for full details.

figures. Not surprisingly, these three countries came out at the top of the index.) The rest of the top 10 is made up of some of the traditional small-state powerhouses of the various regions, such as Mauritius from the Indian Ocean, Trinidad and Tobago from the Caribbean, and Fiji Islands from the Pacific.

Of noteworthy interest is the performance of the 'BLNS' countries that make up the Southern African Customs Union (SACU) with South Africa. In the rankings all four score highly: Swaziland is 3rd, Lesotho 8th, Botswana 9th and Namibia 11th. This high performance may again be due in part to proximity to large markets, and the trade and investment stimulus that an agreement such as the SACU produces for its 'satellites'.

Some countries do not perform as well as might be expected. For example Cyprus, ranked 23, did not perform as well as the other European countries in the sample.

Box 6.1. The small states manufactured export competitiveness index (SSMECI)

The small states manufactured export competitiveness index (SSMECI) emphasises the ability to produce manufactures competitively in the world's smallest economies. It has been designed in light of the problems with data availability in some small states and the need to build in realistic data requirements in order to make the country coverage of the index as wide as possible. The SSMECI is composed of just three variables, each of which captures a different aspect of industrial competitiveness and which combine to create a simple but effective snapshot of the economy's overall international competitiveness in this area. The three factors captured are:

- current performance in world export markets scaled by size;
- the dynamism of this performance over time – i.e., growth rates; and
- the size of the manufacturing base in the structure of the wider economy.

The first factor captures an economy's actual record of competing in international markets rather than simply alluding to an ability to be competitive. The second captures how dynamic this performance is, and whether the economy's performance is on an upward or downward trend. The third looks at more structural issues, recognising that in a small state where economies of scale are such an issue, a larger manufacturing base is likely to reflect an advantage in achieving competitiveness. To reflect these three concepts and in light of the data issues, three specific variables were selected for the small states index. These were:

- manufactured export value per capita in 2001 (US$);
- average manufactured export growth per annum 1990–2001; and
- manufacturing value added as a % of GDP in 1999.

Using these variables, the SSMECI was constructed for 40 small states in the Commonwealth and IMF defined sample set. This sample size is sufficient to be representative and to permit basic statistical analysis of determinants. Calculations were performed to give each country a value between 0 and 1 for each of the three variables, and these were then weighted to produce a final index figure for each country, which could then be ranked. Higher values in the SSMECI indicate greater levels of competitiveness, thus for example, Malta, with a SSMECI of 0.72 is perceived to be more competitive than Djibouti, with a SSMECI of 0.22 in Table 6.3.

In interpreting the findings, readers should be aware of the sensitivity of results in small states. When the overall production base is so small, the establishment or closure of a single factory can substantially affect the overall figures for that year. The quality/reliability of the data obtained can also often be poor, due to underdeveloped/understaffed statistics institutions in small states. To a degree such factors may have influenced the overall rankings, and led to marginally higher or lower placement than would be expected. This needs to be taken into account when interpreting the results, though it is unlikely to change the basic patterns observed.

Full details of data sources, definitions, and the specific methodology used to construct the SSMECI are given in Annex 1.

Whilst it scored fairly highly in terms of per capita exports and manufactured value added, manufactured exports have actually fallen over the last ten years, possibly reflecting a fall in comparative competitiveness, and this negative average growth brings down the overall SSMECI ranking score.

3.2 Findings by region, income group and country size

In an attempt to establish patterns of performance and provide analytical insights, the 40 small states have been grouped into various categories as follows:

1. geographical region to facilitate comparisons across regions,
2. income per head to permit analysis of different income groups, and
3. population to enable analysis by country size.

In each case, the group values for each of the three variables have been calculated using weighted averages, which have then been indexed, using the same methodology as before. Simple averages are also shown for each grouping, calculated using average index values for each country in the group.

Table 6.5 aggregates the results according to geography, allowing the regional breakdown of the results to be analysed.

The high performance of the European region is probably to be expected, as discussed earlier. In comparison, the relatively high performance of the African region is more surprising, and closer inspection shows that there are in fact two tiers of performance within the region. At the top level, the four BLNS countries, Mauritius, and the Seychelles are all in the top 11 of the SSMECI rankings. At the other end, a number of African countries, particularly in Western Africa, occupy the bottom ten positions. Overall, the contributions of the top-tier performers are enough to produce a high average in comparison to the other regions.

Also of note is the particular poor performance of the Pacific region, which was not strong in any of the three variables, and significantly lower in the SSMECI rankings.[3] Apart from the Fiji Islands at 10 in the overall SSMECI, the other countries of the Pacific were all in the bottom 15.

Table 6.6 shows the performance by income grouping, which reveals some very interesting results. Rather than running from 'high income' down to 'low income' in a linear fashion, the performance of the four groups is more erratic. High-income countries perform only third best out of the four, with the lowest average growth rates in manufacturing exports, and the lowest manufacturing value added as a percentage of GDP. They do have the second-highest manufactured exports per capita though, which prevents them from being below the low-income countries. This pattern of results could reflect 'mature' economies who have developed a manufacturing export base, as shown in the high per-capita figures, but have then diversified their economies into other sectors such as services, particularly financial services and high-end tourism. In such a case, the per capita exports in manufacturing would still be relatively high, but growth in manufacturing exports would slow, and value added in manufacturing as a share of total GDP would fall.

Table 6.7 shows the SSMECI performance grouped by population size. This distinction is particularly important to capture the record of tiny, micro-states compared with

Table 6.5. SSMECI performance by region

Rank	Regional grouping[a]	No.	Weighted average SSMECI[b]	Simple average SSMECI	Manufactured exports per capita 2001 (current $US)		Average manufactured export growth % (1990–2001)		Manufacturing value added as % of GDP (1999)	
					Rank	Value	Rank	Value	Rank	Value
1	Europe	3	0.79	0.63	1	2,076	3	8.70%	2	12.24%
2	Africa	12	0.49	0.42	3	602	5	2.74%	1	12.86%
3	Asia	3	0.45	0.51	5	351	1	16.95%	5	8.46%
4	Caribbean/ Latin America	13	0.37	0.45	4	481	2	9.84%	4	9.04%
5	Middle East	2	0.28	0.50	2	1,200	6	2.41%	6	8.21%
6	Pacific	7	0.14	0.33	6	51	4	5.01%	3	9.53%

Sources: Table 6.4 and author's calculations

[a] Regional groupings according to World Bank (2003)

[b] Group values calculated from weighted components of sub-indices for members of each region. Where original data for manufactured exports for 1990 and 2001 was not available, data for these years has been extrapolated using average growth rates of that country. SSMECI values calculated using sample maximum and minimum levels.

Table 6.6. SSMECI performance by income grouping

Rank	Regional grouping[a]	No.	Weighted average SSMECI[b]	Simple average SSMECI	Manufactured exports per capita 2001 (current $US)		Average manufactured export growth % (1990–2001)		Manufacturing value added as % of GDP (1999)	
					Rank	Value	Rank	Value	Rank	Value
1	Upper middle income	11	0.84	0.52	1	1,520	1	6.23%	2	11.06%
2	Lower middle income	14	0.55	0.40	3	193	2	4.93%	1	13.98%
3	High income	8	0.36	0.50	2	1,308	4	3.80%	4	8.49%
4	Low income	7	0.13	0.33	4	38	3	4.62%	3	9.09%

Sources: Table 6.4 and author's calculations

[a] Income groupings according to World Bank (2003)

[b] Group values calculated from weighted components of sub-indices for members of each income group. Where original data for manufactured exports for 1990 and 2001 was not available, data for these years has been extrapolated using average growth rates of that country. SSMECI values calculated using sample Maximum and minimum levels.

larger small states. In the absence of a universally accepted definition of sub-categories by size, the sample was divided into countries with populations under 250,000 (micro-states), between 250,000 and 1 million, and over 1 million. The striking finding is that the micro-states record a particularly weak competitiveness performance. This suggests that even within the world's smallest economies, country size matters for industrial competitiveness. Perhaps unsurprisingly, the performance of the larger states was better than that of the two smaller population categories, though the magnitude of this is perhaps unexpected. Many factors probably explain the gap in industrial competitiveness performance between larger small states and micro-states These include the facts that larger small states have somewhat bigger markets than smaller ones; have access to a larger pool of technical and managerial skills; are more attractive to inflows of foreign direct investment; are better able to finance costly infrastructure project (e.g. setting up a national airline); and, possibly, are less susceptible to natural disasters.

3.3 Comparison with results from other indices

As stated earlier, one of the reasons for developing the SSMECI is the lack of coverage that existing work gives to small states. The IMD index contains none of the small states in the SSMECI, and so comparison of results is not possible. The WEF index,

Table 6.7. SSMECI performance by population size grouping

Rank	*Population*[a]	*No.*	*Weighted average SSMECI*[b]	*Simple average SSMECI*	*Manufactured exports per capita 2001 (current $US)*		*Average manufactured export growth % (1990–2001)*		*Manufacturing value added as % of GDP (1999)*	
					Rank	*Value*	*Rank*	*Value*	*Rank*	*Value*
1	More than 1m	11	1.00[c]	0.52	1	615	1	5.96%	1	12.42%
2	250,000 to 1m	16	0.63[c]	0.45	2	592	2	4.34%	2	8.72%
3	Less than 250,000	13	0.00[c]	0.36	3	123	3	0.48%	3	8.27%

Sources: Table 6.4 and author's calculations

[a] Population groups as per author's definition

[b] Group values calculated from weighted components of sub-indices for members of each population group. Where original data for manufactured exports for 1990 and 2001 was not available, data for these years has been extrapolated using average growth rates of that country. SSMECI values calculated using sample maximum and minimum levels.

c The extreme range of the weighted average SSMECI index values obtained (1.00 and 0.00) reflects the strength of the correlation. The group with population of over 1m was ranked first in all three variables, thus achieving an index value of 1.00 for all three variables. When weighted this gives an overall SSMECI of 1.00. For the group with a population under 250,000 the reverse is true, with last place rankings in each variable giving 0.00 index values, and an overall SSMECI of 0.00.

however, has eight common countries, and the MECI of Wignaraja and Taylor (2003) has 11 similarities. A comparison of the resulting rankings is given in Table 6.8.

Only three countries appear in all three indices, and so comparison across all at the same time is difficult. If the SSMECI is compared individually against each in turn, however, the results, whilst not identical, show some correlation. Against the WEF, the results are broadly similar, and whilst Botswana and The Gambia do slightly better in the WEF rankings than in the small states SSMECI, the rankings are otherwise fairly similar. The correlation with the MECI is somewhat surprisingly less strong, with a number of countries having significantly different rankings. However if these outliers, including Guyana, Cyprus and Dominica, are excluded, the overall pattern of correlation is again visible.

4. Explaining industrial competitiveness performance

Ranking inter-country patterns of competitiveness performance is only the first step in analysing competitiveness. A second and more interesting step is investigating 'What factors led to high, or low, performance?'. In other words, what are the determinants of manufacturing-export competitiveness and what lessons can be learnt for future policy development?

Table 6.8. Comparison of results from SSMECI, MECI and WEF Growth Competitiveness Index

Country	SSMECI ranking	MECI (Wignaraja and Taylor, 2003)	WEF growth competitiveness ranking 2003
Malta	1	–	19
Estonia	2	–	22
Mauritius	4	24	46
Trinidad and Tobago	5	15	49
Botswana	9	–	36
Namibia	11	–	52
Bahrain	12	30	–
Guyana	14	61	–
Grenada	15	55	–
St. Kitts and Nevis	17	50	–
Jamaica	18	45	67
Belize	21	58	–
Cyprus	23	26	–
Dominica	24	38	–
Tonga	32	67	–
Gambia, The	38	–	55

Sources: WEF (2003), author's calculations

4.1 T-test and variables

The analysis of the determinants of competitiveness in small states has been conducted using a simple statistical test, a two-sample *t*-test of the variable means.[4] It analyses whether the two sample means are equal, and thus whether the two groups are distinct in statistical terms. By using the top 20 performers in the SSMECI, and the bottom 20 as our two samples, we can determine whether the mean for a particular determinant is different in the two groups. If, for example, the mean value for a particular determinant (e.g. foreign investment) is higher in the top 20 sample to a level that is statistically significant, this would imply that high levels of foreign investment are associated with high SSMECI performance, and this thus implies it has an impact on competitiveness.[5]

Tests of this nature were conducted on 25 separate variables, to see which factors were statistically significant. The variables used are divided into seven sub-categories:

- *Macro-environment* – A stable and predictable macroeconomic environment, characterised by low inflation and interest rates, sustained GDP growth, and high levels of saving and investment, is widely accepted as a fundamental condition for business activity. Five variables are used in this category, covering a wide scope of macroeconomic variables.
- *Country size* – Recent literature has shown that country size is inversely correlated with susceptibility to economic, political and environmental risks. Traditional economic theory would also suggest that larger country size may allow greater economies of scale and scope. Population is used as the proxy for country size as this has been shown to have the same result as more complex indices based on variables such as total GNP, population and total arable land.
- *Trade and investment regime* – An open trade and investment regime exposes the business sector to overseas competition, encourages economies of scale through increased market access, and facilitates technological transfer. Three proxies of openness are used as well as inward FDI stock.
- *Vulnerability* – 'Vulnerability', whether in the form of susceptibility to natural disasters, or over-reliance on one commodity, may hamper the competitiveness of economies. Six variables are used to test this hypothesis, including both singular and composite measures of vulnerability.
- *Structural* – The overall structure of economic activity may impact competitiveness, with a move away from low-value-adding agriculture into manufacturing and services, freeing labour and benefiting the overall competitiveness of the economy. Conversely, at the opposite extreme, a lack of agricultural and mineral activity may prevent exploitation of potential for value-added industries based on natural resources. Two basic measures of economic structure are used.
- *Infrastructure* – Efficient and cost-competitive physical infrastructure allows businesses to compete in the global market without constraint, and for small states in

particular modern ICT infrastructure allows the possibility to escape the 'tyranny of distance', and stay abreast of the latest technological innovation and production techniques. Three variables of modern ICT infrastructure are used.

- *Human capital* – A strong base of productive human capital is recognised as being the basis for industrial innovation and competitiveness. Education and training provides productive numerate workers with the skills to compete successfully. Four variables are used covering enrolment rates at different stages of education and adult literacy.
- *'Development'* – Whilst not strictly a 'determinant' of competitiveness, a country's level of development would be expected to correlate with its level of competitiveness, even if the direction of causality is complicated. As such three variables are used to proxy for overall 'development'.

4.2 The t-test results

Table 6.9 shows the results of the t-tests on the means of the variables for high-performing sample countries (top 20), and on the low performers (bottom 20). Data availability determined the sample size for a given t-test. In some cases the sample size would ideally have been higher, but all have enough for statistical relevance and are not low by cross national statistical analysis standards.

The main findings are as follows:

- *Macro-environment:* The higher performing sample countries had both significantly higher average savings ratios and lower interest rates (both at the 5 per cent confidence level). This may suggest that cost and availability of capital is a driver of SSMECI performance. The means of GDP growth of the two samples are statistically different at the 5 per cent level (5.6 per cent compared to 3.5 per cent between 1990–99). Whilst the high-performing sample countries do have a lower mean inflation rate, the difference is not statistically significant at the 10 per cent level. Nor was the gross capital formation ratio.
- *Country size* – Using the full data set the difference in the means of population size for the two samples were not statistically significant. However, if Papua New Guinea is not included in the sample (at 5.25 million, it is something of an outlier in the group), then the means are highly significant to the 1 per cent confidence level. This backs up the theory that size, even within the small states grouping, is a significant factor in SSMECI performance.
- *Trade and investment regime* – The higher performing sample countries have significantly greater means for FDI stock (at the 5 per cent confidence level), which would confirm the suggestion that FDI is a driver of competitiveness, through generation of export production and technological transfer. Unsurprisingly, openness as measured by exports/GDP ratio was significant, but imports/GDP and the combination of exports and imports to GDP were not significant. On the one hand

Table 6.9. T-tests to examine significance of determinants

Determinants	*High performers top 20*		*Low performers bottom 20*		*t-stat*	*Significant at 5% (* also at 1% level*
	Mean	*Observations*	*Mean*	*Observations*		
Macro fundamentals						
Inflation % (average 1996-2000) [b]	4.4	20	12.0	20	-1.10	
GDP growth % (average 1990-1999) [b]	5.6	17	3.5	19	1.75	✓
Interest rate % (1999) [b, c]	13.1	17	16.8	15	-1.75	✓
Gross domestic saving as % of GDP (1999) [b]	20.8	16	12.8	16	2.14	✓
Gross capital formation as % of GDP (1999) [a]	26.4	16	25.9	16	0.15	
Country size						
Population (2001) [a]	886,869	20	666,785	20	0.73	
Population (excluding PNG) [a]	886,869	20	425,429	19	2.49	✓*
Trade and investment regime						
FDI inward stock % of GDP (2000) [d]	75.4	18	42.8	18	1.86	✓
Imports as % of GDP (1999) [b]	62.5	20	66.1	20	-0.31	
Exports as % of GDP (1999) [b]	51.4	19	30.9	20	2.10	✓
Imports/exports as % of GDP (1999) [b]	111.3	20	97.0	20	0.92	
Vulnerability						
Vulnerability to natural disasters [e]	127	17	170	20	-0.72	
Composite vulnerability index [e]	7.55	17	7.41	20	0.21	
Export dependence [e]	64.66	17	43.49	20	2.66	✓*
UNCTAD Diversification Index (2000*) [f]	0.77	15	0.69	13	1.97	✓
UNCTAD Concentration Index (2000*) [f]	0.46	16	0.51	14	-0.76	
No. of commodities exported (2000*) [f]	81.9	16	25.3	14	3.62	✓*
Structural						
Agriculture value added % GDP (1999) [b]	7.9	18	18.4	19	-3.28	✓*
Services value added % GDP (1999) [b]	59.4	18	58.9	18	0.09	
Infrastructure						
Telephones/mobiles per 1,000 pop (2000) [a]	379	20	220	17	1.90	✓

Determinants	High performers top 20		Low performers bottom 20		t-stat	Significant at 5% (* also at 1% level
	Mean	Observations	Mean	Observations		
Internet users (2001)[a]	46,000	20	33,974	19	0.50	
Personal computers per 1,000 pop (2001)[a]	87.2	17	79.4	16	0.33	
Human capital						
Adult literacy as % population (1999)[a]	88.6	18	71.5	13	3.07	✓*
Secondary enrolment (2000)[a]	66.2	13	57.8	11	0.90	
Tertiary enrolment (2000)[a]	14.9	13	11.5	10	0.62	
Development						
GDP per capita 2001 (current US$)[a]	6,833	20	2,531	20	2.62	✓*
GDP per capita 2001 (PPP US$)[g]	10,203	20	5,145	18	3.07	✓*
HDI index value 2003[g]	0.76	20	0.67	18	2.34	✓

[a] World Bank (2003)
[b] Commonwealth Secretariat (2002)
[c] IMF (various)
[d] UNCTAD (2002a)
[e] Atkins et al. (2001)
[f] UNCTAD (2002b)
[g] UNDP (2003)

this is surprising but perhaps reflects that all small states are by nature fairly reliant on imports, perhaps even more so if lacking competitiveness.

- *Vulnerability* – Some measures of vulnerability showed high levels of significance, particularly those relating to the structure and diversity of production. Dependence on exports, and the number of commodities exported, were both significant at the 1 per cent level, whilst the UNCTAD diversification measure was significant at the 5 per cent level. Perhaps surprisingly, the recent attempts to produce vulnerability indices were not significant, with neither the natural disasters vulnerability index nor the composite vulnerability index producing statistically significantly different means across the samples.
- *Structural* – The structural variable showed that higher performing SSMECI countries had a significantly lower mean for the share of 'agricultural value added in GDP' than the lower performing group (at the 1 per cent confidence level). Given the nature of the index this is perhaps not surprising, and represents the traditional shift from agricultural production to manufacturing and industry. The share of 'services value added in GDP' was not significant at the 10 per cent level.

- *Infrastructure* – In the area of modern infrastructure the difference in means for telephone connections (fixed lines and mobile) was significant at the 5 per cent level, suggesting that communication and information flow is a factor in competitiveness. The number of internet connections and PCs was not significant however, and this may be because it is too early for such new technology to be feeding through to the indicators found in the SSMECI.
- *Human capital* – The importance of human capital in determining competitiveness may be suggested by the high significance (at the 1 per cent confidence level) in the difference in means between samples for levels of adult literacy. For both secondary and tertiary-level education enrolment rates the higher performing SSMECI countries had greater means than the lower, however this was not statistically significant at the 10 per cent level. This lack of significance may have been effected by poor data availability in these data sets.
- *Development* – As expected the relationship between overall development and performance in the SSMECI was strong. Both measures of GDP per capita had significantly higher means in the top-performing SSMECI countries (at the 1 per cent confidence level), whilst for the Human Development Index the means were significantly different at the 5 per cent confidence level.

5. Conclusions

Exercises to benchmark competitiveness performance across countries, such as that undertaken here, have become increasingly popular in recent years, with the indices of the World Economic Forum and IMD in particular gaining popularity. The coverage of such work has recently broadened from including just-developed countries, to bringing in the developing world as well. To date, however, little attempt has been made to include small states, let alone focus on them particularly. This paper presents a first attempt at such an index, and develops a small-state manufactured-export competitiveness index (SSMECI) based on three sub-components, namely manufactured exports per capita, average growth in manufactured exports, and the share of manufacturing in GDP.

As ever with work of this kind, some results are expected and fit with a-priori expectations. However, other results take more analysis and explanation. The very size of the countries in question leads to increased data volatility, and this may affect the results, perhaps causing a few anomalies and raised eyebrows. This can never be avoided, but whilst one or two may have performed above or below expectations, the general pattern of results is sound, and provides insight.

Not surprisingly, the European small states (such as Malta and Estonia) perform well, as do other traditional regional small-state 'powerhouses', such as Mauritius, Trinidad and Tobago, and Fiji Islands. This shows that small states can successfully transit from a state of vulnerability to developing a viable, internationally competitive industrial sector. The high performance of the BLNS countries in the Southern African Customs

Union is of note, and perhaps points towards the benefits of integrated trade and investment relationships with larger neighbours. At the other end of the performance spectrum, tiny micro-states record a particularly weak competitiveness performance, suggesting that even within the world's smallest economies, country size matters for competitiveness. Factors like the lack of domestic markets, technical manpower, and foreign direct investment may help to explain the poor performance of micro-states.

Unfortunately, greater use of econometric techniques was hampered by the lack of data on key variables, and so the ability to analyse the determinants of competitiveness was constrained. However, simple t-test analysis indicates that the determinants of competitiveness include a number of variables, covering both the policy environment and supply-side factors. Higher performing small states had better macroeconomic conditions, higher levels of foreign direct investment, more trade openness, better levels of education, and modern infrastructure. This strongly suggests that the adoption of a coherent, market-oriented, competitiveness strategy in small states is vital to success on international markets (see Wignaraja (1997 and 2003) for more details of these and other elements of a coherent competitiveness strategy).

Ultimately, even with better data availability that would have enabled more complex econometric analysis to be undertaken, exercises of type can only begin to shed light on competitive performance and its drivers. The complex nature of factors involved in export competitiveness, and the particular circumstances and constraints of different countries, mean that the lessons that a particular policymaker can draw are normally only at the macro level. To truly understand the drivers of competitiveness, there is a need for a greater exploration of specific policy environments and institutional and firm-level competitiveness factors, which requires detailed case studies of individual small states.[6]

Notes

1. The UNCTAD/WTO International Trade Centre (ITC) also produces a Trade Performance Index, which benchmarks across developing countries at an industry/product level (see ITC, 2000). It is not discussed here due to our focus on national-level competitiveness, rather than individual industries/products. However, for policymakers interested in such detail it can be a valuable tool.
2. Swaziland's large share of manufacturing in GDP seems due to the following: (a) 26 garment factories established by Taiwanese investors to take advantage of the Africa Growth and Opportunities Act (AGOA) which provides ready access to the American market; (b) one of CocaCola's five worldwide plants which produces coke concentrate; (c) various sugar pulp factories; and (d) other light industries established by South African investors to take advantage of the South African Customs Union (SACU) market.
3. Out of the 47 small states in our definition, seven countries could not be included in the final MECI due to data reasons, and five of these were in the Pacific. As a result the sample for the Pacific is not complete and may be biased. However, lack of data is often correlated to poor performance, and it is unlikely that inclusion of these countries, if data was available, would significantly improve overall regional performance.

4. Recent attempts at statistical analysis of the factors affecting competitiveness in developing countries include Ul Haque (1995); James and Romijn (1997, pp.189-207); Wignaraja and Taylor (2003); and Wint (2003).
5. An important qualification about the testing procedure should be noted. The simple t-test shows significantly different means between two samples for individual variables. However, it does not indicate causality, and is thus less powerful than full econometric analysis. That said, it does provide insights into those underlying factors correlated with competitive success in comparisons of strong and weak national performance.
6. For recent examples of detailed competitiveness studies on small states see World Bank (1994); Harris (1997); and Lall and Wignaraja (1998).

Annex I

Construction of the SSMECI

This appendix covers the technical details of the methodology used to construct the small states manufacturing export competitiveness index (SSMECI), along with notes on data sources and definitions.

Data – definitions and sources

Definition of 'manufacturing'

The commonly used international definition of manufacturing is used throughout, which is defined using the Standard International Trade Classification (SITC) codes. The manufacturing sector is represented by the addition of the values for SITC code level 5, 6, 7, and 8, minus the value of code level 68.

The use of such a definition has both benefits and costs, but in light of the data constraints of small states, was the only realistic option. In order to put together data for as many countries as possible, a variety of sources had to be used (see below). The use of an international definition made this task both more accurate in terms of common definitions across multiple sources, and more realistic as far as availability is concerned.

Ideally, it would have been useful to define manufacturing to include more of the food processing industry, as this is often a large component of small states' export production. However, without access to dis-aggregated data for each country this was not possible, and in the interests of larger samples, a more standardised definition was more appropriate. Definition of small states and countries used

The standard Commonwealth definition of small states has been used throughout this paper, and is again used here. From this thirty-two small states are identified who are Commonwealth members. This includes four countries with small states characteristics despite their larger populations (Papua New Guinea, Swaziland, Lesotho and Namibia).

To increase the sample size slightly further, the IMF definition of small states was also used; this identifies forty-three small states, and when combined with the Commonwealth list, produces a final sample of forty-seven countries. Data sources

As mentioned above, given the difficulties of obtaining data in many small states, a number of sources were used. For the first two variables, the main source was the International Trade Centre, with data extracted from the COMTRADE database. This was supplemented using data from UNCTAD *Handbook of Statistics*, ITC's PC-TAS, and the World Bank *World Development Indicators*. National sources were also used where there were gaps in the data, or to verify erroneous-looking data. In certain circumstances, gaps in data have been estimated using standard imputation techniques from other data from that country. The specific sources of all data are detailed in the following table.

Table A6.1. Precise sources of all data in small states SSMECI

Country	*Manufactured exports*				*Manufactured va as % GDP*[f]
	Year	***Source***	***Year***	***Source***	***Year***
Antigua and Barbuda	1991 [1]	WTO [a]/ITC	1999	ITC	1999
Bahamas	1995	ITC [b]	2001	ITC	1999 [g]
Bahrain	1994	ITC	2001	ITC	1997
Barbados	1990	ITC	2001	ITC	1999
Belize	1992	ITC	2000	ITC	1999
Bhutan	1991	ITC	1999	UNCTAD HOS	1998
Botswana	1991 [1]	ITC/WTO	2001	ITC	1999
Brunei	1990	ITC	1998	ITC	1999 [g]
Cape Verde	1995	ITC	2001	ITC	1999
Comoros	1995	ITC	2000	ITC	1999
Cyprus	1990	ITC	2001	ITC	1999 [g]
Djibouti	1990	ITC	1995 [1]	UNCTAD/WTO	1999 [g]
Dominca	1990	UNCTAD [c]	2001	ITC	1999
Estonia	1995	ITC	2001	ITC	1999
Fiji Islands	1988	ITC	2000	ITC	1999
Gabon	1993	ITC	2000	ITC	1999
Gambia, The	1995	ITC	2000	PCTAS	1999
Grenada	1990	ITC	2001	ITC	1999
Guyana	1991 [1]	FTAA Web [d]	1998	FTAA Web	1999
Jamaica	1990	ITC	2000	ITC	1999
Kiribati	1990	ITC	1999	UNCTAD HOS	1998
Lesotho	1991	NATIONAL [e]	2001	NATIONAL	1999 [g]
Maldives	1995	ITC	2001	UNCTAD HOS	1998
Malta	1990	UNCTAD	2001	ITC	1999 [g]
Mauritius	1990	ITC	2001	UNCTAD HOS	1999
Namibia	1991	WTO/ITC	2001	ITC	1999
Papua New Guinea	1990	ITC	2000	ITC	1999
Qatar	1990	ITC	2001	ITC	1999 [g]
Samoa	1990	ITC	2001 [1]	ITC/WTO	1997
São Tomé and Principe	1995 [1]	UNCTAD/WTO	2001 [1]	UNCTAD/WTO	1999
Seychelles	1990	ITC	2001 [1]	WTO-ITC	1999
Soloman Islands	1990	WTO-HDI [e]	2001 [1]	HDI-WTO	1999 [g]
St. Kitts and Nevis	1988	UNCTAD HOS	2001	ITC	1999
St. Lucia	1990	ITC	2001	ITC	1999

Country	Manufactured exports				Manufactured va as % GDP[f]
	Year	Source	Year	Source	Year
St.Vincent/Grenadines	1993	ITC	2000	ITC	1999
Suriname	1990	ITC	2000	UNCTAD	1998
Swaziland	1990	WTO-HDI	2001	ITC	1999
Tonga	1991 [1]	ITC/WTO	2000	UNCTAD HOS	1998
Trinidad and Tobago	1990	ITC	2001	ITC	1999
Vanuatu	1990	ITC	2000	UNCTAD HOS	1999 [g]

1. Imputed from figure for alternative reference year (1990 or 2001), using total export figures from the WTO and using the assumption that the % of manufactured exports in total exports stays the same.
[a] WTO (2002)
[b] International Trade Centre using COMTRADE database
[c] UNCTAD (2003)
[d] Free Trade Agreement of the Americas (FTAA) website
[e] Data from national source, for example central bank or statistical office
[f] UNDP (2001)
[g] World Bank (2001)

Construction of the SSMECI

The small states manufactured exports competitiveness index (SSMECI) is a composite index constructed using a methodology similar to that used for the UNDP Human Development Index (HDI).[a]

Indexing the variables

For each of the three variables an index value was calculated using the following general formula:

$$\text{Index} = \frac{\text{actual value} \quad \text{minimum value}}{\text{maximum value} \quad \text{minimum value}}$$

A key consideration in such a calculation was determining the minimum and maximum values that were appropriate. In the absence of a theoretical rationale suggesting definite alternatives, the maximum and minimum values in the relevant sample set were used.

For example: 'Value added from manufacturing as a % GDP' of the Fiji Islands was 14.11 per cent in 1999, the sample maximum is 31.69 per cent in Swaziland, and the sample minimum 1 per cent in Kiribati. The index for Fiji is therefore:

$$\text{MVA Index} = \frac{14.11 - 1}{31.69 - 1}$$

$$= 0.43$$

This method was used for the 'Manufacturing value added' variable, and the 'Growth of manufactured exports' variable. However, for the 'manufactured exports per capita' variable the extreme high values of some countries in the sample meant that all bar three countries had an

index value of below 0.4. This has the effect of introducing a large bias in the overall index in favour of the top three countries. In order to attempt to discount these extreme variables, logarithms were used in the calculations. However, this overcompensated for the bias, and even low performers were attaining index values of above 0.8. In order to even out the effect, an average of the two was used, that is the average of the two values produced from using logarithms and from not using them.

Rank correlation calculations were used to measure the effect of the use/non use of logarithms on the SSMECI order. The rank correlation between the SSMECI based on a logarithmic approach and the 'average' method above is 0.985. Whilst the rank correlation between the SSMECI based on a non-logarithmic approach and the 'average' method above is 0.993. Thus whilst the average method refines the index, its overall impact is relatively limited.

Weighting the indices

The three variables were weighted by percentages 40:30:30, with manufacturing exports per capita gaining the largest 40 per cent weight. This approach has been adopted, rather than perhaps the more obvious choice of equal thirds, given the particular interest in current performance, and the need to account for the varying sizes of the countries involved.

As above, the ranking is robust compared to the use of an equal weighting, with a rank correlation of 0.993 between the results of the two methods.

Annex notes

a. The HDI is an index produced annually by the United Nations Development Programme (UNDP). It uses a weighted sum of three indices representing life expectancy, educational attainment, and adjusted GDP per capita. For each country, each of the three variables is indexed to a value between 0 and 1, and then the three indices are combined with equal weights to form the HDI. See UNDP (2003).

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