Competitiveness Indices and Developing Countries: An Economic Evaluation of the Global Competitiveness Report

SANJAYA LALL *
Queen Elizabeth House, Oxford, UK

Summary. — Developing countries' policy makers worry about national competitiveness and closely watch indices ranking international competitive performance. This paper analyzes, from a development economics perspective, if competitiveness is a legitimate concern, and if the leading indices deserve the attention they get. It assesses the best known index, *The Global Competitiveness Report* of the World Economic Forum, and finds deficiencies at several levels. Its definitions are too broad, the approach biased and the methodology flawed. Many qualitative measures are vague, redundant or wrong. These weak theoretical and empirical foundations reduce the value of the indices for analytical or policy purposes. © 2001 Elsevier Science Ltd. All rights reserved.

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1. THE SETTING: THE COMPETITIVENESS "PROBLEM"

Many policy makers express serious concerns about national competitiveness. Such concern is not new. [1] What is new is its intensity and spread, a response to globalization, rapid technical change, shrinking economic distance and sweeping liberalization. If we measure concern by the volume of reports on enhancing competitiveness, the governments of rich countries worry the most, not just at the national but also at intergovernmental and state levels. [2] Their concerns revolve around retaining their technological lead and entering new activities where high wages are not a competitive handicap. Export-oriented new industrialized economics (NIEs) worry about staying ahead of lower wage entrants and challenging mature industrial countries in sophisticated activities. Import-substituting economies opening themselves to competition worry about restructuring their industries while developing new competencies. The least developed countries, many facing survival problems in existing industrial activities, worry about reviving their economies and diversifying into new export activities.

The concern with competitiveness has spawned a large industry aimed at policy makers, analysts and enterprises. It has a diverse output, ranging from productivity and cost studies for specific activities and institutional analyzes to country strategy papers, cluster studies and so on. Its best-known product, however, is the *competitiveness index*, a composite indicator ranking countries according to selected criteria and measures of national competitive prowess. In addition to two well-known published rankings (discussed below), there are many unpublished ones prepared by governments, consultants and research institutions, all feeding an insatiable appetite for benchmarking competitive performance and providing guidelines for strategy. While their real impact is difficult to assess, the

two leading indices certainly attract considerable attention. Their rankings are quoted in policy statements and in the media. They are subject to intense analysis, particularly in East Asia where competitiveness is considered a matter of national economic survival. Analysts use the data in their research (for instance, the latest UK Government White Paper on competitiveness draws upon one of the two indices, see DTI, 2001). Favorable rankings are used to promote inward investment, poor ones to berate policy makers.

While competitiveness indices have become significant in the policy discourse in many developing countries, surprisingly little is known about their economic foundations: how soundly they are based in theory and constructed in practice. Academic economists have largely ignored the competitiveness "industry" and have been disdainful of its output: business school products based on weak or nonexistent economic foundations. This may be changing, however, as well-known academics enter into debates on competitiveness and also engage in index preparation. In any case, it is useful to analyze the indices simply because they are now so often used for economic policy making and analysis.

This paper examines, from the perspective of development economics, the leading competitiveness index, contained in *The Global Competitiveness Report* of the World Economic Forum (WEF). It also takes note of, but does not analyze in detail, the index prepared by the International Institute for Management Development (IMD) in *The World Competitiveness Report*.[3] The WEF report is published by a respectable academic press (Oxford University Press) and masterminded by eminent Harvard academics Jeffrey Sachs and Michael Porter. The IMD report remains entirely a business school product, and lays no claim to academic respectability. Table 1 shows the leading 30 countries as ranked by the two institutions in 2000, illustrating the overall similarities and differences between the indices: it is the detailed differences (and changes from year to year) that most concerns policy makers.

It is not easy for an outsider to analyze either index properly. The reports do not provide full details of the methodology and, since they aim at a nontechnical audience, skate over complex theoretical issues. Nevertheless, there is sufficient material in the WEF reports to allow a useful initial assessment of its approach. This paper focuses on the 1999 and 2000 *Global*

Table 1. *Competitive rankings by IMD and WEF for 2000*

	IMD competitiveness index	WEF current competitiveness index	WEF growth competitiveness index
USA	1	2	1
Singapore	2	9	2
Finland	3	1	6
Netherlands	4	4	4
Switzerland	5	5	10
Luxembourg	6	N/A	3
Ireland	7	22	5
Germany	8	3	15
Sweden	9	7	13
Iceland	10	17	24
Canada	11	11	7
Denmark	12	6	14
Australia	13	10	12
Hong Kong	14	16	8
UK	15	8	9
Norway	16	20	16
Japan	17	14	21
Austria	18	13	18
France	19	15	22
Belgium	20	12	17
N Zealand	21	19	20
Taiwan	22	21	11
Israel	23	18	19
Spain	24	23	27
Malaysia	25	30	25
Chile	26	26	28
Hungary	27	32	26
Korea	28	27	29
Portugal	29	28	23
Italy	30	24	30

Sources: WEF (2000) and IMD (2000).

Competitiveness Reports. These are of particular interest not just because they are the most recent ones available, but also because the index has diversified (the 2000 report has two major indices and an interesting new subindex) and its methodology improved.

2. A REAL PROBLEM OR A "DANGEROUS OBSESSION"?

The concept of "national competitiveness" has been criticized in recent years and it is useful to start with its validity as an issue. While the widespread discussion of competitiveness may suggest that it has an accepted definition (and measure), this is not the case, at least in economics. The concept comes from the business school literature, where it forms the

basis for a great deal of strategic analysis. Companies compete for markets and resources, measure competitiveness by looking at relative market shares or profitability, and use competitiveness strategy to improve their performance. National competitiveness is assumed similar: economies compete with each other, can measure competitive performance, and mount competitiveness strategy. This may make sense for competitive performance in specific activities: for instance, it is meaningful to say that the United States has become ''less competitive'' in making television sets or textiles and ''more competitive'' in making computers. But is it meaningful to say that the United States is becoming ''less or more competitive'' as an economy?

Krugman (1994) argues that it is not. To him, ''competitiveness is a meaningless word when applied to national economies. And the obsession with competitiveness is both wrong and dangerous'' (p. 44). He is particularly critical of the US debate on the subject: most people who advocate measures to improve national competitiveness are nationalistic or ideological. They misunderstand simple economic theory, or, even worse, understand but ignore it. Defending national competitive interests often becomes a facade for blaming foreigners, asking for privileges for particular groups or seeking to prop up uneconomic activities. [4] Krugman's argument raises two separate issues. The first is whether ''national competitiveness'' has a valid economic definition, and the second, if it does, whether competitiveness ''strategy'' is justifiable. Both are relevant to the analysis of competitiveness indices.

Let us start with the first issue: definitions. Economists use ''competitiveness'' in different ways. One is purely macroeconomic: the lack of competitiveness is regarded a real exchange rate problem, when a country at full employment runs ''a persistent (and unwelcome) current-account deficit which would in due course require adjustment, usually via a mixture of deflation and depreciation'' (Boltho, 1996, p. 2). The measure of competitiveness here is ''relative price and/or cost indices expressed in some common currency'' (p. 3). [5] This assumes that underlying structural factors are constant (or irrelevant) and focuses on the kinds of short-term macroeconomic management that affect relative prices of national goods and services relative to other countries. Given this orientation, such analysis serves a useful purpose; moreover, unlike the main competitiveness in-

dices, as shown below, it treats countries as ''competing'' directly with each other. [6]

Most analysts, however, use a broader definition of competitiveness and focus on structural factors affecting medium to long-term economic performance: productivity, innovation, skills and so on (Fagerberg, 1996). This is the use Krugman criticizes: the analysis of structural competitiveness, according to him, repudiates the basic theory of comparative advantage. When economies trade with each other they do not (as firms do) compete in a confrontational manner. They engage in a non-zero sum game that benefits all parties: countries specializing according to their factor endowments do better than in the absence of trade. [7] To focus on competitive gaps in particular activities is partial and misleading. Declining US competitiveness in TVs or textiles does not mean that the US economy is less competitive. The decline of these industries may be a manifestation of its changing endowments and a necessary part of resource reallocation from old to new areas of comparative advantage. In a general equilibrium setting only optimal resource allocation matters, not the rise or decline of particular activities. In this setting, therefore, there is no way to define ''national competitiveness.'' Some analysts use economic growth to measure competitiveness, but this is only a ''poetic way of saying productivity that has nothing to do with any *actual conflict between countries*'' (Krugman, 1996, p. 18, italics added).

This does not, however, dispose completely of ''competitiveness'' as an economic issue. In theory, free trade optimizes resource allocation under several strong (and often unrealistic) simplifying assumptions. These include, among others, perfect competition with efficient markets, homogeneous products, universal access to technology (with no learning costs), and no externalities or scale economies. When these requirements are not met when market failures exist free markets cannot allocate resources optimally, and countries can improve their position by intervening to remedy (or exploit) market failures. For instance, they can capitalize on monopoly power held by their firms in other markets. They can promote the shift of resources from activities that yield lower returns, productivity growth or beneficial externalities to those that yield higher ones, where resource mobility is held back by information gaps, unpredictable learning costs, linkages or missing institutions. They can be

the first to reap economies of scale, scope, agglomeration or clustering (a more intense form of realizing the externalities of agglomeration) where these exist. They can coordinate activities linked in production or technology flows that are, because of technological linkages, unable to optimise individually. They can create new productive or innovative capabilities, and strengthen or build supporting institutions. [8] The diverse and widespread nature of market failures in developing countries in particular is well known, especially in industrial and technology development. [9] Market failures may interact to create multiple equilibria, with poor countries caught in low-growth traps unless they mount coordinated strategies to shift from low-skill, low-technology activities to higher value activities. [10]

In imperfect markets, therefore, there are valid issues concerning national competitive ability. Krugman accepts this fully. He stresses, however, that competitiveness must be analyzed in this theoretical context, which is often not the case. Thus "people who talk about competitiveness must understand the basics [of international trade theory] and have in mind some sophisticated departure from standard economic models, involving imperfect competition, external economies, or both" (Krugman, 1996, p. 18). Such "sophisticated departures" are, of course, widely recognized in economics, at least outside the purview of simple theoretical models. Most economists would accept that scale economies, increasing returns, externalities and linkages, technological leads and lags, cumulative learning and first-mover advantages are common in real life. Such imperfections are particularly common in technology and innovation, the main drivers of national competitiveness.

The main aim of competitiveness strategy in this context is to help countries realize or build dynamic comparative advantage. [11] There are three broad approaches to how this can be done, corresponding to different assumptions about the appropriate role of government. The first relies on factor accumulation driven by free markets, assuming that all markets work efficiently and the necessary institutions are in place (the strong neoclassical approach). The second accepts that some markets and institutions are deficient. It advocates interventions to remedy market failures, as long as these are "functional" and do not favor selected activities over others (the "market friendly" approach). The third also includes selective interventions where market failures require this (the "revisionist" or structuralist approach). The difference between market friendly and structuralist approaches, to which we return in analyzing competitiveness indices, is critical to competitiveness analysis, since few analysts now adopt a "strong neoclassical" stance. It takes the analysis beyond the existence of market imperfections to the nature of those imperfections (whether they call for selectivity or not). In theory, however, it is clear that conditions that call for selectivity are common in developing countries: diffuse information market failures, costs of mastering tacit technology, existence of widespread externalities and linkages, and pervasive weaknesses in factor markets and institutions. [12]

This brings us to the second issue: when selective interventions are theoretically justifiable, whether it is feasible in practice for governments to mount selective "strategy." Krugman opposes competitiveness analysis mainly on this point: accepting the validity of strategy, he is deeply skeptical of its practical utility. He divides analysts into "realists" and "strategists." Realists (as he considers himself) are skeptical of government abilities to mount effective selective interventions. Strategists are naïve about strategy, believing that interventions can work and yield significant benefits. Krugman uses the unsuccessful US government intervention in semiconductors to argue that "it is very difficult to formulate strategic trade policies, and... even if you could, it would not be worth much to the economy" (Krugman, 1996, p. 24).

This is not the place to engage in the debate on the role of government. We need only note that the evidence does not support such a sweeping dismissal of competitiveness strategy. There are many examples in the developing world, particularly in East Asia (and, indeed, in the developed world in its earlier stages of industrialization) of successful strategic intervention. Selective strategies *do* work under specific circumstances, and the rewards in terms of growth and dynamic competitiveness are enormous. They also fail quite often, however, and development history is littered with strategic mistakes and failures. The real issue is what the circumstances are under which successful strategies are mounted and if they can be created in countries that presently lack them. [13] But, we need not explore this issue at length: we only need is to establish that there is a valid case for competitiveness analysis. This we can clearly do.

This does not imply that competitiveness analysis can, even in theory, fully redress market failures in the sense of returning an economy to a full neoclassical equilibrium. For informational and computational reasons governments clearly cannot reproduce "perfect" markets. More important, however, is the possibility that in a world of constant technical change with scale and scope economies, externalities, and diffuse information failures, it may not even make much sense to try (Stiglitz, 1996). Correcting for "market failures" in the sense of remedying deviations from a perfectly competitive equilibrium may not be the correct way to describe good development strategy. Developing countries are not trying to achieve some ideal static equilibrium but to create new factors, markets, institutions and capabilities that take them on to a new and higher (disequilibrium) growth path. [14]

In this context, competitiveness analysis is necessarily more modest, using limited information and partial equilibrium tools to overcome market deficiencies that impede the realization of dynamic comparative advantage. It is a way of integrating numerous branches of economic analysis that pertain to such issues as physical and human capital formation, innovation and diffusion, risk financing, competition polity, mobility, clusters and so on. If the integration is done well, with a sound framework, appropriate empirical analysis and a good grasp of governance issues, it can serve as a valuable tool of policy. Note, however, that competitiveness analysis involves making assumptions on government capabilities as well as on the nature of market failures affecting dynamic comparative advantage. The value of the analysis depends on the theoretical and empirical validity of those assumptions.

If competitiveness analysis is valid, there is a useful role for competitiveness indices to benchmark national performance. Indices can help policy makers to evaluate the shortcomings of their economies, in the same way that technical benchmarking helps enterprises to assess themselves against rivals and undertake appropriate strategies. Indices can also help investors to allocate resources between countries, researchers to analyze important issues in comparative terms, aid donors and international institutions to judge economic performance, and domestic industries to measure themselves against competitors. The justification for using benchmarks (rather than theoretical norms) is simple: many aspects of

performance can only be assessed with reference to actual practice. Theoretical norms are often difficult to construct with the precision needed to allow evaluations in a complex and fast changing world.

If this reasoning is valid, a sound competitiveness index must fulfill two conditions. First, it must confine itself to activities involving competition (what Krugman terms "actual conflict") between nations; otherwise it becomes a broader and very different exercise dealing with productivity or growth in general. Second, it must revolve around market failures that affect competitive ability, particularly the evolution of dynamic comparative advantage. Competitiveness strategy must go a step further: to analyze which failures are remediable by policy and whether the government concerned has the ability to undertake such policy. But, building an index *per se*, with the objective of providing indicators of competitive performance or capabilities, need not include this step. In the following discussion, therefore, we do not take the analysis of government capabilities into account.

3. THE WEF INDEX: THE BROAD APPROACH

Let us now turn to the competitiveness index constructed by the World Economic Forum, starting with its broad approach to the determinants of competitiveness and the role of government policy. WEF is clearly concerned with dynamic comparative advantage, and places technological dynamism at the core of building such advantage: there is now "a multi-speed world economy divided by technological dynamism" (WEF, 2000, p. 19). The ability to sustain incomes and growth depends, in a globalizing world, on each country's ability to innovate or import and use technologies created elsewhere.

This approach opens the way, in economic terms, to the analysis of how technology generation, import, absorption and adaptation take place and, for competitiveness analysis, the market failures affecting the process. Recent economics literature has a great deal of such analysis, in particular the branch dealing with "national innovation systems" from an evolutionary perspective (Edquist, 1997; Lundvall, 1992; Metcalfe, 1995; Nelson, 1993). "Systems" exist because of the existence of inherent and widespread spillovers (i.e., market failures),

with considerable scope for collective action as well as policy intervention. As far as developing countries are concerned, a related branch of analysis deals market failures involved in building technological capabilities; on the empirical front, it analyzes the policies of the countries that made enormous technological leaps (Lall, 2001). One would expect WEF, in focusing on innovation, to reflect some of such innovation analysis and draw upon the economics of policy intervention in stimulating innovation and learning. Unfortunately, it does not do so.

Technological dynamism, for WEF, depends mainly on microeconomic factors. Good macro management may be necessary, but is not sufficient, to ensure competitiveness.

> In advanced countries, which have largely gotten their macro policies right, it is micro reform that holds the key to reversing unemployment problems and translating economic growth into rising standards of living... In developing countries, if reform efforts continue to concentrate on IMF style macroeconomic adjustment, we will face a continued succession of disappointment. Only by tackling the specific constraints to productivity and the numerous policies that blunt local rivalry will developing countries achieve sustainable improvements in productivity (WEF, 2000, p. 41).

It also notes that technological dynamism is very unevenly spread.

> Large regions of the world, especially in the tropics, have so far failed to benefit from the technological progress of the advanced economies.... In many parts of sub Saharan Africa, the situation is desperate... These economies are competitive only in a very narrow range of primary commodities... Without a new strategy for economic development, it is unlikely that globalization alone will solve the problems of many parts of the African continent (p. 22).

Many development economists, including myself, would agree with much of this argument. "IMF-style reforms" are not the answer to the development needs of economies with severe problems of structural backwardness, inefficient industries, missing markets, low skill levels and deficient institutions. Adjustment in the "Washington consensus" mold has done little for the dynamic comparative advantage of most such countries. [15] Untrammeled globalization is likely to continue exacerbating divergences between countries unless the laggards can mount strategies to raise their technological capabilities. This being said, however, the WEF approach to the technological strategies

needed at the micro level is restricted, and in some aspects misleading. There are two related reasons for this. First, WEF seems to take an oversimplified view of the process of and constraints to (microeconomic) structural change in developing countries. Second, it adopts, despite its strictures on "IMF-style adjustment," an approach to the role of government that veers between the strong neoclassical and market-friendly position. [16] Taken together, these lead to naïve and misleading strategy conclusions for competitiveness building.

Since the position of WEF on the role of government is never explicitly discussed, its underlying approach has to be gleaned from its essays and indices. This suggests a general assumption that markets are efficient in all countries: a competitive setting with full exposure to international markets is the primary requirement of success. The role of the government, apart from providing such a regime, is to raise skills and improve infrastructure (largely by deregulation). Proactive measures to strengthen capabilities and promote the exploitation of externalities or overcome the costs and coordination problems of learning are not considered. Relations between free markets and technology development do not vary according to the level of development. The same strategies work for poor countries, with weak markets and institutions, as for rich ones. At the micro level, it is the strategic responses of firms, set in free markets that decide competitiveness. The whole array of market failures that economics is concerned with in innovation and learning is conspicuous by its absence; so are all the structural problems of development and in particular of building technological capabilities.

As a result, WEF indices assign uniformly higher values to freer trade, stronger intellectual property protection and more liberal capital accounts across countries. This ignores valid arguments for interventions in all three, at least for developing countries with fledgling industrial sectors, weak capabilities and backward institutions. There is a good economic case for infant industry protection in developing countries, particularly in overcoming the initial costs of tacit learning and building new skills and networks. The evidence also bears out the vital contribution that well-managed industrial policy can make to rapid technology upgrading and competitiveness building: the story of the mature NIEs in East Asia is well

known (Rodrigo, 2001; Stiglitz, 1996; Westphal, forthcoming). Strong intellectual property protection by non-innovating countries can lead to higher costs of importing technology and products embodying new technology. It can also constrict a valuable avenue for learning, copying and reverse engineering. After the Asian crisis, the dangers of premature liberalization of the capital account hardly need to be argued. While some of WEF's implicit premises may be suited to advanced countries, they do not apply equally well to less developed ones.

The free market bias, with an implied rejection of failures inherent to market structures, is also found in indices dealing with government spending as a share of GDP, private as well as indirect taxes, union power, and pension benefits. All these are assigned negative relations to competitiveness. The ability of firms to hire and fire workers freely, by contrast, is regarded as uniformly positive for competitiveness: this gives Russia one of the highest scores and Sweden, Germany and Italy, respectively, among the lowest. Appealing as all this may be to the report's corporate audience, the economic validity of many of these propositions is debatable.

Its chapter on globalization (WEF, 2000) illustrates the naivete of WEF's approach to development. Noting that globalization has "seen widening global disparities" due to the inability of poor countries to use new technologies, one may be led to expect that the policy conclusions will deal with issues of market failure in skill, technology or institutional development. Nothing of this sort is even hinted at. Given its basic assumption that all relevant markets work efficiently, the conclusion is inevitably that the complete solution lies in faster integration with global markets and greater deregulation. Thus,

> Globalization alone is unlikely to solve the problem of much of the world's poor, yet a reaction against globalization is even less of an answer. Countries can counteract the isolating effects of geography with infrastructure, break local telecommunications monopolies that make access to the Internet prohibitively slow and expensive, ensure proper incentives for innovation to overcome their own specific problems, and leave aside false solutions based on a fear of global integration (WEF, 2000, p. 27).

The WEF solution to growth and global competitiveness in the poorest countries lies, in other words, in greater access to the Internet, more entry of international telecom providers and incentives for "innovation" (whatever that means in these economies). The possibility that rapid liberalization is, in the absence of policies to upgrade capabilities, itself partly responsible for increased marginalization is ruled out. Complex interactions between learning failure, institutional weaknesses, skill deficiencies and social structures are too far removed from the picture to even merit mention. The provision of a computer in every village will presumably solve all problems of technology absorption, deployment and innovation. One gets the feeling that even the World Bank and International Monetary Fund (IMF), the arch-proponents of the "Washington consensus," will cringe at this solution to problems of marginalization.

This constricted approach to the analysis of technological change and its policy requirements greatly reduces the utility of the WEF analysis of competitiveness strategy. A conducive environment for private business with full exposure to world market forces and lots of "local rivalry" may be all that technological dynamism needs in some countries (though this is doubtful), but it is neither necessary nor sufficient for overcoming the enormous problems of structural transformation in poor countries.

4. MEASURING COMPETITIVE PERFORMANCE

Any competitiveness index should start with a measure of national competitive performance (the dependent variable in the analysis), confined to activities involving competition with other countries. Delineating activities in this way is not easy. Several economic activities clearly involve competition between nations (i.e., tradable industrial, agricultural and service activities). Others feed into competition indirectly, as inputs into tradable activities (e.g., parts of infrastructure, financial and transport services, or the cost of some land), but it is difficult to separate the elements relevant to competitiveness. Yet others do not affect the competitiveness of tradable activities even as inputs (such as domestic help, realtors, entertainers or restaurateurs), though some may, by affecting the "quality of life," influence the location of investments that do affect competitiveness. [17] Though theory suggests that a competitiveness index must distinguish relevant from irrelevant activities, this is very difficult in practice. No easy solutions present

themselves, at least so long as the objective is to measure national competitiveness as a whole.

In view of these inherent problems, WEF and IMD choose alternative solutions, neither of which is fully satisfactory. IMD chooses not to provide any measure of competitiveness, since "a country's competitiveness cannot be reduced only to GDP and productivity, because firms must cope with the political, cultural, and educational dimensions of countries, as well as their economies" (IMD Website, 2000). In the absence of any measure of the dependent, however, it is difficult to see how to verify the analysis and the choice of relevant determinants. In effect, IMD appears to ask its audience to take its findings entirely on faith or to assume that "competitiveness" has a universally accepted meaning (to which it adheres). The first stretches credibility unduly, the second is simply wrong.

WEF does provide a quantitative measure of performance, per capita GDP (at purchasing power parity values) in each country, but does not try to separate competing from noncompeting activities. [18] This is problematic for the reasons noted: it includes many activities that do not involve competition between countries and takes "competitiveness" beyond its legitimate scope into the analysis of income and growth. Its notion of competitiveness is, to repeat Krugman's words, simply "a poetic way of saying productivity." It has little to do with overcoming market failures in competing or realizing dynamic advantage (WEF does deal with market failures in income generation, but, as shown later, in a very narrow way). While there is an obvious relationship between competing internationally and raising incomes, the fact that the former is a subset of the latter means that the analysis includes unnecessary or irrelevant variables. It is possible, however, that an analysis of incomes will not go "too far wrong" in dealing with competitiveness in the stricter sense. Competing activities probably contribute a significant part of GDP (certainly in smaller economies) and the realization of dynamic comparative advantage is likely to be a powerful engine of income growth. But, the broad definition dilutes the analysis of the structural factors affecting competitiveness.

The other drawback of a broad definition, that it takes (essentially) corporate strategy analysis into the realm of growth economics, is perhaps more serious. Here it competes head-on with a voluminous literature using very different tools, with rigorous economic models and powerful econometrics, which also seeks to ex-

plain income growth. Competitiveness analysis has to match or improve upon this to claim validity and originality. It is not clear that it does so. As shown below, its underlying model tends to lack rigor and clarity, with a propensity to use a large number of variables without theoretically justifying their causal relations to the dependent (and often without measuring them correctly). By the usual standards of economic rigor, its methodology is weak and its findings suspect.

While it is beyond the scope of this paper to suggest the "right" theoretical way to measure national competitive performance, the reasoning suggests that this is something of a doomed quest. Apart from the option used by WEF (and others) to use the broad income-based definition, which is understandable but not satisfactory, the only alternative is to focus on competitiveness in a narrower sense. It is easier to construct a coherent quantitative measure of competitive performance for a specific sector, say manufacturing, than across all sectors, and becomes easier as one moves down the scale. This is not to say that competitiveness measures at narrower levels are very easy to calculate: the concept remains multifaceted and always needs simplifications and judgement. [19] A more limited approach is easier to justify, however, in terms of looking at means of overcoming market failures in competing and creating dynamic comparative advantage. The WEF attempt to conduct a growth accounting exercise without the analytical or empirical tools used by economists seems unwarranted and unwise.

5. THE WEF "CURRENT COMPETITIVENESS" INDEX

The last available WEF report (2000) departs from its earlier versions (and all IMD reports) in providing not one but two competitiveness indices: the *Current Competitiveness Index* (CCI) and the *Growth Competitiveness Index* (GCI). [20] To facilitate the analysis, we focus on this set of indices, which yield fairly different rankings across countries. The distinction between the two indices is as follows. CCI

aims to identify the factors that underpin high current productivity and hence current economic performance, measured by the level of GDP per person... [GCI] "aims to measure the factors that contribute to the future growth of an economy, measured by the rate of change of GDP per person"... The *level* of income, in the WEF model, depends on the capital stock (including human capital) and the "current level

of technology.'' Its *growth* depends on additions to the stock of capital and technology (p. 14 15).

CCI is WEF's measure of the microeconomic base of competitiveness across countries. It consists of two components: "the quality of the microeconomic business environment" and "the sophistication with which companies or subsidiaries based in the country compete." [21] Both are based on Porter, 1990 work on national competitive advantage, the former directly deriving from his famous "diamond of competitiveness." The quality of the business environment measures the quality of inputs firms obtain externally, while the sophistication of strategies measures variables internal to firms. There are 64 variables making up CCI, of which 49 comprise the business environment and 15 company operations and strategy.

There are two sets of (connected) problems with the calculation of CCI. The first set relates to the measures used to capture the determinants supposed to determine current competitiveness. The second relates to its underlying analytical framework.

(a) *Measures*

The economic model underlying CCI is described as follows.

> Gross national product per person is proportional to the amount of capital per person: $y = Ak$, where (A) represents the level of technology, summarized by a single number measuring the average productivity of a unit of capital [and k is the national capital stock per capita]. The level of income, then, is determined by the *capital stock* and the *level of technology*. [22]

WEF defines "capital stock" and "level of technology" broadly. Apart from the physical capital embodied in equipment, buildings and physical infrastructure, *capital stock* includes "the level of education, workforce skills and attitudes, and managerial talent. Also part of the stock of "capital" in an economy are the set of legal interventions and regulatory practices governing business. Social capital (levels of trust, mores and the presence of networks) also contribute to the quality of the overall capital stock" (p. 14). *Technology* includes "not only the technological knowledge embedded in a nation's scientific and technological institutions, but also the technology rooted in firms. Technology is embodied in every activity a firm performs as well as in the strategies firms use to compete" (p. 14). "Technology" can therefore

also be seen as a stock, of knowledge, capabilities, institutions and company strategies.

When it comes to calculating CCI, however, WEF uses no stock measures for physical, human, technological or strategic capital. While there are well-known problems inherent to quantifying such stocks for countries, several attempts have also been made to overcome them. Estimates of physical capital stocks exist for several countries, and are widely used in the analysis of productivity and growth. Estimates of human capital stocks also exist, and of research and development stocks (though the data pertain only to some developed countries). None of these estimates are even mentioned in the WEF report. The technological, strategic and social elements of national "stock" are far more difficult to quantify. There is, for instance, no way to measure stocks of "technological capabilities" in all the firms in an economy. It is difficult to even conceive what national "stocks" of social capital, legal systems or regulatory practices (i.e., government policies affecting business) may mean in quantitative terms, or how the practices of firms can be aggregated into a national "stock" of business strategy.

This does not deter WEF from ranking countries according to its 64 variables for microeconomic competitiveness: all are flows and all except one (for patents) are qualitative, based on business perceptions rather than on hard data. The measures are interesting. For instance, *physical capital* is proxied by a set of variables for "capital availability," based in turn on qualitative measures of "financial market sophistication," "stock market access," "venture capital availability" and the like. None of these says anything about capital stocks. WEF does not even use available data on current investment rates. There is a measure of the investment rate, but this appears along with 21 other variables in a "Finance Index," which is a determinant of GCI rather than CCI. It is unlikely, therefore, that "capital availability" captures well intercountry differences in the ability to invest. Or take *human capital*, another critical determinant of competitiveness. This is captured in CCI by qualitative answers to two questions: whether local "public schools are of high quality" and "first-class business schools are locally available." Even as flow measures, these are a travesty of the human capital literature.

The problems, however, lie less in the proxies used for economic variables than in the

underlying analytical model for CCI. This model does not call for stock measures, or indeed for what economics conceives of as determinants of income or comparative advantage. The economic model quoted above is actually irrelevant to the actual approach, to which we turn now.

(b) *Analytical model*

To understand the model we must digress briefly into Porter's "competitiveness diamond," which forms the explicit base for CCI. The diamond dates back to Porter's well-known book on *The Competitive Advantage of Nations* (1990), where Porter distinguishes national "competitive advantage" sharply from the "comparative advantage" of trade theory (represented by the canonical Heckscher Ohlin model). The concept of competitive advantage originates in corporate strategy analysis rather than in economic analysis. To apply it to the national level, Porter argues that advantages do not arise, as in H O, from the interaction of industry-specific factor intensities with country endowments of those factors. They arise instead from firm-level ("man made") efforts to develop new products, make improvements, develop better brands or delivery methods and so on: to innovate in the broad sense. Innovation can, according to Porter, arise in any industry regardless of factor intensity, wherever conditions are conducive to innovative effort.

These conditions are given by the four elements of the "diamond:" *factor conditions, demand conditions, related and supporting industries* and *the context for firm strategy and rivalry.* Moreover, favorable conditions only lead to competitive advantages if firms are able to mount the necessary strategies. Like other elements of the "diamond," strategies also have country-specific characteristics. The competitive potential of each economy is then given by the intersection of its innovation conditions and strategic patterns. Competitive success over time needs constant upgrading of both diamond conditions and corporate strategies. Countries must shift from basic or simple factors (cheap unskilled labor and natural resources) to advanced ones (innovation and ICT infrastructure), with concomitant shifts in company strategy. This approach, illustrated with a rich variety of examples, forms the WEF model for current competitiveness. To its credit, it captures much of the dynamism and variety inherent in changing patterns of com-

parative advantage, with its underlying externalities, interactions, nonlinearities and uncertainties (Smith, 1993). In doing this, it emphasizes factors largely ignored or assumed away by mainstream economics and of importance to practitioners and businessmen. [23]

Interesting as Porter's analysis is, however, it does not yield a theory of competitive advantage in economic terms (i.e., yielding testable predictions on which activities succeed in which locations). It only explains *post hoc*, and in a rather diffuse way, why certain activities have succeeded in certain countries. The link from competitive advantages at the firm level, where the approach is most useful, to those at the national level remains weak and unsubstantiated. [24] It is true that many of the variables that Porter focuses on are difficult to model and quantify. Moreover, not surprisingly, many others are common to standard trade theory (not in the canonical H O form but its modern, differentiated versions based on imperfect markets [25]). But, there is a risk to which WEF falls prey that the introduction of strategic and other "nonstandard" variables leads to confused analysis and lack of rigor in empirical application. This can be illustrated by a few examples.

Porter's assertion that industry characteristics (what trade theory takes as "factor intensities" broadly defined) are not systematically related to innovation, the tendency of activities to produce new products and processes, is unjustifiable. While particular advantages may indeed arise in any activity, some activities have inherently higher propensities to create and sustain innovative advantages. Evidence shows that technology and skill-intensive activities tend to consistently produce more competitive advantages than low-technology activities. [26] Moreover, these activities at least innovation and complex production remain rooted in locations with strong bases in skills research and development (R&D), universities and research institutions and the like: factor endowments do matter.

Some variables making up CCI reflect the theoretical weakness of the diamond. For instance, the nature of local demand, particularly demand by what Porter calls "sophisticated customers," plays a significant role in stimulating advantages based on advanced factors. It is not clear, however, how the sophistication of local demand (obvious idiosyncrasies based on local resources or climate apart) can be differentiated at the country level except by income

levels. But, if it is mainly higher incomes that make demand more sophisticated and discriminating, the chain of causation is reversed. It is not the nature of demand that leads in general to higher incomes via greater competitiveness. Moreover, even if the inherent sophistication of demand varied independently of incomes, it is not clear that it affects systematically the pattern of competitive advantage. For this to happen, it would have to be shown that sophisticated customers affected different activities differently, and that sophistication was causally related to the move to more advanced capabilities. Without such distinctions, it is difficult to generalize about competitive advantages based on the nature of demand: it remains a *post hoc* explanation.

The weakness of the concept shows up in the measures used for demand sophistication in the index. WEF tackles the issue qualitatively, asking respondents if they think their customers are "knowledgeable and demanding, and buy the latest products" and if they "actively seek the latest products, technologies and processes." Even if answers to these questions provide a good measure of demand sophistication (the questions overlap significantly), it is not clear how they can be related to competitiveness in specific activities. Are discriminating customers good for all activities? If so, they do not impart a specific set of advantages related to advanced factors. Are they equally discriminating in whatever they buy? How discriminating must they be before the economy gains a distinct advantage? Surprisingly, the category of "demand conditions" also includes variables for demanding regulatory standards and stringency of environmental regulations: it is difficult to see how these are a cause, rather than the effect, of higher incomes. Ambiguous causal relations are taken up below.

Porter's emphasis on firm strategy as a determinant of competitiveness, leading to WEF's stress on corporate strategy variables in CCI, is similarly questionable. Economics does not treat individual firm responses as a systematic influence on national comparative advantage. Firms are taken to respond rationally to signals emanating from the market. While individual responses certainly differ due to differences in perception, attitudes to risk, access to information or sheer "animal spirits," these are taken to be random differences that do not have systematic effects on national outcomes. Porter suggests, by contrast, that there are unique strategic patterns in each country (influenced

by the local context for rivalry) that do have such systematic effects. [27] This does not appear justified by theory or evidence. It is not clear that there are national patterns of company strategy irrespective of market signals (or of the general environment determined by income levels), which yield distinct, systematic and predictable patterns of competitiveness.

There are clearly differences in business cultures between countries: the "Anglo-Saxon model" of corporate financing and management is different from the "European/Japanese model." What is not clear is that these differences systematically explain patterns of competitiveness at the national level. To do this, the evidence must show four things. First, there must exist national patterns of competitive strategy across firms and industries; German strategic behavior must, for instance, be identifiably different from the French or Dutch. Second, such differences must have systematic (and so predictable) effects on industrial specialization. Third, strategic factors exist independently of economic ones (otherwise they add nothing to the market-based explanation). Finally, they must also be independent of government policy, otherwise the explanation becomes purely contingent. Take the Anglo-Saxon and European models as distinct business cultures. Can it be said that the German business culture in general less or more competitive than British? Are there differences by industry: do German companies in chemicals benefit more from the business culture than in electronics? Does it alter over time: is German business culture more or less conducive to competitiveness now than one, two or four decades ago? Does the business culture represent rational institutional responses to past market forces or government policy? It does not seem that the diamond model answers   or even addresses these basic methodological questions.

The practical application of these concepts to CCI is also confusing, at least to the economist. It is difficult to see how such impressionistic variables as "nature of competitive advantage," "extent of marketing," "extent of regional sales," "value chain presence," or "consumer orientation" lead to predictions on national competitiveness. Quite apart from issues of objective measurement (taken up later), it is not evident that these factors signify greater innovative capacity in a country. To the extent that they do, the economist would ask, are they independent variables or do they simply reflect

market forces like skill endowments, income levels, science and technology infrastructure and government policy? Was Japan's, and later Korea's, rapid growth of innovative effort due to inherited business strategy, or did strategy evolve in response to economic pressures and deliberate policy? Many would probably pick the latter explanation.

To recapitulate on CCI, WEF is right to emphasize the microeconomic base of competitiveness. Its methodology, however, is weak. The economic model that supposedly underlies it, purporting to explain income levels by stocks of productive factors, has little to do with its empirical approach, aimed at assessing current company strategy and the market, institutional and policy environment. One calls for stock variables, the other does not. The variables adduced to quantify current competitiveness are not linked into a coherent model of competitive advantage. The application of management concepts to the national economy leads not so much to a theory of competitiveness as to a catalog of factors associated with competitive success, strung together by loose ideas on how they are interrelated. This is as far as the approach is concerned; there are other problems in how the variables are causally related to the dependent, how they are measured and how they are aggregated to form the final index (below).

6. THE ''GROWTH COMPETITIVENESS'' AND ''ECONOMIC CREATIVITY'' INDICES

(a) Growth competitiveness index

There are three subindices making up GCI: the economic creativity index, the finance index and the international index. The creativity index consists of variables for current technological effort and technology imports (see below for more details). The finance index has variables for financial market sophistication and accessibility, interest rates, financial supervision and so on the current state of the capital market. The international index measures import barriers, exchange rate alignment and volatility and capital account liberalization.

The intuition behind WEF creating two national indices from one is appealing. CCI concerns the national ability to realize the potential inherent in existing stocks, GCI the ability to raise those stocks and so growth. But, creating

two indices using essentially the same information as in previous reports faces problems. WEF admits that it is hard to separate the factors that determine current productivity from its growth. To quote, ''some of the same institutions, regulations, attributes and practices affect *both* level and growth, sometimes through different mechanisms... In practice, then, the influences on current competitiveness and growth competitiveness will be different but overlapping'' (p. 15). What it does not note is that in practice any such division can be artificial and arbitrary.

The rationale for WEF's procedure is difficult to comprehend. Why, for instance, do physical infrastructure, capital availability, efficiency of supply cluster and (in particular) human resources and the science and technology position appear under current rather than growth competitiveness? Surely all of these determine the ability of a country to grow and compete in the future? Similarly, it is not clear why the trade system appears under growth competitiveness, when such factors as exchange rate alignment, import fees and barriers and tariffs also directly affect countries' ability to compete at present. The trade regime is also a major influence on the existing stock of competitive capabilities, having shaped the incentives under which resources and technological effort are allocated. Some technology-related variables (e.g., company spending on R&D, capacity for innovation and foreign technology licensing) appear in both indices. While this may be understandable, it shows up the artificiality of the division the same reasoning should lead to most variables appearing in both. In the end, the new index looks too much like unnecessary product differentiation on the part of WEF, and it would be well advised to revert to one index.

(b) Economic creativity index

ECI is a new entrant to the WEF stable of indices, and the 2000 report devotes a chapter to its exposition. [28] But, the attempt to measure innovation under a separate index was in fact introduced in 1999, when it was called the ''Capacity for Innovation'' (CAP) index. CAP did not, however, form part of the final competitiveness index in 1999. In the following year, WEF replaced CAP by the (very different) ECI, which plays a prominent role in GCI. The reasons for the changes made to the innovation index are not explained. Since innovation is

central to all competitiveness analysis, and is also my particular area of interest, it is useful to consider the antecedents of the index and its transformation.

The 1999 CAP index drew upon work by Porter and colleagues on an "*Innovation Index*," calculated for the US Council on Competitiveness. [29] The Innovation Index sought to explain the "ability of a country to produce a stream of commercially relevant innovations," measured by patents taken out internationally by each country. This was a relatively complex process, using panel data for each year for 1973 96. Unlike the WEF exercise, however, it was confined to 17 OECD countries. The premises of this Index were that patents were a good indicator of innovative capacity and that domestic innovative capacity was the most important technological variable in competitiveness.

Both premises are questionable. Patents are only a rough proxy for commercially relevant innovation, and do not capture the minor, incremental technological effort that accounts for the bulk of productivity increase in most economies. Domestic innovation is a misleading indicator of competitive (technological) capabilities because it ignores the inflow and use of foreign innovation. Technology diffuses today with growing rapidity, especially within multinational corporations setting up integrated production systems spanning the world. In industries where such systems are prevalent, technologies are spread almost instantaneously. This does not mean that local technological capabilities are irrelevant, since the ability to use new technologies efficiently entails significant technological effort. But such effort may not generally result in patentable (i.e., frontier) technologies. R&D expenditures, perhaps together with stocks of technical manpower, would be better indicators of competitive technological capability. But, the Innovation Index uses R&D as an explanatory rather than the dependent variable in the analysis of innovative capacity.

Apart from R&D spending, the Innovation Index used the following independent variables: per capita income, R&D personnel, economic "openness," strength of intellectual property regimes, share in GDP of secondary and tertiary education spending, share of R&D funded by industry and the share funded by universities. [30] The rationale for some of these variables and the causal links between them and the dependent are difficult to understand. For instance, the use of per capita GDP as an explanatory variable for innovation is strange. The causation is normally taken to be the other way around; in any case, incomes are highly correlated with all technological and skill measures. Variables such as R&D personnel, R&D spending and skills are also highly intercorrelated. The obvious problems that arise for multiple regression analysis are ignored: the coefficients yielded by multiple regression are used to assign weights to the variables in the Index.

The share of total R&D funded by private industry is supposed to measure the strength of local "innovation clusters," while the share of university R&D is meant to measure the strength of linkages between research and industry. Both are bizarre measures. The share of business-financed R&D in total R&D has nothing to do with its geographical or industrial clustering. The share of university-funded R&D has little to do with how closely universities link with industry in technology creation. In most countries, the government largely determines university R&D budgets. In developing countries, a high share of total R&D emanating from universities may actually indicate low links between academia and industry. The measure of skills (the share in GDP spent on secondary and tertiary education) does not reflect the availability of skilled manpower: enrollment or graduation rates at higher levels, particularly of technical personnel, would be better indicators.

The CAP index in WEF (1999) was directly based on the Innovation Index, similarly emphasizing the role of frontier innovation in national competitiveness. But, CAP was calculated not from patents but from qualitative responses. Countries where "companies obtain technology by pioneering their own new products and processes" were given the highest scores and those ones where "companies obtain technology exclusively from foreign countries" the lowest. WEF, 1999 also provided patent data (similar to the Innovation Index) for 56 out of its 59 countries. Patents turn out to have a very similar statistical distribution to the qualitative measure; thus, CAP turns out to be effectively the same as the Innovation Index.

Both the qualitative and patent measures of innovative ability are positively related to incomes (and so to competitiveness). While the correlation with income is entirely expected, the causal link with competitiveness is tenuous. It is not clear that frontier innovation is a good

measure of relevant technological effort in "follower" countries in the developing, and even developed, worlds. The appropriate variable would be a combination of technology import and technological effort. WEF ignores this problem and proceeds to generalize about links between frontier innovation and incomes. The following statement reveals its simplistic approach to drawing causal connections and policy implications.

> ...[a] doubling of patent output would result in a nearly $2000 increase in GDP per capita. Doubling the patenting rate would be a tall order for countries such as the United States. However, in lower patenting countries, such an increase is more feasible over a 5–10 year period and would have a larger percentage impact on income. In Chile, for example, increasing patent output from 0.6 to 1.2 per million persons could imply a 15% increase in GDP per capita (WEF, 1999, p. 59).

We can only speculate on how relevant Chilean policy makers would regard this route to growth. Countries further down the income scale (e.g., Bolivia, Zimbabwe and Vietnam in the WEF sample) would find it even easier to raise international patenting, and would presumably benefit even more. Should development economists use the WEF's insights and persuade them to devote resources to this? Have we erred by overlooking such a straightforward solution to development problems? Combined with telecom deregulation and greater Internet access, perhaps we have a comprehensive solution to both growth and integration with a globalized economy.

WEF (2000), as noted, replaces CAP with "creativity," apparently in admission of the irrelevance of using frontier innovation to measuring national technical competence. "Creativity" now includes the ability both to create new technology and to use technologies created elsewhere. In a reversal of the earlier argument, it is now suggested "Nations can link themselves to the global technology engine by being centers of innovation themselves, or by facilitating technology transfer and the rapid diffusion of innovation. Both innovative countries and technology-transfer countries have been successful in the 1990s" (WEF, 2000, p. 28).

While the inclusion of imported technology is an improvement, the way WEF ranks countries in terms of technological capability is unsatisfactory. ECI has two components: the *Innovation Index* and the *Technology Transfer Index*.

The Innovation Index remains similar in concept to the CAP index in the 1999 report, but is based on 10 qualitative questions (shown below in the section on data). The Technology Transfer Index comprises responses to two questions: "FDI is a source of technology transfer" and "Licensing of foreign technology is a common way to get technology." The final index gives *equal importance* to both elements: a country scores equally highly whether it innovates or imports technology. Thus, Mexico ranks 45th in innovation but comes 12th overall because it ranks fourth in technology transfer. This formulation ignores the complex relationship between technology import and the ability of importers to absorb technology by domestic technological effort. Evidence suggests that without strong domestic technological activity, heavy dependence on foreign technologies leads to limited and shallow technology transfer (Lall, 2001). This can become a constraint on long-term competitiveness; a culture of heavy reliance on imported technology can limit the development of domestic R&D capacity. In the 2000 report, in other words, WEF may have swung too far away from its earlier emphasis on domestic technological activity.

7. AMBIGUITIES IN CAUSATION AND ECONOMETRICS

There are problems with the causal relations posited by WEF and its handling of data. The 2000 report acknowledges that some variables may be correlated with income without being its cause (p. 47). What it does not mention is that the causation often runs the wrong way (from income to the independent variable). This is because it never analyzes causal relationships for theoretical validity. For instance, it uses variables such as "demanding regulatory standards" and "stringency of environmental regulations" to explain higher incomes, when common sense suggests that these are likely to be the result rather than causes of high income. The same goes for many of the corporate strategy variables. Having noted the problem of circular reasoning and causation, however, the report proceeds as if it did not exist, greatly weakening its model.

WEF also uses statistical analysis without noting its limitations. For instance, WEF (2000) reports bivariate regressions for each of the 64 CCI variables on 1999 GDP per capita,

with the finding that each is significantly related to the dependent for the sample as a whole. This creates a presumption that the theory is sound and the empirical specification robust. This is misleading, since many variables cannot, on theoretical grounds, be taken as causes of higher incomes. For instance, ''demanding regulatory standards'' and ''stringency of environmental regulations'' have among the highest regression coefficients (83% and 82%, respectively). Yet the theoretical basis for their causal impact on income is so unconvincing that the result appears meaningless or misleading.

There are many other variables with similarly wrong, unclear or spurious causal connections. Take one concerning poor countries. WEF divides its sample into three groups by income and reports the results of regressions for the CCI variables within each. For the group of 17 low-income countries, the ''most important single discriminator between more and less successful developing countries is the effectiveness of antitrust, a measure of a nation's commitment to competition'' (p. 51). Apart from demonstrating WEF's commitment to free markets, it is difficult to see the point of such statistical analysis. Would any serious development economist argue that antitrust is an important   not to say the most important   determinant of growth in the least developed economies? In fact, this goes against the argument in the Report's globalization chapter that IMF reforms (good macro management and opening up to free competition) can be highly damaging to least developed countries.

Even if the bivariate regressions used meaningful variables, they would not show which variables are most significant for competitiveness when they are used together (as they invariably are). For the users of competitiveness indices, however, this is likely to be an important consideration. The use of multiple regressions, which would show the relative significance of variables, is limited by multi-collinearity problems, compounded by many variables being slight variations of each other (see below). Correlated variables can be used together, if justified in economic terms, but the appropriate tests have to be satisfied.

WEF does not choose this path. Instead, it uses common factor analysis to compute the ''dominant factor'' in the Microeconomic Competitiveness Index. The dominant factor, capturing 70% of the covariance between variables, becomes the quantitative measure of Current Competitiveness. A regression of the factor against per capita GDP explains 83.3% of the variation in the latter. This is impressive for cross-section regression analysis, and purportedly shows the strength of the model. In fact, as the coefficient is higher than in 1999 (82.4%), WEF claims that there are ''improvements in the model'' (p. 48).

At first sight, this result appears to vindicate WEF's methodology, variables and functional relationships (with its implicit free market bias). It does not in fact do so. High correlations cannot establish causation if there is no theoretical justification for a relationship between variables. Given the number of variables in the dominant factor that have dubious, wrong or spurious causal relations with income, one cannot draw such a conclusion. Even where a variable has a plausible theoretical relationship, a regression of this sort (for one year) may not demonstrate causation. [31] In sum, then, the WEF's statistical analysis does not allow for strong causal or policy conclusions   it simply shows that a whole lot of variables move together with each other and nothing more.

8. DATA AND AGGREGATION

Even if the methodology and theory were faulty, the WEF report would be useful if it provided new data from its business contacts; in fact, this is one of the uses to which both the WEF and IMD reports are put most. But, WEF also disappoints here: the data are not collected rigorously, and are likely to be misleading as a base for ranking countries. It uses a mixture of qualitative and ''hard'' information for 59 countries (47 for IMD). The qualitative data come from some 4,000 local respondents, 91% from the private sector. Of the latter, some 25% are local affiliates of multinational corporations (MNCs) and the remainder local private companies or associations. This breakdown is significant, since the background of the respondents affects the soundness of the variables.

WEF (1999) has a chapter describing its methodology but WEF (2000) does not. Since the methodology is essentially unchanged in this period (though the number and framing of questions has changed somewhat), we rely on the former report for the analysis. In 1999, a total of 173 variables go into the index (Table 2). No econometric methods are used to include, exclude or weight the variables (unlike

Table 2. *Variables in WEF, global competitiveness report 1999 (numbers, sources and weights)*

Category of variable	Numbers of variables			Weight in factor		Weight in
Factors in competitiveness	Quantitative	Qualitative	Total	Quantitative	Qualitative	overall index (%)
1. Openness	3	10	13	3/4	1/4	16.7
2. Government	9	13	22	3/4	1/4	16.7
3. Finance	9	15	24	3/4	1/4	16.7
4. Infrastructure	5	11	16	1/4	3/4	11.1
5. Technology	5	17	22	1/4	3/4	11.1
6. Management		23	23	0	1	5.5
7. Labor	7	10	17	3/4	1/4	16.7
8. Civil institutions		23	23	0	1	5.5
Supplementary (business operations and strategy)		13	13			
Total	38	135	173			100

the Innovation Index discussed earlier). The variables are grouped under nine headings, eight being "factors of competitiveness" that formed the main index. The remaining set comprised "supplementary" information on business strategy. Most (135) are qualitative responses, based on a seven-point scale where the respondent "strongly agrees" or "strongly disagrees" with a statement. [32]

Quantitative variables are assigned different weights from qualitative ones. The former carry a higher weight in categories 1, 2, 3 and 7 and lower in 4 and 5 (6 and 8 has no quantitative variables at all). The reasoning is:

> Wherever we have both quantitative and survey data available, we tend to give higher weight to the quantitative data... For the rest of the data however, there is often a scarcity of quantitative data, so we rely more heavily on the survey results. Furthermore, there are some aspects of competitiveness that are difficult to quantify, such as management, institutional quality and corruption, where it is preferable to rely on survey data. Therefore, for two factors, management and institutions, we rely entirely on survey data and for two other factors, infrastructure and technology, we give the survey data a weight of 3/4 (WEF, 1999, p. 97).

The variables under each heading (called "factors in competitiveness") are standardized and aggregated to yield a score ("factor indices") for each of the eight. The factor indices are, in turn, assigned different weights to yield the final score for each country. This time the weighting is *a priori*; the report says that it was "based on the economic growth literature" (p. 98), but which part of this literature yields the weights is left to the imagination. Where in the literature, for instance, does the higher

weight for finance as compared to technology come from? Can it be defended on economic grounds? The answers are not clear.

Since qualitative responses (primarily from local business) are the main base for the rankings, it is important to establish their soundness and reliability. Four issues arise here.

Whether quantitative data are available on variables for which qualitative data are sought; if they are, a strong reason must be given to use qualitative responses instead.

Whether statements and questions to which qualitative responses are sought are clear and unambiguous, allowing respondents in different countries to interpret them identically.

Whether the respondent has sufficient information related to the question to provide an answer that allows his or her country to be ranked against others.

Whether the data sought by qualitative responses are repetitive. If the same information is sought by several questions phrased slightly differently, respondents may interpret them in different ways and provide differentiated answers. This can create "noise" and redundant information, and to cloud rather than improve the rankings.

There are deficiencies on each front. There are many variables on which hard quantitative data are available but are not used; WEF chooses instead to rely on qualitative responses without explaining why. [33] The questions are often unclear or confusing, and there is a strong possibility that respondents are not using identical benchmarks, leading to misleading rankings. Finally, many questions are very similar, with the minor variations apt to deteriorate the information base.

Let us illustrate these points for technology, the most critical element of competitiveness. Take first the availability of quantitative data (and the biases inherent in subjective responses). The WEF uses eight qualitative questions to assess local technological effort:

"Your country is a world leader in technology."

"The business sector in your country spends heavily on R&D."

"Companies in your country are aggressive in absorbing technology."

"Competitive advantages of companies are due to unique products."

"Companies develop their own products."

"Product designs are developed locally."

"Scientific research institutions in your country are world class."

"Intellectual property is protected."

The first six questions revolve around the intensity of business-financed R&D, asking essentially for the same information in different forms. What is surprising is that WEF does not use published data on R&D by the business enterprise sector. Such figures are available from UNESCO, OECD and national sources for most countries. Data on enterprise-financed R&D (or business enterprise, BERD, as the OECD calls it) as a proportion of GDP would serve as a good (and widely used) measure of relative research intensity. It is difficult to understand why WEF ignores these data, particularly since their qualitative ranking differ significantly from that yielded by hard data (Table 3). Let us compare one qualitative WEF ranking (on "private sector spending on R&D") with quantitative data for the 40 leading countries on enterprise financed R&D as a percentage of GDP. We use this WEF index because it matches closely the hard data — it is not its "innovation index" as a whole but one component.

The two rankings differ significantly. Sweden leads the rankings based on hard data while in the WEF ranking it comes sixth. In the newly industrializing world, Korea comes third in the quantitative rank and 13 in WEF; Taiwan comes 13 and 15, Singapore 21 and 12 and Hong Kong (not shown in the table because of its low quantitative rank) 57 and 27. Only three countries (UK, Spain and Chile) of the 40 shown have identical ranks; 27 countries (two-thirds of the sample) have a ranking difference of three or more, by any criterion a high margin of error.

A similar comparison for technology transfer shows even larger differences (Table 4). Here we compare data on royalties and technical fees

Table 3. *Enterprise innovative effort: rankings according to published R&D and WEF data*

	R&D data ranking[a]	WEF ranking	Ranking difference		R&D data ranking[a]	WEF ranking	Ranking difference
Sweden	1	6	5	Singapore	21	12	9
Japan	2	4	2	Italy	22	28	6
Korea	3	13	10	Spain	23	23	
Switzerland	4	1	3	S. Africa	24	22	2
Finland	5	2	3	N. Zealand	25	31	6
USA	6	3	3	Brazil	26	29	3
Germany	6	5	1	Hungary	27	24	3
France	8	9	1	Poland	28	32	4
Belgium	9	10	1	C. Rica	29	30	1
Denmark	10	11	1	Malaysia	30	33	3
Netherlands	11	8	3	Turkey	31	35	4
Ireland	12	19	7	China	32	34	2
Taiwan	13	15	2	Portugal	33	46	13
UK	14	14		India	34	39	5
Norway	15	18	3	Greece	35	40	5
Israel	16	7	9	Chile	36	36	
Australia	17	21	4	Argentina	37	44	7
Canada	18	17	1	Indonesia	38	53	15
Austria	19	16	3	Venezuela	39	57	18
Czech Rep	20	54	34	Mexico	40		

Sources: R&D data are the latest available from UNESCO, OECD and national sources, generally for 1995–98, deflated by GNP. WEF rankings are from Table 7.07 of its 2000 report, "Private sector spending on R&D."
[a] R&D data refer to productive enterprise or business financed R&D as a percentage of GDP. Russia has been excluded because no quantitative data are available for enterprise financed R&D.

Table 4. *Technology transfer: rankings according to published royalty and technical fees and WEF data*

	Royalties ranking[a]	WEF ranking	Ranking difference	Royalties ranking	WEF	Ranking	Ranking difference
Ireland	1	35	34	Finland	21	28	7
Malaysia	2	16	14	Portugal	22	8	14
Singapore	3	4	1	Australia	23	5	18
Hong Kong	4	14	10	Germany	24	22	2
Indonesia	5	23	18	Norway	25	39	14
Netherlands	6	9	3	C. Rica	26	51	25
Thailand	7	17	10	Japan	27	6	21
Korea	8	18	11	Israel	28	20	8
Taiwan	9	10	1	Czech Rep	29	27	2
Egypt	10	24	14	Philippines	30	19	11
UK	11	32	21	France	31	30	1
N. Zealand	12	26	14	Argentina	32	43	11
Hungary	13	25	12	USA	33	37	4
Belgium	14	31	17	Brazil	34	13	21
Sweden	15	46	31	Mexico	35	15	20
Switzerland	16	21	5	Peru	36	49	13
Austria	17	34	17	Poland	37	44	7
Ecuador	18	59	41	South Africa	38	12	26
Canada	19	11	8	Italy	39	33	6
Spain	20	7	13	Zimbabwe	40	41	1

Sources: Data for royalties are for the latest available year (generally 1998) from the International Monetary Fund and national sources. WEF ranks are for 1999, taken from Table 7.08 of the 2000 report ("Licensing of foreign technology is a common means to acquire new technology").

[a] "Royalties" refers to payments overseas for royalties and technical fees as a percentage of GNP in the relevant year. The ranking by royalties excludes Jamaica, Kenya, Morocco, Madagascar, Panama, Honduras and Slovenia from the top 40 countries since these are not covered by the WEF survey.

paid abroad as a percentage of GDP with WEF ranks on the question "licensing of foreign technology is a common means to acquire new technology." India ranks highest in the WEF report, while according to royalty data India ranks 57th (and so is not shown in the table, which only includes the leading 40 countries). Ireland has the highest technology payments per capita but is ranked 34th by WEF. No countries appear in the same position in the two rankings, while 34 countries (85% of the sample) have differences of three places or more.

Now take the clarity of questions. Many are vague and likely to be interpreted differently by individual respondents. For instance, the question about a country being a "world leader in technology" is very ambiguous. Which technology that of the respondent's own industry or in other industries, or even across all activities, including services? What does "world leader" mean: leader in market share by sales? In taking out patents? In bringing new products to market? Even given the industry, the technology for which products? Leader over how long? Or take the question on whether local "scientific institutions are world class." Which institutions are included and which ex-

cluded? Does the question refer to the average of all institutions, if there is a lot of variability in quality? How is "world class" judged? Or take the fourth question: what does it mean to be "aggressive in absorbing technology" buying the newest vintage or making efforts to build up local R&D? How is "aggressiveness" to be assessed for a country as a whole? We could go on, but the point is clear: the answers can vary enormously by respondent and context.

More important, answers may be misleading not just because the questions are ambiguous but also because respondents use different (implicit) benchmarks. Most respondents are local businesses, with different access to information, experience of technology and perspectives on international standards. Even if they are answering very clear and straightforward questions, their responses can reflect such contextual differences. For example, the 1999 WEF report ranks Mauritius ahead of Korea (at 29 and 30, respectively) in the quality of scientific research institutions. To someone who has examined industrial research institutions in both countries (Lall & Wignaraja, 1997; Najmabadi & Lall, 1995), this is patently absurd. Korean

R&D institutions are clearly far in advance of Mauritius, which has hardly any industry-related formal R&D outside of the university, which in turn does little research of industrial relevance. More interestingly, the WEF (2000) report switches the ranking around dramatically, ranking Korea 14 places ahead of Mauritius. How can structural rankings change so much in one year, unless the responses are intrinsically subjective and unreliable?

Finally, there are many repetitive and redundant questions, as the example of technology shows clearly. Respondents may try to differentiate their answers without really adding meaningful new information, with counterproductive results.

Thus, the subjective data that are at the core of the WEF index can be a very unreliable guide to the real world. The implications for the final rankings are, to say the least, disturbing. If the errors noted above are repeated over a large number of such questions, and the errors do not offset each other (there is no reason to believe that they do), the final effects may be highly distorting. It is not clear then what exactly is being compared across countries in the competitiveness indices, and whether it should form the basis of policy analysis and action. This does not mean that all qualitative survey information is equally unreliable. Business perception surveys *do* provide useful information when questions are carefully framed, subjective biases accounted for and the respondents share a common economic, business and information context. They are particularly helpful where the same respondents give their impressions of conditions over time. They can be misleading, however, if questions are worded confusingly and respondents are located in very different economic, social and cultural settings.

Despite all these methodological problems, WEF reports give an impression of precision and authority. The rankings serve as the basis for magisterial pronouncements on performance and policy. There is no hint of how slender and weak the base is. On the contrary, dubious statistical tests are used to convey an impression of rigor, backed by *kaizen* (continuous quality improvement) in the product. The indices may be of some use in comparing advanced countries, but they are of dubious value in ranking countries at vastly different levels of development. Yet this is how developing countries use them, and so why development economists should worry about them.

9. CONCLUSIONS

"National competitiveness" has taken a hold on the government and corporate imaginations, though professional economists tend to be skeptical of the concept and its applications. There are important issues at stake and the scepticism appears misplaced. Once market and institutional failures are admitted, there is a legitimate role for competitiveness analysis and strategy. Economics is concerned with most issues related to competitiveness investment, skills, innovation, clusters, information, competition policy and so on but does not integrate them under the generic label of "competitiveness." There is however no reason why such integration should not take place if the theoretical foundations are clearly understood and the concept applied to economic conflict among nations.

Economists are also skeptical of attempts to quantify competitiveness. Here the skepticism seems more justified, though there is a strong case for constructing indices that reliably and objectively benchmark national performance. While many institutions make such indices, the task is more difficult than may appear. Our examination of the WEF index shows that it suffers from several analytical, methodological and quantitative weaknesses. Moreover, its presentation conceals these weaknesses, giving a misleading impression of precision, robustness and sophistication. While the *Global Competitiveness Report* is well written and contains useful material, its competitiveness indices do not merit the attention they attract and the policy concern and debate they generate.

At the general level, the WEF index has two problems. The first is its underlying assumption that markets are efficient and that policy intervention, where necessary, must be "market friendly." This removes from consideration a large, important set of issues, particularly in developing countries, where market failures call for selective responses. The assumption of efficient markets also goes against its stress on innovation, which is prone to many market failures. The second is that its broad definition of "competitiveness" diverts it from its legitimate focus on direct competition between countries, taking it into areas where competitiveness analysis is both unwarranted and has little analytical advantage. While its attempt to analyze growth differently from economics is promising, its methodology and procedures fail

to live up to this promise. The transposition of concepts from business strategy to the national level does not work well: the result, in the end, looks fuzzy and confused.

WEF then has problems with the model specification, the choice of variables, the identification of causal relations and the use of data. ''Current competitiveness,'' which should be explained by stock variables, is measured almost wholly by flow (or rather, perceptions of flow) variables. Causal relations between independent and explanatory variables are confused or theoretically unwarranted. Many nonlinear or controversial relationships are left unexplored. The plethora of explanatory (often repetitive) variables does not add to the explanatory power of the index. The use of econometrics to demonstrate the statistical power of the analysis and to derive detailed conclusions may be misleading. The empirical base is too weak and fragile to support such exercises.

The strong point of WEF analysis is its emphasis on the micro-economy as the vital determinant of competitive performance. WEF is correct that getting the macroeconomic situation right, while necessary, cannot by itself lead to sustained growth in countries with serious structural deficiencies. Its critique of the IMF-style reforms as the full solution to growth problems is well founded, though hardly original. Many development economists have argued that the economic structure has to be changed and improved, and that the classic Washington consensus is inadequate to this task. Many have also argued that there is a large and positive role for government in doing this by improving markets, remedying market failures and strengthening institutions. How interventionist the government should be remains controversial, but it is wrong to assume, as the WEF apparently does, that the case against targeted policies is firmly established. The weaknesses of its approach are epitomized by its trite conclusion on how least

developed countries can cope with globalization.

The qualitative data used to generate the indices, held up as one of the reports' strengths by WEF, are of dubious provenance (how dubious is difficult to say). It is surprising that it chooses to rely on questionnaire responses for some items on which hard data are available. The extensive use of local executive responses, with many questions posed in an unclear manner, raises too many doubts to allow the data to be used to rank countries in the way WEF does. The impressive pyramid of rankings and policy conclusions reached by WEF rests ultimately on a small, inadequate and often suspect base. If they are useful at all, it is probably in tracing business perceptions over time within particular countries and, to a lesser extent, in comparing countries at similar levels of development. However, the use to which they are actually put is much broader   and the claims made for their scope and validity are much greater. This is unfortunate. There is clearly a strong felt need for benchmarking national competitive capabilities, and it is important that WEF improve its product and methodology.

Many of the deficiencies of the WEF report also appear to be present in the IMD, though it is less exposed to criticism on reliance on qualitative responses. There is clearly considerable scope for other benchmarking exercises (though they may find it difficult to establish a competitive edge given the brand advantage established by the two institutions). 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 pulling 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.

NOTES

1. Reinert (1995) argues that competitiveness in a broader sense has occupied policy makers in the currently industrialized countries for centuries. The terminology used was however different. Early concerns were with ''national wealth,'' ''good trade'' (exporting manufactures and importing primary products), and

''productive power.'' Most sought to promote manufacturing.

2. For instance, see the third and fourth official reports on UK competitiveness (UK Cabinet Office, 1996 and DTI, 1998, respectively) and the recently published

Competitiveness Indicators (DTI, 2001). In the United States, a great deal of work on competitiveness is conducted at the state or district levels, but there are many studies at the national level, such as the US Department of Commerce (1994) and Dertouzos, Lester, and Solow (1990). There are in addition myriad unpublished reports in all industrial countries. At the international level, studies are undertaken by the European Commission (some references are given in the bibliography), the OECD and regional groupings.

3. Both institutions are based in Switzerland and used to jointly publish a competitiveness index in the World Competitiveness Report. They split up on 1996 and since then have produced separate indices (for a description of their approaches at the time, see The Economist, 1996). Their main findings are on the Internet at http://www.weforum.org (for WEF) and at http://www.imd.ch/wcy/wcy.cfm (for IMD). After the separation, WEF places greater reliance on qualitative data (about two thirds of data are based on qualitative responses and one third on "hard" information), while for IMD the proportions are reversed. WEF sells its report at normal academic prices while the IMD charges very high prices, presumably aiming at companies and institutions (this is the reason why we could not analyze the IMD report in detail).

4. Fagerberg (1996) suggests that blaming foreigners is a US (or large economy) rather than a European phenomenon. "Although the tendency to blame foreigners for one's own failures may be universal, it has never been a real option for smaller economies. The reason is simple; if one depends on export markets for a large share of what one produces, the last thing one would do would be to give other governments an incentive to impose import restrictions... If there is an obsession here, it is not with competitiveness *per se*, but with trade policy/protectionist politics" (p. 40).

5. Boltho (1996) considers a number of relative cost measures in use and concludes that the most common one is relative unit cost of labor in the manufacturing sector expressed in a common currency.

6. Its usefulness is revealed, for instance, in the regular publication by *The Financial Times* under the heading of "competitiveness" of data on relative real exchange rate and wage movements in major OECD countries.

7. Under the Heckscher Ohlin model each country by assumption has access to the same technology and cannot be more or less efficient than another. Under the Ricardian model, technologies can differ across countries (for reasons inherent to the "state of nature");

however, even in this model, a country that is more efficient than another in all activities benefits from trade as long as relative factor prices differ. No competitiveness strategy is thus called for under Ricardian assumptions either.

8. There is now a long tradition of analyzing noncompetitive market structures under strategic trade theory, and Krugman is one of the founders of this tradition. See, for instance, Krugman (1979).

9. See, for instance, Lall (1995, 1996), Pack and Westphal (1986) and Stiglitz (1996).

10. On multiple equilibria and the possibility of low level growth "traps," see Stokey (1991) and Redding (1999).

11. This assumes that static advantages (based on existing factor endowments) are already fully realized. This is often not the case, as when inefficient policies stop firms from competing internationally. For instance, entry into export markets may be held back by the enforced use of high cost local inputs, export taxes, uneconomically high wages, restrictions on foreign entry or high business costs (of entry, exit, expansion). The appropriate competitiveness strategy here is relatively straightforward to reduce harmful interventions and allow market incentives to work.

12. See, for instance, Chang (1994), Lall (1994, 1996), Pack and Westphal (1986), Stiglitz (1996), Wade (1990) and World Bank (1993). For a review of the historic arguments for selective government interventions, including those debated intensively in the United States, see Reinert (1995).

13. This suggests that good competitiveness analysis must have, as an intrinsic part, a consideration of how government abilities to design and mount strategy can be improved and policy makers induced to learn effectively (Lall & Teubal, 1998).

14. Stein (2000) makes a similar point about the Krugman critique and takes the analysis from static comparative advantage into dynamic issues of "sustainable developmental competitiveness."

15. The evidence suggests that in sub Saharan Africa (excluding South Africa and Mauritius) rapid liberalization has led to massive destruction of industrial capacity because the conditions needed for technological upgrading were not laid down (Lall, 1999). Exposure to direct international competition then resulted not in

enhanced competitiveness but in closure: the surviving activities are largely in resource based or other activities that enjoy continued or natural protection (Stein, 1993). At the same time, in countries, such as in East Asia, managed their macro economy well but combined this with carefully targeted measures to build competitive capabilities, the result has been sustained growth (Lall, 1996; Westphal, forthcoming).

16. IMD is more straightforward in its free market ideology and simplistic in its reasoning. We can illustrate with some quotations from its "Principles of World Competitiveness" on its website. "Openness for interna tional economic activities increases a country's economic performance... International investment allocates eco nomic resources more efficiently worldwide... The state intervention on business activities should be minimized apart from creating competitive conditions for enter prises... A well developed internationally integrated financial sector in a country supports its international competitiveness." IMD does not express the caveats of WEF when discussing the merits of free markets in the context of liberalization or globalization.

17. Westphal notes in private communication that countries such as Hong Kong and Singapore deliberately used subsidized housing and low land costs for industrial facilities to promote competitiveness.

18. This broad definition is fairly widespread. See, for instance, the Commission of the European Communi ties, 1993. But the EC emphasizes employment in its definition: competitiveness is the ability to maintain high rates of economic growth and productivity together with sustained employment.

19. Let me illustrate for manufacturing industry, with the method I am using to calculate an national industrial performance index for UNIDU (2001). World Industrial Development Report 2001. The base indicator is simply manufacturing value added in each countries, deflated to account for size (we use population). MVA does not, however, show how competitive industry is. A significant part of production may not enter international compe tition. There are nontradable segments in every country; these can vary by the size of the country, its level of development and its trade policies (smaller, more devel oped and more open economies would have small nontradable segments). Since it is almost impossible to quantify this, we have to find a proxy for competitive manufacturing. The easiest measure is manufactured exports (again per capita); this then becomes the second component of the performance index. This joint index does not take technological differences between manu facturing activities into account. It is reasonable to assume that different activities, with different levels of technical change and complexity, have varying implica tions for competitiveness and sustained growth. Techni cally advanced activities enjoy faster growth, offer greater scope for productivity increase and learning and generally have greater spillover benefits (Lall, 2000). Thus, we add two more elements to the index: the share of sophisticated (medium and high technology) products in industrial production and exports. An average of these four elements yields an index that captures different aspects of industrial performance in a given year. Using the latest trade and production data yields the following 10 leaders (in descending order) for 1998: Singapore, Switzerland, Japan, Ireland, Germany, Ja pan, United States, Sweden, Finland and France. The bottom five economies (in ascending order) are Ethiopia, Ghana, Yemen, Uganda and Central African Republic.

20. It also introduces a new subindex, the *Economic Creativity Index* (ECI), to feed into GCI; as this is of special interest, it is taken up in a separate subsection.

21. Porter (2000).

22. Porter, Sachs, and Warner (2000, p. 14).

23. I am grateful to Chris Rodrigo for this point.

24. In a perceptive review of Porter's book, Grant (1991) concludes that its findings on competitiveness are derived "at the expense of precision and determinacy. Lack of precision is apparent in the woolly definitions of some key concepts in the book and in the specification of relationships between them... Reliance upon broad but ill defined concepts such as the "upgrading of compet itive advantage" reflects a more general failure to perfectly reconcile micro level analysis of competitive advantage of firms and industries with macro level analysis of national development and prosperity... Por ter presumes the existence of some invisible hand whereby firms' pursuit of competitive advantage trans lates into increasing national productivity and prosper ity... Lack of precision is also apparent in the "national diamond" framework. At its most basic, the diamond is a taxonomy for classifying the various national influ ences on firm and industry competitiveness. Yet the categories overlap to such a degree that it is not clear that the various influences would not be better repre sented by a triangle or pentagon... Some corners of the diamond become so all embracing that the variables included and their relationship to national competitive advantage are widely diverse... Ambiguity over the signs of the relationships, the complexity of interactions, and dual causation renders the model unproductive in generating clear predictions. Porter's prescriptions in

the form of "national agendas" are symptomatic of this predictive weakness. The chapter establishes imperatives for each country, most of which relate to the removal of impediments to the process of upgrading. But there is little prediction of how each country's industry pattern of comparative advantage is likely to evolve in terms of the industry clusters which will prosper, which will lose out to international competition, and what the implica tions of structural change and differential rates of upgrading will be for national rates of economic growth" (pp. 541 543).

25.   For a useful review, see Pietrobelli (1997).

26.   These are activities intensive in technological (R&D) effort. The US National Science Foundation shows that high technology activities are growing significantly faster than others both in trade and production across the world (NSF, 1999). This suggests a systematic tendency for R&D based industries to produce new advantages. Similarly, a study of manu factured trade patterns shows that technology intensive exports are consistently growing faster than others (Lall, 2000). On the strategic implications (from the corporate perspective) of this, see Grant (1998).

27.   To quote Porter on this: "To become more competitive, companies must widen their capabilities in other activities such as marketing, logistics and service. To achieve more advanced development, firms must become more strategic. Greater focus, continuity and discipline are needed if firms are to gain a real competitive advantage... Only through sustained strat egies can companies assemble the truly unique skills, build the unique customer franchises, and operate at a level of productivity and innovation necessary to support high wages and profits... Successful economic development is a process of successive upgrading, in which the business environment in a nation evolves to support and encourage increasingly sophisticated and productive ways of competing" (WEF, 1999, pp. 41 42).

28.   Warner (2000).

29.   See Porter and Stern (2000) and on the Internet at http://www.compete.org. A more detailed exposition is given in Stern and Furman (2000).

30.   The regression analysis used panel data with a three year time lag. Interestingly, and unlike the WEF procedure, the results of the regression (from a "pre ferred model" including per capita income) were used to assign weights to variables according to their impact on the dependent.

31.   For instance, take import protection, on which there as been considerable debate in terms of its effects on industrial development and competitiveness. As noted, WEF adopts the position that free trade is best for growth while many analysts, argue that carefully designed infant industry protection can boost growth and has done so in East Asia. Suppose now that a regression of trade openness shows that rich countries are more open than poor ones. Does this prove that WEF is right? The answer is "no," since the need for protection falls as infant industries mature and market failures diminish with development: richer countries need less protection than poor ones. The regression shows nothing about the case for protection at lower levels of income, either in countries that are poor today or in those that are rich but used protection earlier to build industrial capabilities. Static regression analysis cannot, in other words, show causal relations that evolve over time.

32.   The questions are now on the Internet at http://www.cid.harvard.edu/gcr/survey.htm

33.   This preference may be due to the fact that WEF regards its Executive Opinion Surveys as providing superior information to published quantitative data. It certainly makes much of these surveys, calling them a "truly unique set of data" (WEF, 2000, p. 7).

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