ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA

METHODOLOGY FOR THE ASSESSMENT OF COMPETITIVENESS OF SELECTED EXISTING INDUSTRIES

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Preface

Various approaches have been advanced in industrialized countries, and in some developing countries, to assess the competitiveness and performance of the manufacturing sector and evaluating its competitiveness. Knowledge about the use of these methodologies is not, as yet, common in countries of the ESCWA region, thus it is felt that there is a need to increase awareness and promote the use of these methodologies in, the region as well as to review the case studies where some methodology has been used to assess the competitiveness and performance of the industrial sector in ay one country in the region.

This study has been commissioned to qualified ESCWA consultants. It consists of two parts. The first theoretical part, undertaken by Mr. Nicolas Vonortas and his assistant, Robin Auger, consists of a technical review of major methodologies used to assess the performance and competitiveness of selected industries in industrialized countries.

The second part is a review of the attempts made in the countries of the region—Jordan and Lebanon- to use the cluster methodology to assess the performance of selected industrial branches. This part was undertaken by Mr. Riad Al-Khouri.

The Study ends with a few conclusions and recommendations relevant to the manufacturing sector in the region.

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INTRODUCTION

The economic performance and international competitiveness of manufacturing industries has been a central concern of policy decision-makers interested in economic growth and development (Tassey, 2001). Economists have tried for a long time to understand the conditions that allow countries to reach a critical minimum mass of capabilities and embark on a long, sustained journey to economic growth and development (Abramovitz, 1986, 1994; Baumol et al., 1994; Freeman and Soete, 1997; Rostow, 1990). They have also been very much concerned in the past few decades with understanding the processes that allow countries to restructure and upgrade their economies in order to retain and enhance their international competitiveness in the face of increasing international competition (Chesnais, 1986; Nelson, 1994, 1995; Nelson and Wright; 1992; Porter, 1990; Romer, 1990; Rosegger, 1996).

The success of this endeavor has critically depended on the ability to:

(a) Benchmark past and current performance and international competitiveness of individual sectors;
(b) Assess the prospects of individual sectors for future growth and decline.

This study reviews major methodologies used for the assessment of performance in the manufacturing sector. It has two parts. The first adopts the competitiveness concept to provide a broader scheme for appraising past performance and future prospects of a sector. Reviewed indicators include the well developed economic productivity methodology plus a wide assortment of other metrics applied at the sectoral level. The competitiveness approach places emphasis on international comparisons as is appropriate in an increasingly interdependent, globalizing economic environment. The second part of the study focuses on the cluster approach to assessing the performance and future prospects of industries in specific countries/regions. The popularity of the cluster approach has been boosted during the past decade due to its geographical dimension, a natural interest of policy decision-makers in increasingly "porous" economies. The study closes with implications for ESCWA member countries.

PART ONE
THEORETICAL ANALYSIS:
METHODOLOGY FOR THE ASSESSMENT OF PERFORMANCE OF SELECTED EXISTING INDUSTRIES

I. INDUSTRY COMPETITIVENESS

Economic competitiveness has become a central concern of decision-makers around the world. While competitiveness has always been the core interest of business firms, during the past 2-3 decades the term has been increasingly used in conjunction with the economic performance of whole industries or countries. It has also been closely associated to globalization. Globalization—the increasingly expansive and more complex process of internationalization associated with ever larger amounts of cross-border trade, investment, capital flows, technology transfers, human mobility, and competition—has heightened the interest of analysts and policy makers in the international competitiveness of firms, industries, or countries.

Upgrading the competitiveness concept from the firm to the industry and to the country and underlining the importance of its international dimension has not been uncontroversial. Critics have stressed that concerns about competitiveness at the national level are, as an empirical matter, almost completely unfounded and dangerous as (a) they divert attention from the traditional and much more precisely defined economic concept of productivity and (b) skew policies and threaten the international economic system (Krugman, 1994). Proponents counter that nothing can be further from the truth. They argue that the discussion on international competitiveness pays attention not only to trade but equally to investment, technology, and human resources which together constitute the building block of productivity. Far from dismissing the importance of productivity, competitiveness emphasizes it and illuminates the means to achieve it (Burton, 1994; Preeg, 1994). Similar disagreements extend to the industry level.

Productivity is a much better defined concept than competitiveness, with fairly concrete theoretical support of the utilized indicators (OECD, 1996a, 1996b, 1996c). It is also a much narrower concept. On the whole, the advantage of using the broader (competitiveness) approach to appraise industry performance is the combination of various types of indicators that allows to illustrate not only past performance but also future prospects of a sector. The limitation of this approach is the lack of strong theoretical guidance concerning the delineation of the most appropriate metrics that should be used to determine the international competitiveness of the section of an industry located within the geographical boundaries of a country or region.

This study adopts the broader (competitiveness) approach. While productivity receives significant attention, we also discuss several other indicators of industry performance. Before getting to the indicators, however, we must place a little more structure to the concept of competitiveness.

A. DEFINING COMPETITIVENESS

In the mid-1980s, the US President's Commission on Industrial Competitiveness issued its report providing a definition of competitiveness that has since been the foundation of almost any other.

> "A nation's competitiveness is the degree to which it can, under free and fair market conditions, produce goods and services that meet the test of international markets while simultaneously expanding the real incomes of its citizens.
>
> Competitiveness at the national level is based on superior productivity performance and the economy's ability to shift output to high productivity activities which in turn can generate high levels of real wages.
>
> Competitiveness is associated with rising standards [of living], expanding employment opportunities, and the ability of a nation to maintain its international obligations. It is not just a measure of the nation's ability to sell abroad, and to maintain a trade equilibrium." (PCIC, 1985, p. 1).

The importance of maintaining relative performance, increasing productivity and strengthening of the underlying factors, and raising structural flexibility permeate the definition. More specifically, the important ideas directly linked to our subject matter are as follows:

(a) Competitiveness relates to the ability to produce and compete internationally;

(b) Competitiveness is about both goods and services;

(c) Productivity is at the heart of competitiveness;

(d) Ability for structural adjustment to changing conditions (competition, technology) and ability to upgrade to higher value-added economic activities is also at the heart of competitiveness;

(e) International trade performance does not say much on its own and may actually be misleading in judging competitiveness.

Only one year later, another very important article on competitiveness pushed the envelope further (Chesnais, 1986). According to Chesnais, the international competitiveness of national economies is built on the competitiveness of firms which operate within national borders. To a large extent, then, it is an expression of the dynamism of domestic firms (reflecting management practice) and their capacity to invest and to innovate both as a consequence of their own R&D and of successful appropriation of technologies developed elsewhere. However, international competitiveness also, and increasingly, depends on "structural factors" such as the flexible and proficient productive structure of the national economy's industries, the rate and pattern of capital investment, its technical infrastructure and other factors determining the "externalities" on which firms can build. The externalities refer to economic, social and institutional frameworks and phenomena which can substantially stimulate or hamper both the productive and competitive thrust of domestic firms. Hence one needs to think broader according to Chesnais, leading to the concept of "structural competitiveness".

The important ideas for our purpose include:

(a) Firms are the foundation of competitiveness;

(b) A forward look to what the firms can do in the future through investment, innovation and so forth is very much part of the competitiveness story;

(c) The structural factors determining the "externalities" on which firms build, including economic, social and institutional frameworks and phenomena deserve very much attention with regards to industry competitiveness.

B. COMPETITIVENESS INDICATORS

The discussion in the previous section strongly indicated that the productivity of firms populating a particular sector largely defines the sector's performance. It also indicated that the ultimate judge of performance is the market, especially the international market where products and services compete for a share of the domestic and foreign markets. If one, then, had to select the most basic indicators of industry performance, one should choose productivity and market shares.[1]

The discussion in the previous section also indicated the necessity to understand the more general socio-economic fundamentals affecting firm actions. Hence, the first line of indicators of industry performance should be complemented with a second line of indicators that deal with the factors determining the socio-economic environment such as:

(a) Relative prices;
(b) Unit labor costs (relative to labor quality (productivity));
(c) Capital costs;
(d) Rate of investment;
(e) Foreign direct investment/portfolio investment;
(f) Rate of exposure to foreign competition.

[1] A third front-line indicator, profitability (profit rates), could be used mainly as a check for market share results—firms can always raise their market share in the short term by dropping their prices below marginal cost.

Finally, the discussion in the previous section indicated that the competitiveness of a sector is a dynamic concept that takes very much into account the ability of firms to react to changing economic/technological conditions, restructure and upgrade. A third line of performance indicators take a more dynamic approach by considering industry evolution and changing company capabilities. Such indicators may, for example, include those related to:

(a) The dynamics of competition in an industry such as:

(i) Firm entry and exit;
(ii) The rise and fall of incumbents;
(iii) Patterns of large- and small-firm mobility;
(iv) Measures of market structure and intensity of competition.

(b) The innovatory capability of firms in an industry such as:

(i) The rate of introduction of new products and production processes;
(ii) Upgrade of the product mix;
(iii) Upgrade of the quality of the factors of production;
(iv) Technology output (patents, licenses, etc.);
(v) Technology imports and exports;
(vi) R&D expenditures/intensity.

(c) The participation of domestic producers in regional, national, and international production and innovation partnership networks.

The problem with the above lists of indicators is, of course, their ad hoc nature. While that fact has not stopped analysts piling up empirical results on the basis of whatever data becomes available, the issue is more serious than commonly understood. Strictly speaking, the lack of coherent theory—to choose important variables and determine cause and effect—makes interpretation difficult.

The task is enormous. It actually transcends the ability of economists to go-it-alone and requires inter-disciplinary solutions. Nonetheless, there have been attempts to construct consistent analytical frameworks that will be able to both benchmark industrial performance ex post and ponder the development of industrial capabilities ex ante. A well known approach is reflected in the work of Michael Porter (1990) underlying his notion of competitive advantage vis a vis the staple economic concept of comparative advantage. The difference between the two is that, while comparative advantage is a timeless concept reflecting relative factor endowments, competitive advantage has change and a time element built into it. Competitive advantage can be created, and improved or lost. Porter's "diamond" postulates the primary importance of four sets of conditions that allow a nation to create and sustain competitive advantage in a specific industry: (a) factor conditions, (b) demand conditions; (c) firm strategy, structure, and rivalry; and (d) related and supporting industries' conditions.[2]

Needless to say, Porter's work does not stand in a vacuum. There is a long tradition of work at the industry level by economists, business analysts, economic historians, and policy makers. This work naturally relates to the interpretation of indicators. But it is dispersed and at a fairly experimental stage to be meaningfully represented here (see annex I).

The remaining of this first part of the paper will deal in more detail with the first line indicators. Important serial publications by the US National Science Foundation (NSB, 2000), the European Commission (EU, 1997), the Organization for Economic Cooperation and Development (OECD, 2000), the World Bank (2001), and the United Nations (UNCTAD, 2000), as well as occasional publications of these and other organizations, discuss many of the second and third line indicators.

[2] An offshoot is Porter's (1998) concept of clusters with which we will deal in the second part of the study.

1. *Productivity*

A necessary step in the appraisal of the performance of firms, industries and economies is the measurement of productivity levels and trends. The widespread use of productivity measures and their use for benchmarking purposes, frequently internationally, have naturally created considerable debate on the concepts of productivity measurement and on data requirements and constraints. Important issues associated with productivity measurement include the following (OECD, 1996a, 1996b, 1996c):

(a) *The choice between partial (e.g., labor) and total factor (multifactor) productivity measures*

Labor productivity indexes relate the change in output to the change in the labor input utilized in producing that output. Multifactor (total factor) productivity indexes relate the change in output to the change in the combination of capital, labor, and intermediate inputs utilized in producing that output. The incorporation of a measure of combined inputs in multifactor productivity eliminates the influence of substitution of capital and intermediate inputs for labor, thus taking away a major limitation that affects measures of labor productivity. On the other hand, it increases data requirements and raises complications of data availability and comparability. The basic choice between labor productivity and total factor productivity measures is, then, typically a trade-off between measurability (which favors the former) and theoretical appropriateness (which favors the latter).

(b) *The quality adjustment of price indexes*

Neglecting the quality adjustment of deflators in sectors that experience rapid technological change may lead to very significant effects on measures of inter-industry productivity. The issue of quality-adjusted price indexes was largely initiated by the case of computers and other electronics which the last few decades have experience very significant jumps in performance paralleled by rapid decreases in price. A good number of "hedonic" estimates have been developed to construct performance-related computer prices. These estimates have been produced on the basis of methods involving the use of regression analysis to estimate a hedonic function such as $p = f(X_1,X_2,\ldots,X_n)$ where observed price p is related to quantities of associated characteristics X. This approach permits the separation of price changes induced by quality changes from residual price changes unexplained by shifts in characteristics.

The experience has been that hedonic price indexes have varied dramatically from their traditional counterparts. In addition, (a) maintaining hedonic price indexes has proven to be expensive and (b) only some of those countries that have developed such indexes have incorporated them in their national accounts. Moreover, we now understand that limiting quality adjustments to outputs is not sufficient and may again lead to miscalculation and erroneous attribution; inputs need equal consideration.

(c) *Output measure choice*

The choice of the appropriate measure for output has attracted a lot of attention. Choices include gross output, gross output adjusted for intraindustry flows, value-added, and physical measures. Issues of aggregation over products or industries have also been important, as the better approaches increase data quality requirements. A related topic involves the reduction of base-year biases of index numbers in the measurement of real output.

(d) *The appropriate measurement of labor and capital inputs*

A basic problem here is the correct measurement of services from the capital stock to the production process. This has been the subject of a significant amount of literature which has tried to deal with the conceptual and measurement difficulties. For example, what is the correct definition of the stock of knowledge accumulated through R&D and other invention/innovation-related activities? Does this stock only accumulates in time or also depreciates and at what rate? (Griliches, 1995) Not very different is the issue of the treatment of quality changes in capital goods which carries over in the measurement problems of real output. Empirical conventions and best practices have been developed, as is shown in the next section, but they are always subject to improvement.

(e) *The international comparison of productivity levels*

A recurrent issue in inter-country comparison of productivity levels is the derivation of appropriate conversion factors for the comparison of figures of real output and productivity in a common currency. At the industry level, the appropriate conversion factors are relative output prices. These are not normally readily available from official statistics, obliging analysts to use exchange rates or conversion indexes based on expenditure-based purchasing power parities (EPPP) and the unit value ratio (UVR). This problem multiplies to the use of appropriate index numbers to ensure coherent aggregation over time, across space and between more than two countries.[3]

(f) *Productivity measurement in service industries*

Physical output is an attractive measure but it is not always feasible due to product variety and differences in quality. Especially in the service sector, physical productivity is a promising alternative to gross output and value added comparisons. Physical productivity needs a detailed comparison of the different functional activities in an industry, finely defined so that each can be claimed to produce a relatively homogeneous output. Physical productivity measures can be applied in industries such as telecommunications, airlines, or retail banking. For example, in telecommunications labor productivity can be defined as a weighted average of access line productivity and call (minutes) productivity.

Physical productivity measurement is also possible in manufacturing industries although the required degree of disaggregation usually increases. As a result of the need for fine breakdown into specific product categories, comparisons cannot usually be performed at the industry level, but rather at the company or product category level.

In light of this context, we proceed below with a brief summary of the approach of a specific national agency in estimating multifactor productivity. Their experience is hardly unique; a more in-depth expert analysis would be needed to juxtapose this approach to that of other similar agencies around the world.

Multifactor productivity at the Bureau of Labor Statistics (US)[4]

Multifactor (total factor) productivity indexes relate the change in output to the change in the combination of capital, labor, and intermediate inputs utilized in producing that output. Multifactor productivity is calculated as the ratio of a Tornqvist index of output over a Tornqvist index of combined inputs (annex II).

Output quantities are measured either with deflated values of production or with actual physical quantities.

Annual output indexes based on deflated production values. For manufacturing industries, value of shipments data are divided by price indexes for each five-digit (SIC) product class in the industry. The price indexes are mostly BLS Producer Price Indexes (PPI). Several adjustments are made after aggregation of the product class data to include the value of secondary products, exclude the value of primary products made in other industries, include the value of inventory change, and remove double-counting of intraindustry shipments (shipments between plants in the same industry).

Annual output indexes based on physical quantities of production. In all possible cases such indexes are a Tornqvist aggregation of quantities of component products.

The index of *combined inputs* is a Tornqvist aggregate of separate indexes of capital, labor, and intermediate inputs. The labor share weight is based on the total value of labor compensation including fringe benefits. The intermediate input share weight is based on the total value of materials, fuels, electricity,

[3] See Gersbach (1996) for a detailed discussion at the industry level.

[4] This section is based on BLS (2000), Duke and Usher (1998), and Gullickson (1995).

and purchased services. The capital share weight is a residual—value of net production minus the value of labor compensation and the value of intermediate inputs.

The measure of *capital input* is based on the flow of services from the stock of physical assets, including equipment, structures, land and inventories. Changes in the stocks of capital are assumed to be proportional to changes in capital services for each asset. Stocks of different kinds of capital assets are Tornqvist aggregated using estimated rental prices to construct the weights for each kind of asset.

The perpetual inventory method is used to calculate capital asset stocks (see annex III). This method takes into account the continual addition to the stock through investment and subtraction from the stock through retirement of old capital. Capital stocks are measured at the end of a year: they equal the weighted sum of all past investments, where the weights are the asset's efficiency relative to a new asset. A hyperbolic age-efficiency function is used to calculate the relative efficiency of an asset at different ages. It assumes a parameter of efficiency decline of 0.5 for equipment and 0.75 for structures. Such a function and parameters correspond to assets losing efficiency more slowly at earlier stages and rapidly at later stages of their life-cycle.

(1) $S_t = [L-t]/[L-(B)t]$

Where S_t = relative efficiency of t-year-old asset;
L = service life;
t = age of the asset;
B = parameter of efficiency decline.

Using industry-specific price deflators for each asset category, price change is removed from the investment data in order to calculate stocks. This way current-price investment is converted to constant-price investment. Detailed price indexes (PPIs) with weights based on the capital flow tables for the Bureau of Economic Analysis (BEA) of the Department of Commerce are used to construct industry-specific price deflators for each asset category (24 categories of *equipment* and 2 categories of *structures*). Service lives are taken for each asset used in the 2-digit SIC multifactor measures prepared by BLS.

Current-price values of *inventory* stocks are calculated for three categories of manufacturers' inventories: finished goods, work in progress, and materials and supplies. The average of the end-of-the-year stocks in years t and t-1 represents the average used during the year as a whole. Inventory values for finished goods and work in progress are deflated with an industry output implicit price deflator. Inventory values for materials and supplies are deflated with a deflator structured with combined price indexes weighted on the basis of detailed consumed materials. *Land* stocks are estimated as a function of the movement in constant-price gross structures stocks for the given industry.

Finally, the various equipment, structure, inventory, and land stock series in constant prices are aggregated into one capital stock measure, using implicit rental prices to construct the weights. The rental prices for each asset are calculated as follows:

(2) $RP = [(P \times R) + (P \times D)-(P_t - P_{t-1})] \times (1 - uz - k)/(1 - u)$

Where RP = rental price;
P = deflator for the asset;
R = internal rate of return;
D = rate of depreciation of the asset;
$P_t - P_{t-1}$ = capital gain for the asset (average of the current and two preceding years' price change);
$(1 - uz - k)/(1 - u)$ = taxation effect;
u = corporate tax rate;
z = present value of a monetary unit of depreciation deductions;
k = effective investment tax credit rate.

Each rental price is calculated by its constant-price capital stock to obtain current-price capital costs. These are then converted to value shares for Tornqvist aggregation.

The indexes of *labor input* are calculated by dividing the aggregate employee hours per year by the base-period aggregate. Employee hours are treated as homogeneous and additive, clearly a limitation but a necessary one due to data inadequacies. The aggregate hours for production workers and the estimated hours for nonproduction workers are summed up to calculate the annual hours of all employees. Data on employment and hours are based on BLS surveys.

The index of *intermediate input* purchases is constructed as a Tornqvist aggregate of separate indexes of change in the quantity of materials, services, fuels, and electricity consumed by an industry. Annual current-price values of total consumed *materials* for each industry are obtained from the US Census Bureau's Annual Surveys of Manufactures and Censuses of Manufactures (run every five years). Whenever possible, intraindustry purchases of materials are subtracted from the gross measure of materials costs to obtain estimates of "net" materials consumed. Constant-price net materials consumed by each industry are calculated by dividing the current-price values by an industry-specific materials price deflator (based on detailed producer price indexes). Current-price *services* purchased by each industry are estimated based on proportions from the Bureau of Economic Analysis' benchmark input/output tables. Due to the lack of historical data on service price indexes, the aggregate fixed-weight materials deflator is used for services as well. Annual data for the total value of *fuels* consumed by an industry are also obtained from the Annual Surveys of Manufactures and the Censuses of Manufactures. They are deflated with industry-specific price deflators. Finally, direct quantity data are available for *electricity*.

A final observation concerns a strand of recent literature that was not mentioned above. During the past decade, there has been a dramatic increase in productivity studies that use longitudinal micro-level data sets which follow large numbers of establishments or firms over time. The popularity of this research has depended very much on the increased availability of micro-level data, particularly the Longitudinal Research Database of US manufacturing plants developed by the US Bureau of the Census. We have not expanded on it because developing countries lack data at such detail. A recent good survey of this emerging literature hs been carried out by Bartelsman and Doms (2000).

2. *Market shares*[5]

International market shares

One of the basic metrics used by firms to gauge their competitiveness is market share. Since firms are the foundation of national competitiveness, the same metric aggregated to the industry level is frequently used as an indicator of the capacity of firms operating within the boundaries of a nation to win new markets. At this level, one needs to examine foreign market shares (export market shares) and domestic market share (import penetration).

Export share ES_{ij} for country i and product j is defined as the share of exports X_{ij} of product j by firms in country i in relation to world exports of this product.

(3) $ES_{ij} = 100\ X_{ij} / \sum_i X_{ij}$

The rate of import penetration MS_{ij} for country i and product j corresponds to the share of domestic demand Dij which is met by imports M_{ij}.

(4) $MS_{ij} = 100\ M_{ij} / D_{ij}$

[5] This section draws primarily on Hatzichronoglou (1996).

Exports have provided the traditional way for accessing foreign markets. However, increasing globalization has meant that foreign markets can also be—and increasingly are—accessed through foreign direct investment and modes of technology transfer. While these different forms of globalization are interdependent, the relationship is no always clear. For example, foreign direct investment can both substitute for exports and complement exports. Similarly, foreign direct investment can substitute for imports or generate increased import flows due to intra-firm trade. Foreign direct investment is linked to technology transfer (patents, licenses, know-how). Foreign direct investment can be both a sign of strength and a sign of weakness. It is a sign of strength when it is related to efforts by domestic firms to exploit their competitive advantage abroad, including new products, technologies, and other intangible competence such as efficiencies in marketing, distribution, finance. Foreign direct investment is a sign of weakness when it is prompted by increasing domestic costs, better opportunities for accessing technologies abroad, and so forth. Offshore production can replace exports and even turn exports into import flows back to the country of origin.

A number of indicators of foreign direct investment can be used as indicators of market gains, including:

(a) FDI flows abroad;
(b) FDI stocks;
(c) Turnover (or production) of foreign subsidiaries;
(d) Realized profits abroad.

Several factors influence market shares and should be taken into account when interpreting market share indicators:

(a) Changes in a country's specialization can impact market shares in the concerned sectors – gradual withdrawal from one sector and increased entry into another will have consequent changes in market shares.

(b) Difficult economic conditions in traditional export markets can also affect market shares without any change in the competitiveness of domestic industries;

(c) Differences in growth rates between domestic and foreign markets also has implications for market shares. For example, increases in domestic demand is often matched by an increase in imports. If the impact on competitiveness of differing rates of growth of domestic and foreign demand is to be measured accurately, the difference must be calculated between the gains made by domestic producers on the domestic market as a result of the extra demand and the gains that would have been available by satisfying foreign demand under normal circumstances. In the opposite case of slower relative growth in domestic demand, the rate of import penetration may fall while the rate of export market shares may increase without any change in the competitiveness of the affected industry;

(d) Changes in the exports from one region to some destination will affect the exports of other regions to that destination without necessarily any change in competitiveness;

(e) Exchange rate movements can influence market shares and the way they are interpreted.

Given these observations, it has been proposed that a more comprehensive evaluation of import penetration is needed. Such an evaluation must take into account both imports and the output of foreign affiliates, resulting in a measure of "effective" import penetration (compared to the measure of apparent import penetration in (4)). The traditional measure of apparent import penetration is $P_A = M / D$ where $D = Y - X - M$ and Y, X and M denote a country's manufacturing output, exports and imports, respectively. If Y_d and Y_f stand for the output of domestic and foreign enterprises respectively and X_d and X_f stand for domestic and foreign exports, effective import penetration P_E of the domestic market by foreign industries may be represented by:

(5) $P_E = (Y_f - X_f + M) / D$

This measure of effective import penetration double-counts the part of foreign affiliates' production realized from imports that is already included in imports. If available, foreign affiliate imports should be subtracted. Similarly for the import content of foreign affiliate exports.

Care should be exercised in interpreting the apparent and effective import penetration rates. A low level of import penetration may be indicative of high productivity, lower domestic price levels, or barriers to entry. A high level of import penetration may be indicative of better integration in the world economy, rapid growth of domestic demand, or substantial depreciation of supplier country currencies. In addition, country size is also important. Smaller countries tend to have relative higher rates of import penetration due to their inability to specialize in many sectors, thus becoming dependent on imports.

Over the long term, industry competitiveness problems may be indicated by import penetration levels rising faster than domestic demand without being accompanied by equivalent gains in export markets.

Export-import ratios

Trade balance—exports minus imports (X-M) – is probably the most frequently used indicator of industrial competitiveness. Another complementary indicator of competitiveness is export-import ratio (X/M), calculated as follows. The export market share by volume of country i for product j (EMS^v_{ij}) is:

(6) $EMS^v_{ij} = [X_{ij} / P^x_{ij}] / D_{wj}$

Where X_{ij} = exports of product j by country i;
P^x_{ij} = export prices of product j by country i;
D_{wj} = world demand by volume for product j.

The import penetration rate (MP^v_{ij}) of product j by country i is:

(7) $MP^v_{ij} = [M_{ij} / P^m_{ij}] / D_{ij}$

Where M_{ij} = imports of product j by country i;
P^m_{ij} = import prices of product j by country i;
D_{ij} = domestic demand by volume of product j by country i.

Then, the export/import ratio EM_{ij} will be:

(8) $EM_{ij} = X_{ij} / M_{ij} = [EMS^v_{ij} / MP^v_{ij}] [P^m_{ij} / P^x_{ij}] [D_{wj} / D_{ij}]$

The factors that come into play in the case of trade balances and export/import ratios are those affecting export market shares and import penetration, including improvement in structural competitiveness and/or relative prices, cyclical lags, terms of trade, etc.

Exposure to international competition

This is an indicator of market openness and competition. It rests on the assumption that the exported share of production is fully exposed to international competition whereas the share sold domestically is exposed to international competition to the same extent as the import penetration of the market.

It is constructed as follows. Starting again from the identity Y + M = D + X, the rate of exposure to international competition (Exp) is:

(9) $Exp = X/Y + (1 - X/Y)\, M/D = ER + (1 – ER)\, MP$

Where ER = X/Y is the export ratio and MP = M/D is the rate of import penetration.[6]

[6] It can be easily shown that the export/import ratio X/M = [1/MP – 1] / [1/ER – 1].

International data with the constituent parts of this indicator show that: (a) import penetration has increased the past couple of decades for most countries; (b) small countries are exposed to international competition more than larger ones; (c) some countries are more exposed on foreign markets than on the domestic market; (d) some countries are more exposed on the domestic market than on foreign markets.

Interestingly, research results indicate that exposure to international competition does not have a clear relationship with employment; similar employment trends can be accompanied by quite different exposure to competition, in terms of both levels and growth. This finding must be qualified with two observations. First, employment data are very sensitive to the reference period. Second, it can not be concluded that there is no link between employment and competition as the latter depends on many factors and can be pretty severe even in the absence of strong exposure to foreign competitors.

3. *Industry-specific indicators*

The indicators reviewed in this section were called earlier first-line indicators; they are the necessary ones to compute in an appraisal of industry performance and they are of equal importance across industries. Things become increasingly specific to the environment of particular industries as one starts going down the list to second-line and, even more, to third-line indicators. Thus, in-depth appraisals of past and expected future industrial performance often become very specific to the context of particular industries and particular regions, thus gaining in detail while sacrificing comparability.

An interesting example in this respect is the recently released report of the British Pharmaceutical Industry Competitiveness Task Force on the performance of the specific industry in the specific country (PICTF, 2001). The Task Force created a long list of indicators, divided in three main categories: supply conditions, demand and regulatory conditions, and industry outputs. Forty-six indicators in all were used for benchmarking with other countries. They were divided in twelve main indicators and a secondary list of supporting indicators. The list of main indicators used by PICTF is shown in annex IV.

More recently, specificity has found its way to the industry performance debate in a different and very important way reflected in the increasing attention of analysts and policy decision-makers to *the geography of industry and related capabilities*. The US Council on Competitiveness, for example, has for some time promoted the view that in the global economy national boundaries matter less in some respects; the clusters of firms and industries concentrated at the regional level matter more. "Clusters develop where a critical mass of companies, suppliers, service providers and supporting institutions in a particular field (e.g., research institutions, trade associations, technical or vocational schools) are concentrated geographically." (Porter and van Opstal, 2001).

II. INDUSTRIAL CLUSTERS

Industrial clusters have become an area of interest to policymakers concerned with identifying, maintaining, and increasing regional competitiveness (competitive advantage). Investigations and policies centering on industrial clusters as an important contributing factor to regional economic growth and development have proliferated throughout the developed, and increasingly, the developing, nations. While often thought of as technology-based and innovative, industrial clusters do not necessarily have to be either by definition. Industrial cluster analysis is an examination (which may vary in comprehensiveness) aimed at understanding the nature of the economic performance of a region, including both current conditions and likely future trends. It is often considered a useful input to policies addressing the challenges or the opportunities afforded by certain regional socio-economic characteristics.

A. INDUSTRIAL CLUSTERS DEFINED

Industrial clusters are concentrations of interdependent firms in related industries that tend to be geographically concentrated in specific regions or states or in particular parts of countries. The clusters are interdependent due to the flow of goods and services between them and to the fact that their products typically are functionally interrelated. They are linked not only by their commonalities, but also by their complementarities (Porter 1998b). Clusters also include the supporting organizations, such as associations and research institutions, infrastructure, and resources, related to the core cluster functions (Andersen 1994; Porter 1990, 1998a,b, 2000; Stough and Kulkarni 2000).

There is no universal consensus on a precise definition of "industrial cluster". Some authors denote specific definitions, while others use the term rather indiscriminately, to describe sectoral concentration or industrial specialization.[7] This has both positive and negative potential implications for the advancement of the cluster field as both scholarly research and applied endeavor. A positive implication is that the lack of precision allows for flexibility to emphasize different dimensions of cluster phenomena. Others, most notably Feser and Bergman (2000), believe that the "fuzziness" of the cluster definition may eventually stunt the potential growth of scholarly research devoted to the topic and will lessen the fruitfulness of its application to regional analysis.

A cluster is a broader entity than an industry or economic sector. Bergman and Feser (1999) make the following distinction. A sector or industry is a group of enterprises that manufacture similar products, whereas an industry cluster is a group of business enterprises and non-business organizations for whom membership within the group is an important element of each member firm's individual competitiveness. Linkages, such as buyer-supplier relationships or commonalities in technologies, distribution channels, or labor pools, are what bind the organizations in a cluster together. Clusters have a geographical scope which "… relates to the distance over which informational, transactional, incentive, and other efficiencies occur." (Porter, 2000, p. 16).

Porter emphasizes the discretion involved when discussing industrial clusters. He notes that drawing cluster boundaries is often a "creative process" that is determined by understanding of the linkages and complementarities across the industries and institutions that are the most critical to competition in a particular area. "The strength of these spillovers and their importance to productivity and innovation often are the ultimate boundary-determining factors" (Porter 2000, p. 17). The understanding of linkages and complementarities is essential to correctly bounding a cluster. Aggregate "clusters," such as manufacturing, services, or "high tech" industries, are defined too broadly, as the linkages and relationships among cluster industries and institutions are weak and too general. However, a cluster defined as a single industry is too narrow of a definition. A cluster must have linkages with other related industries and institutions. It is these linkages that greatly affect competitiveness (Feser and Bergman 2000; Porter 2000).

The appropriate definition of a cluster may be different depending on the region, as the components in which cluster member companies compete and the strategies they utilize may also differ. Clusters also can

[7] See Altenberg and Meyer-Stamer (1999), Feser and Bergman (2000), and Porter (1998) for discussion.

be examined at various levels of aggregation, thereby highlighting analysis of different issues. It is important to note that the definitional boundaries of a cluster are not fixed. Rather, they continuously evolve as new companies, institutions and/or industries become part of the cluster, and as established firms, institutions, and/or industries dissolve from the cluster. As the components of clusters (firms, industries, institutions) are continuously changing themselves, the cluster changes also. New technological or market developments may influence the evolution of a cluster as they spawn new industries, establish new relationships, or serve new markets. Changes in the regulatory environment or other governmental domains may also affect the nature of a defined cluster.

The development of clusters is often determined by historical incident or locational circumstance, including proximity to research universities, strategic and efficient physical location, quality infrastructure, or appropriately skilled labor pool. Clusters may also develop as a result of a unique, particularly stringent, or highly sophisticated demand. Clusters may form as a "spin-off" from other clusters. For example, Porter (1998) maintains that cluster development is particularly noticeable where two or more industrial clusters intersect. In other words, new clusters are created to bridge gaps between existing ones.[8] Doeringer and Terkla (1996) specify three major drivers of industry clustering: (1) strategic business opportunities derived from specific kinds of interfirm alliances; (2) traditional regional factor market advantages (labor pools and localized knowledge spillovers); and (3) the role of non-business institutions such as universities, colleges, trade unions, and associations.

Industrial clusters can occur in traditional ("old economy") industries and in industries considered key to the "new, knowledge-based economy." Thus, industrial clusters can occur in virtually any area, whether manufacturing—or service-based, as well as in a combination of areas. Clusters can be considered traditional—it is and has been the dominant group of related industries in a region—or emerging/propulsive—has exhibited recent growth or exhibits growth potential and has, or promises to have, relatively high wages. Bergman and Feser (1999) define a potential or emerging industry cluster as a group of related and supporting businesses and institutions, that given additional core elements, interfirm relationships, or critical linking sectors, would obtain some pre-defined critical mass, or would develop trading patterns. Clusters that have significant growth in employment earnings, wage levels, and productivity, and that are large in size relative to a national or global base are considered propulsive (Stough and Kulkarni 2000).

1. *Industrial clusters, regional economic development, and competition*

Industrial clusters are important to regional economic development because they generally consist of industries exposed to competition, frequently by exporting part of their produce. The phenomenon of industrial clusters has been recognized and investigated in a wide variety of literatures, beginning with the geographic concentrations of trade and firms centuries ago. Alfred Marshall in his *Principles of Economics*, originally published in 1890, was perhaps the first economist to write about these geographic concentrations (what he called externalities of specialized industrial locations) that would develop into industrial cluster theory.

Industrial cluster theory also has antecedents in the literature on agglomeration economies, industrial districts (notably Piore and Sabel, 1984), economic geography (notably Krugman, 1991), growth poles, backward and forward linkages, national innovation systems (notably Lundvall 1992), regional science, social networks (notably Fukyama 1995 and Saxenian 1994), and urban and regional economics. For developing countries, the literature on urban agglomeration economies may be of particular relevance

[8] One study indicates that the development of clusters may be related to the firms' stage in the industry life cycle. Audretsch and Feldman (1996, p. 272) found, "On the one hand, new economic knowledge embodied in skilled workers tends to raise the propensity for innovative activity to spatially cluster throughout all phases of the industry life cycle. On the other hand, certain other sources of new economic knowledge, such as university research, tend to elevate the propensity for innovative activity to cluster during the introduction stage of the life cycle but not during the growth stage, but then again during the stage of decline." They also found that as the geographic concentration of production increased, so did the dispersion of innovative activity. During the early stages of the industry life cycle, knowledge spillovers remain within the distinct geographic region, but as the industry matures or even declines, these knowledge spillovers are more widely dispersed by what the authors call a "congestion effect."

(Porter, 1998b). Agglomeration economies refer to cost savings firms enjoy as a result of increased spatial concentration. The relevant literature explains input cost minimization, input specialization due to extensive local markets, and the advantages of locating near markets. Meanwhile, the economic development literature has for some time stressed the importance of backward and forward linkages in picking industries to support. Cluster theory primarily focuses on encouraging firms in existing or emerging industrial concentrations to develop strong linkages and spillovers within the fields in the cluster.[9]

Porter (2000) argues that clusters cannot be understood independent of a broader theory of competition and competitive strategy in a global economy. At the same time, the study of industrial clusters offers valuable insights into the role of location in competitive advantage and the microeconomics of competition. According to theory, competition among firms (or industries, regions, or nations) is dynamic and is based on strategic differences, traditionally considered to be resource-based but more recently thought increasingly innovation-based. Close relationships and linkages between producers, buyers, suppliers, and supporting institutions, such as financial, management, marketing, academic, and governmental institutions, are critical. These relationships help with efficiency and with the rate of innovation.

Geographic location influences competitive advantage through its affects on productivity. Prosperity in a certain region is based on the efficiency in using and upgrading factors of production in that region. This efficiency is, in turn, dependent on the industries in the region and the intensity of competition and the sophistication of the firms of these industries. "Company sophistication" entails both operational effectiveness and company strategies. Operational effectiveness is the extent to which firms in a nation or region utilize "best practices" in the areas of production, technology, and management.

As noted previously, the business environment of a region in which a firm is located is key to its ability to develop and sustain competitive advantage. However, describing this environment is very difficult due to the vast number of geographic influences on productivity and productivity growth. In *The Competitive Advantage of Nations* (1990), Porter developed a model of the locational conditions on competition by using four interrelated influences: factor (input) conditions, the context (environment) for firm strategy and rivalry, demand conditions, and (condition of) related and supporting industries. He presented these interrelated influences as a "diamond," with bi-directional linkages among all four influences.

A cluster is argued to be the manifestation of the diamond at work. (Porter, 2000). The geographical concentration that is a characteristic of clusters increases pressures to innovate and upgrade. Firms associated with a strong cluster have greater incentives and pressures to innovate than others, resulting in greater productivity benefits.

Industrial clusters are argued to influence firms' (and thus a region's) competitive advantage in three primary ways. First, clusters increase the current productivity of its firms and industries. Second, clusters increase the innovative capacity and the productivity growth capacity of its members. Third, clusters trigger the creation of new firms to support these innovations, thus enlarging the cluster. Many competitive advantages of clusters are based on external economies or spillovers across firms, industries, and supporting institutions. Thus, all of the primary influences of clusters on competitive advantage are based to a significant extent on relationships and linkages, a good part of which are personal. Such relationships are not automatic, but they are very likely to develop and become effective through the cluster.

Clusters affect productivity by providing superior or lower cost access to specialized inputs and employees. A cluster increases both the demand for and the supply of specialized inputs. Clusters also provide firms with quicker, easier, and lower cost access to technological and market information. Proximity, supply and technological linkages, and the existence of repeated personal relationships and community ties fostering trust facilitate the information flow, including the flow of tacit knowledge, within clusters. A cluster also enhances productivity by facilitating buyer, marketing, and alignment

[9] See Camagni (1991), Ceglie and Dini (1999), Feldman (1994), Feser and Bergman (2000), Humphrey and Schmitz (1995), Pinch and Henry (1999), Porter (1998a,b, 2000), and Steiner (1998) for more extensive discussion.

complementarities. Clusters improve the incentives within companies for achieving high productivity by fierce competitive pressure as well as "peer" pressure. The combination of competition and cooperation in clusters is considered extremely beneficial for innovation and thus competitive advantage and regional economic growth.[10]

Culture—organizational, industrial, regional, and/or national—obviously plays an important role in maximizing the benefits of these personal relationships. Saxenian (1994) found that the culture of Silicon Valley fed the success of its cluster whereas the culture associated with the Route 128 area in Boston hampered the cluster from reaching its full potential. Fukuyama (1995) analyzed the role of trust and "social capital" in various cultures and its affects on developing successful (or unsuccessful) business relationships.

B. INDUSTRIAL CLUSTER ANALYSIS METHODOLOGIES

Industrial cluster analysis is a relatively new analytical approach, still at the very early stages of theoretical and methodological development. A number of general observations are appropriate before progressing further:

1. As with the definition of an industrial cluster, there is no standard methodology or consistently applied pproach to identifying and analyzing industrial clusters.

2. Many cluster studies are highly descriptive in nature, rather than analytical.

3. Cluster studies vary in scope; the scope is often determined by policy objectives or concerns, resource (financial and time) constraints, data availability, and different interpretations of the associated theory(ies).

4. Most of the literature concerned with industrial cluster analysis is not comparative in the strict sense of the term. It can, however, be used for policy benchmarking. In some instances, relatively small numbers of regions and their clusters are analyzed and compared systematically. Most case studies describe different clusters in a region and attempt to analyze the strengths and weaknesses of each, particularly the studies aimed at informing development and planning authorities.[11]

In general terms, the typical steps of industrial cluster analysis are:

(a) State clearly the goals and objectives of the analysis;

(b) Define or select the region that is to be the base of analysis. Industrial cluster analyses have been conducted at the city/metropolitan level, the state/county/province level, the sub-national regional level, the national level, and even the supra-national regional level;

(c) Identify the industry clusters within the region of analysis. There are various methodologies for identifying clusters, and this is the basis of the following section of the paper. Both quantitative approaches and qualitative approaches, and often a mix of the two, can be employed;

(d) Validate the cluster groupings and add supplemental information about their nature in general. For example, the organizations and enterprises comprising the cluster should be identified;

(e) Assess the cluster in terms of size, performance, and likely future trends;

(f) Determine appropriate policy measures or initiatives.

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[10] It can thus be claimed that there are increasing returns and positive feedback loops associated with clusters (Feldman 1994).

[11] See, for example, Altenberg and Meyer-Stamer (1999), Andersen (1994), Austrian (2000), Bacheller (2000), Bingham (1992), Feser and Bergman (2000), Hill and Brennan (2000), Morfessis (1994), Padmore and Gibson (1998), and Stough and Kulkarni (2000).

Bergman and Feser (1999) classify most regions that are interested in conducting industry cluster analysis into three categories:

(a) Regions aware of their principal industries, aiming at understanding of how ties among firms within those industries might be strengthened and turned to competitive advantage;

(b) Regions aware of their principal industries, wanting to identify unseen complementarities and potential strategic alliances between those and other different – and perhaps as yet undeveloped – regional industries;

(c) Regions that have little knowledge of their core regional strengths and potentials, apart from what can be gleaned from traditional single-sector trends.

Further, Bergman and Feser (1999) distinguish between three levels of industrial cluster analysis:

(a) *Micro-level (firm) cluster applications* focus on the firm level, often using pre-determined sectors. At the firm (micro) level, clusters are conceived as one enterprise or a few linked enterprises often restricted to a single visible collection of firms that produce similar products and have key complementary formal as well as informal linkages. The value chains are typically not of much interest in these studies; rather the focus lies in identifying, characterizing, and illustrating ties between these similar producers. Thus, it is not surprising that studies at this level often only document one cluster per region;

(b) *Meso-level (industry) cluster applications* focus on the extended value chains of given end-market products involving best-practice benchmarking and studies of cluster-specific technology adoption and innovation processes. Analyses at this level are generally in response to the latter two categories of regional study demand specified above. These analyses utilize methods that allow for a more comprehensive investigation of virtually all sectors in the regional economy. Meso-level applications are sometimes followed by more detailed and intensive micro-level analyses of relationship between firms in identified clusters;

(c) *Macro-level (national) cluster applications* focus on broad industry groups linked within the overall national economy. These types of analyses generally focus on transaction networks of nationally documented flows.

The three different perspectives—micro, meso, and macro—may produce very different results when applied to the same region (Feser and Bergman, 2000; Steiner, 1998).

There are two basic types of meso-level industry cluster analyses: top-down and bottom-up. Top-down industry cluster methods attempt to identify industry clusters empirically through various data reduction techniques (statistical cluster analysis, factor analysis, etc.). They are more appropriate when there is sufficient industrial diversity in the regional economy to make a detailed, sector-by-sector piecing together of the picture of regional economic interdependence very complicated. In the bottom-up approach, the analyst tries to identify industry clusters by beginning with individual sectors and then finding linkages with other industries and related non-business institutions. In essence, the analyst builds a picture of regional industrial interdependence from the ground up, one sector at a time. This approach is particularly appropriate in regions with only a few industries that account for a significant share of employment.

Researchers have utilized a variety of approaches and methodologies in industrial cluster analysis, both quantitative and qualitative, with the more productive studies using both. The quantitative approaches typically analyze industrial sector data using methods that range from measures of industry size and change to measures of inter-industry linkage levels. Quantitative measures and methods used in industrial cluster analysis include factor analysis, location quotients, input-output analysis, and shift-share analysis, among others. Indicators include employment size, value-added measures, export or trade measures, sales and production figures, profits, outward direct investment, production channels, forward and backward linkages,

productivity, and relative earnings.[12] Qualitative approaches include the use of interviews, focus groups, surveys, and cluster maps.[13]

1. *Quantitative methods*

(a) *Input-output tables*

A widely used, comprehensive technique for determining industry interdependence is the trade-based input-output table. Data reduction methods—such as statistical cluster analysis and factor analysis—are used to derive the clusters on the basis of formal trading patterns. A weakness of this method is that the utilized data may be somewhat dated and the definitions of industries are not perfectly aligned with actual industries. Another weakness of this methodology is that it neglects the role that supporting institutions play in clusters. Thus, this method is often supplemented by other qualitative methods.

A new but seemingly important input-output approach that has been applied in a limited number of OECD countries is based on analysis of innovation interaction matrices rather than (or sometimes in concert with) traditional production flow matrixes. Debresson (1996) offers a comprehensive source for techniques and examples of such analyses. Innovation matrices that have been derived from surveys describe the flows of innovations between innovation-producers and innovation-users. There are essentially two approaches to innovation surveys depending on whether the unit of analysis is determined to be important technical innovations or the firm. The principal advantage of this technique is its focus on the interaction among industry members when innovating. Disadvantages of this technique are the cost associated with obtaining the amount of data necessary as well as conceptual difficulties in survey design.

Specialization and performance indicators: location quotients

Perhaps the most common method of identifying regional industry clusters is the location quotient (LQ). The location quotient is the ratio of the local industry's actual percentage of total local employment to the percentage of the national industry's percentage of total national employment. A location quotient of 1.0 indicates that the regional economy has the same share of employment in industry *i* as the nation as a whole. Location quotients exceeding 1.25 are usually taken as initial evidence of a regional specialization in a given sector.

The location quotient of a region is really a specialization indicator and does not show linkages within a cluster, so it should be used in conjunction with other methods (whether input-output or qualitatively based methods). Location quotients are easy and inexpensive to calculate, and useful to use in conjunction with other methods. Its primary weakness is that it focuses on industrial sectors, not clusters per se; it offers no insight on interdependencies between sectors.

(b) *Shift share*

Another key indicator is shift-share. Employment shifts-and-shares analysis focuses on changes in local employment by industry over a period of time compared with changes in total country employment. The results of shifts-and-shares analysis help identify areas of strength and weakness in the local economy, which local decision-makers should then investigate further.

There are three components to the total change in local employment for a given period of time: national growth, industrial mix, and competitive share. The national growth component is calculated by multiplying the total local employment (in a given industry) at the start of the time period under consideration by the country total employment growth rate (of all industries). This provides the employment

[12] See, for example, Bacheller (2000), Bingham (1992), Feser and Bergman (2000), Hill and Brennan (2000), Ivanova et al. (1998), Morfessis (1994), Murray (1999), Padmore and Gibson (1998), Pinch and Henry (1999), and Stough and Kulkarni (2000).

[13] See, for example, Austrian (2000), Bacheller (2000), Held (1996), Kleinhenz (2000), Stough et al (1997), and Waits (2000).

level of the industry if it grew at the same rate as the national economy during the time period under investigation. The industrial mix component is calculated by subtracting the national average growth rate for all industries from the national growth rate for the industry under consideration, then multiply this result by the local employment in the given industry at the beginning of the time period under consideration. This provides an adjustment for the actual growth rate of the industry. The competitive share component is calculated by subtracting the national growth rate for the specific industry from the local industry growth rate, and then multiplying this result by the local industry employment at the beginning of the time period under investigation. This is a measure of competitive position. The sum of these three components represents the total change in industry employment.

(c) *Other specialization and performance indicators*

Specialization and performance indicators are used to varying degrees, and in varying combinations, with other methods of industrial cluster analysis. These indicators are sometimes classified as indicators of scale, performance, robustness, growth, centrality, competitiveness, employment specialization, and export orientation. Examples of such indicators, in no particular order, are:

(a) Productivity;
(b) Rate-of-change in productivity;
(c) Regional industry's change in national employment share;
(d) Relative earnings: ratio of local average earnings to national average earnings;
(e) Change in relative earnings;
(f) Share of industry's output shipped out of the region;
(g) Share of local exports accounted for by the industry;
(h) Forward linkages (customers);
(i) Backward linkages (suppliers);
(j) Change in local employment share;
(k) Change in location quotient;
(l) Employment size;
(m) Employment change;
(n) Total wages;
(o) Rate-of-change in total wages;
(p) Establishments;
(q) Rate-of-change in the number of establishments;
(r) Wage level relative to the national industry wage level;
(s) Rate of change in relative wage;
(t) Inter-industry dependency;
(u) Value-added;
(v) Sales volume.

2. *Qualitative methods*

(a) *Expert opinion (Interviews and focus groups)*

Probably the most common approach to identifying regional clusters is the use of interviews, focus groups, Delphi techniques, and other means of gathering expert information. Regional experts (industry leaders, public officials, etc) are important sources of information about regional economic trends, characteristics, strengths and weaknesses. Industry association reports, newspaper articles, and other published documents that are not based on systematic empirical analysis also fall under this category.

Expert opinion data can be relatively cost and time effective and can yield rich contextual information about the region's economy. However, it is rarely done systematically enough that findings can be generalized. Results can be easily biased if not carefully controlled: analysts can overestimate the accuracy of strongly held opinions to bias the results and to underestimate each expert's limited field of experience within the broader economy. There has also been comparatively little research on ways to marry expert opinion data with secondary economic data, an important feature for meso-level cluster studies.

(b) *Multi-sectoral qualitative analysis*

Stough, Stimson, and Roberts (1997) have developed a technique (multi-sectoral qualitative analysis), for identifying core competencies, economic possibilities, strategic markets, and economic risk. It consists of simple categorical scoring of regional sectors along a set of performance criteria. They use major decision-maker groups to derive a series of indices to qualitatively measure the strengths and deficiencies (existing and potential) of a region.

They first focus on regional core competencies, defined as "a bundle of skills and technologies within a physical resource base that can be synthesized to produce distinctive products and sets or skills, technology and knowledge that give a region a competitive advantage". Results are synthesized in the form of a weighted *sector competency index* and a weighted regional *core competency index*. The scores may be graphed to display the relative importance of industry sector or competency criteria in a region as evaluated by the key decision maker groups.

The MSQA methodology then proceeds to develop a regional *inter-industry opportunity index* by having the groups evaluate the degree to which there are limitations or opportunities for stretching existing inter-industry linkages and for leveraging to build new inter-industry linkages. Other indices produced by this methodology include a matrix of industry export potential with specified target export market regions, an index of potential export industry development, an index of export market potential for each export market region, a sector risk index, and a regional risk factor index.

(c) *Surveys*

Surveys are not used as a stand-alone methodology for industrial cluster analysis but, as noted above, can be used to obtain information about innovative activity and to collect cluster information that can be used to verify and/or supplement the results of other analysis. Survey advantages include flexibility and ability to collect the exact data needed for the analysis.

3. *Combinatorial methods*

As stated previously, there is currently no commonly accepted or preferred methodological approach for conducting industrial cluster analysis. Several scholars and practitioners have developed their own methodologies using various combinations of both qualitative and quantitative techniques. These include combining cluster analysis with other statistical and mathematical tools such as discriminant analysis; using a multi-stage approach that combines quantitative and qualitative methodologies; and developing new diagram-based indexes. A few are summarized below.

(a) *Cluster analysis in conjunction with discriminant analysis*

Hill and Brennan (2000) report on a new rigorous method for identifying the clusters of industries in which a region has a competitive advantage. The method combines cluster analysis with discriminant analysis, using variables derived from economic theory and the concept of competitive advantage such as measures of productivity, inter-industry linkages, and export measures. The identified driver industries—those in which a region has its greatest competitive advantage—are then linked to supplier and customer industries with information from a region-specific input-output model to form industry clusters.

The authors use four sets of variables in constructing the cluster and discriminant analyses that identify the region's industrial drivers: measures of competitiveness, indicators of export orientation, measures of centrality in the regional economy, and employment specialization.

(i) Measures of competitiveness:

a. Productivity proxy (estimated gross product per hour);
b. Regional industry's change in national employment share;
c. Relative earning: ratio of local average earnings to national average earnings;
d. Change in relative earnings.

(ii) Indicators of export orientation:

a. Share of industry's output shipped out of the region;
b. Share of local exports accounted for by the industry.

(iii) Measures of centrality:

a. Forward linkages (buy relationships);
b. Backward linkages (purchase relationships);
c. Change in local employment share.

(iv) Employment specialization:

a. Location quotient;
b. Change in location quotient.

The cluster analysis places industries that have similar characteristics into a group. The discriminant analysis then associates these groups of industries with the descriptive (explanatory) variables, identifying which variables are most closely associated with each group of industries. Driver industries have some combination of six key characteristics:

(a) "They export a large fraction of their products (indicating competitiveness);

(b) They ship a disproportionate share of the region's exports (indicating that they are part of the export base);

(c) They have relatively large forward and/or backward multipliers (showing that they are at the heart of an industrial complex);

(d) They have high levels of productivity (another sign of competitiveness);

(e) They have large location quotients (showing a specialization in product markets, a sign of the existence of cluster economies);

(f) The region has an increasing share of national employment in the industry (a sign of increasing market share)."

(b) *GEM analysis*

Padmore and Gibson (1998) present a model for assessing regional industrial clusters. Their model expands Porter's (1990) "diamond". The determinants are organized under the headings "groundings, enterprises, and markets" (GEM). *Groundings* include the supply determinants, the inputs to the productive process that originate outside the cluster and include resources (natural, inherited or developed endowments within the region), and the infrastructure (physical and institutional arrangements that facilitate access to resources and support other business functions). *Enterprises* include the structural determinants of production efficiency, public or privately owned, such as supplier and related industries—success factors include diversity, quality, cost and proficiency of the local suppliers as well as the quality of the buyer-seller relationships; and firm structures, strategies and rivalry, including organization, security, confidence, and flexibility. *Market* or demand determinants include local markets and access to external markets. Markets include both final and intermediate demand. Accessibility to external markets includes closeness of markets, their size and growth rates, global market share for the cluster, characteristics of end users, existing market relationships, barriers to entry, trade and export barriers.

The methodology develops heuristic scoring criteria for the determinant factors that relate to the overall competitiveness of the cluster and that capture the substitution/complementary relationships among the determinants. The determinants are arranged in a hexagon, with scores from 1 to 10 attached to each of them. The overall GEM score of a cluster results from the hexagon space covered by the specific shape.

(c) *Spider diagrams and indexes*

Stough and Kulkarni (2000) have developed a method of analysis and presentation similar to that of Padmore and Gibson. They argue that

> "States have an opportunity to use technology policy and programs to drive and accelerate the development of the emergent and propulsive parts of economies and to thereby better leverage their technology resources. To do this it will be necessary to know the parts of the economy that are propulsive and the nature of their structural dynamics, i.e., the sectoral elements that are clustered around the propulsive components and supply chains, and how technology is used or could be used to encourage and facilitate the interactions of these clusters." (p. 1).

Their cluster evaluation process of industrial clusters in the Commonwealth of Virginia was based on fifteen economic performance indicators that represent four basic development parameters: scale (S), performance (P), robustness (R), and growth dynamics (D). The indicators are:

(a) Employment (S);
(b) Employment change (P);
(c) Total wages (S);
(d) Rate-of-change in total wages (P);
(e) Establishments (S);
(f) Rate-of-change in the number of establishments (P);
(g) Wage level relative to the national industry wage level (R);
(h) Rate of change in relative wage (D);
(i) Inter-industry dependency (R);
(j) Productivity (R);
(k) Rate-of-change in productivity (D);
(l) Contribution to gross state product (S);
(m) Rate-of-change in contribution to gross state product (D);
(n) Location quotient (R);
(o) Change in location quotient (1992-1998) (D).

They then developed "*spider*" *diagrams* with fifteen spokes to represent each cluster. The shape of the diagram and the amount of area encompassed are indicators of the strength of the cluster both in terms of size and growth. Spider diagrams that are full in shape (i.e., not characterized with several sharp edges or points) and that fill sizeable amounts of the total area available in the diagram are larger and generally more propulsive clusters.

In addition, the fifteen economic indicators were compiled into a cluster *strength index*. The larger the index value, the larger, more robust and growth-oriented the cluster. These strength index values complement the spider diagrams and provide a relatively clear way of comparing the performance of different industrial clusters. The authors found that new economy clusters tended to have high index values and old economy clusters tended to have low values.

Two other parameters of the spider diagrams were estimated. A *change index* was computed by calculating the average spider diagram scores for all of the change variables and multiplying by 100. This index serves as a measure of dynamism with higher scores representing the more propulsive sectors. A *form index* was also computed. More propulsive sectors tend to have fairly regularly shaped diagrams. This occurs because new growing industries score high on change measures and usually fairly high on scale measures. However, sectors heavily tied to the old economy tend to have more irregular shaped spider diagrams because they have high scores on the scale measures but low scores on the change variables. An attempt to measure this shape with the form index was made. The form index is the ratio between the long and short axes of the diagrams multiplied by 100.

(d) *National cluster templates*

Feser and Bergman (2000) develop yet another method of identifying industrial clusters in a regional economy. They define the term cluster to mean a specific constellation of linked firms. A regional cluster

means the presence of such an industrial cluster in some specific spatial context. The logic of this method is to first group industrial sectors at a national scale into a number of clusters in which the industrial sectors are technologically linked, irrespective of geographical location, and then use the non-spatial industrial clusters as a technological template to identify to what extent the clusters are present in a regional economy.[14]

Twenty-three clusters are identified in the national (US) manufacturing industry. These clusters are then deployed as "templates" to identify the strength of the clusters in the specific region (North Carolina). The analyses are presented in different forms: tables of summary statistics, diagram of linkage network, map of establishments, spider diagram for geographical distribution, bar charts.

The authors discuss the use of national versus local input-output tables in these terms:

> "One might attempt to identify clusters in a given region by collecting or using available data on actual local input-output patterns to reveal existing buyer-supplier chains within the region. While useful for such purposes as estimating impacts triggered through regional multipliers (and assuming those rare data can be collected or are otherwise available), that approach would unnecessarily restrict the cluster analysis since it excludes any industries that do not trade locally at a significant level. Thus key sectors that may informally interact or share pools of labor with local cluster firms (by virtue of being engaged in related production) are ignored. Accordingly, this method cannot detect nor reveal gaps in supplier chains that might reveal something about local competitive advantages. That sacrifices a major advantage of the national template approach, i.e. its ability to reveal latent opportunities or strengths or weaknesses in a subnational economy that are not apparent using standard SIC aggregation or local trading patterns. We suggest that the examination of local trading patterns most usefully comes after an analysis of the regional economy using the template interindustry chains."

(e) *Network analysis*

A relatively novel way of identifying industry clusters is through network analysis, focusing on linkages between firms or sectors. The most obvious data sources are trade or innovation-based input-output tables, patents, or strategic partnerships. However, expert surveys or other qualitative sources of connections between regional industries can also be used. Qualitative analysis of industry clusters using techniques from the social network analysis literature also seems to have potential. Debresson (1996) provides a short discussion of techniques for identifying clusters through graph theory. The principal challenge of graph network analysis techniques for identifying regional industry clusters is interpreting the revealed complexity.

4. *Concluding remarks on industrial cluster methodology*

Recent literature acknowledges that both quantitative and qualitative approaches are needed in order to obtain the most complete and appropriate analyses of industrial clusters and use clusters as a strategy to increase regional competitiveness (Austrian, 2000; Waits, 2000). The qualitative methods supplement the quantitative methods by providing mechanisms to learn about the structure of supply chains and to describe supporting institutions and infrastructure. Quantitative methods alone do not adequately capture the complexity and reality of business and technical relationships. Qualitative methods alone may also be prejudicial, misconstrued, or anecdotal. The deep understanding of a region's economy needed in order to develop appropriate state-level economic development efforts can best be obtained by a combination of both qualitative and quantitative approaches to analysis of industrial clusters.[15]

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[14] Four-digit SIC input-output data are used to obtain direct and indirect inter-industrial linkages in manufacturing industry. Based on the buying and selling pattern of each sector in manufacturing industry and non-manufacturing industries, coefficients are computed to show the similarities of buying and/or selling patterns across industries, the industrial linkages. They are then treated as variables to derive new variables through principal component factor analysis under the rationale that the most linked sectors are clustered on the same new variable, an industrial cluster.

[15] See Bacheller (2000) for an interesting note on how industrial cluster analysis debunked previously held beliefs on the industrial cluster strengths of New York.

III. LESSONS FOR ESCWA COUNTRIES

The assessment of industrial performance is a complicated task, still more of an art than a science. Different methodologies are applied around the world, mostly complementary rather than substitutive, without any of them being a clearly dominant candidate. As soon as one diverts from the classic productivity and market share appraisals, comparability of approach and applied performance metrics is still rather weak.

In our view, the international competitiveness debate has contributed significantly in raising awareness and broadening the acceptance of industry benchmarking by policy decision-makers. This debate has put forward long lists of potential indicators suitable for appraising industrial performance and assessing future prospects for creating, maintaining and enhancing competitive advantages. Recent efforts to make this rich material directly relevant to the development efforts of geographically-bounded regions has sprung a flourishing strand of literature on industrial clusters and economic growth.[16]

This paper has followed a two-pronged approach in reflection of the potential methodological exercise policy analysts in ESCWA member countries should implement in assessing the performance of selected existing industries. On the one hand, the paper has tried to conceptualize the various indicators of industrial performance that have sprung up in the competitiveness debate. Here we functionally categorized performance indicators in several categories ranging from the most basic, generally applicable ones to the more specialized to particular industrial contexts. We selected a few from the former group to discuss in more detail. On the other hand, the paper has tried to conceptualize the industrial cluster approach and has reported on a broad range of literature using a bewildering array of quantitative and qualitative indicators of industrial performance. It cautioned that, useful and promising as it is, the industrial cluster approach is still at an early stage of development to be able to put forward standardized, widely acceptable indicators.

We think that the objectives of the assessment of performance and the available resources for it should determine the appropriate methodology to follow. We would argue for a start with the first-line of industrial performance indicators—productivity and market share—which are better developed, widely acceptable, and applicable across industries. The next step should be to employ a suitable selection of the second-line of industrial performance indicators, dealing with the factors determining the socio-economic environment in which firms operate. Given that, ideally, assessments of industry performance should have a strong desired component of future prospect considerations, the third step would be to employ a series of third-line indicators that take a more dynamic approach by considering industry evolution and changing company capabilities.

The cluster approach is considered a very good supplement for the latter two steps as it provides a useful methodological framework and adds the regional dimension. Major advantages of this approach, in our view, include its flexibility and focus on the contextual side of industrial development which can be easily lost when dealing with more standardized quantitative indicators. Several recent examples of application of the industrial cluster approach have demonstrated significant innovativeness and improvement in terms of analytical sophistication in turning largely qualitative information into indicators of industrial performance. We would argue that the best course of action for ESCWA members and other developing countries currently is the skillful combination of traditional competitiveness indicators with more versatile quantitative-cum-qualitative indicators in the industrial cluster tradition.

[16] See annex V on application.

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Annex I

UNDERSTANDING INDUSTRY INCENTIVES, PERFORMANCE, AND EVOLUTION

One perhaps can differentiate between two strands of literature. One is rooted in the formal industrial organization tradition and has concentrated on sectoral structure in terms of concentration, vertical integration, diversification; the dynamics of sectors in terms of technical progress, entry, firm growth, etc.; and strategic behavior (e.g., Scherer and Ross, 1990; Sutton, 1998).[17] These analyses have paid less attention to knowledge and learning processes, the role of non-profit organizations, the wide range of interactions among agents, and the transformation of sectors in terms of their boundaries, agents, and products.

The second strand of literature is much more heterogeneous, eclectic, and dispersed.[18] Here one finds very rich empirical evidence on the features and working of sectors, on their technologies, production features, innovation, demand, and on the type and degree of change. Unfortunately, the possibility for an integrated and consistent analytical approach across this group was limited until very recently.[19]

During the past few years, there has been a significant and successful effort by Franco Malerba and his colleagues to provide a multidimensional, integrated and dynamic view of sectors, combining important elements from both analytical traditions above to advance the concept of sectoral system of innovation and production (Gambardella and Malerba, 1999; Malerba, 2000).[20] The theoretical and analytical approach underlying this work is the evolutionary theory (Dosi, 1988; Nelson, 1995) and the system (of innovation) approach (Edquist, 1997). Importantly, this work is also informed by an important strand of theoretical and empirical literature on industry evolution, initiated in the late 1960s by Mueller and Tilton (1969) and Abernathy and Utterback (1975) (see Utterback, 1994, for a synthesis). Work in industry evolution has also benefited from important contributions by Gort and Klepper (1982) and Klepper (1996).

The important aspect of this work is that it deals with all the stages of industry evolution, from the very early ones to maturity and decline. The approach is both quantitative (based on indicators such as patents and firm performance) and formal (with the development of history friendly models of industry evolution) as well as qualitative and "appreciative", by focussing on aspects of industry such as learning, knowledge base, competences, and relationships among agents. In general the basic elements of a sectotal system are identified in the following:

(a) Products;

(b) Agents (firms and other organizations such as universities, financial institutions …);

(c) Knowledge and learning processes;

(d) Basic technologies, inputs, demand, and the related links and complementarities (of the static and dynamic types);

(e) Mechanisms of interactions both within and between firms and outside firms (including market and non market interactions);

(f) Processes of competition and selection;

(g) Institutions (such as rules, norms…).

This analytical approach enables rich conceptualizations of sector birth, death, and turbulence while linking these directly to different market structures and different patterns of innovation. An important role is

[17] Caves (1998) has summarized a large part of the theoretical and empirical aspects of this literature.

[18] See Freeman and Soete (1997) for a review. Rosegger (1996) tries to navigate between the two analytical traditions, bringing up much of the important literature.

[19] But see Carlsson (1955, 1997) for a systems approach.

[20] Recent projects supported by the European Commission have also taken a similar line of research.

played by the learning environment in terms of different technological regimes characterized by various degrees of technological opportunity, appropriability, cumulativeness, and properties of the knowledge base and learning processes. Importantly for our purpose, it allows to examine the processes of transformation of sectors and the dynamics of firms.

Analytical approaches like those of Porter and Malerba are sensitive to issues like those below, considered "state-of-the-art":

(a) Linkages between technological development and the science base;
(b) Linkages of firms to domestic or foreign sources of technology;
(c) Backward and forward linkages between sectors;
(d) Knowledge spillovers and learning;
(e) The creation of clusters of industrial activity.

Annex II

TORNQVIST INDEXES[21]

The formula aggregates the growth rates of various products in an industry between two periods with weights based on the products' shares in industry production value. The weight for each product equals its average value share in the two periods. Specifically, output is calculated with the formula:

$$\frac{Q_t}{Q_{t\text{-}1}} = \exp\left[\sum_{i=1}^{n} w_{i,t}\left(\ln \frac{q_{i,t}}{q_{i,t\text{-}1}}\right)\right],$$

where

$\frac{Q_t}{Q_{t\text{-}1}}$ = the ratio of output in the current year (t) to output in the previous year *(t-1)*,

$\ln \frac{q_{i,t}}{q_{i,t\text{-}1}}$ = logarithm of the ratio of the quantity of product *i* in the current year to that of the previous year,

n = number of products, and
$w_{i,t}$ = average value share weight for product *i*.

The average value share weight for product *j* is computed as

$$W_{j,t} = (s_{j,t} + s_{j,t\text{-}1}) \div 2$$

where

$$s_{j,t} = p_{j,t}\, q_{j,t} \div \left(\sum_{i=1}^{n} p_{i,t}\, q_{i,t}\right) \text{ and}$$

$p_{i,t}$ = price of product *i* at time *t*.

The Tornqvist formula yields the ratio of output in a given year to that in the previous year. If *t*=3 and the base year is denoted by the subscript 0, then,

$$\frac{Q_t}{Q_0} = \frac{Q_3}{Q_0} = \left(\frac{Q_3}{Q_2}\right) \times \left(\frac{Q_2}{Q_1}\right) \times \left(\frac{Q_1}{Q_0}\right).$$

The resulting chained output index $\frac{Q_t}{Q_{t\text{-}1}}$ *is used as the numerator in the productivity formula.*

The quantities of products used in the output index (the q_i's) are measured either with deflated production values or with actual physical quantities.

[21] This section draws on Duke and Usher (1998).

Annex III

PERPETUAL INVENTORY METHOD FOR ESTIMATING CAPITAL ASSET STOCKS

Let K denote the current stock of capital, determined by current and past investments. Let W(B)k be an index of these investments, where W(B) is a lag polynomial describing the relative contribution of successive capital investments to K, and B is the lag operator. Then:

$$K = G\,[W(B)k]$$

Where $W(B)k_t = (w_0 + w_1B + w_2B^2 + \ldots)\, k_t = w_0k_t + w_1k_{t-1} + w_2k_{t-2} + \ldots$

Annex IV

LIST OF MAIN COMPETITIVENESS INDICATORS FOR BRITISH PHARMACEUTICAL INDUSTRY

Supply Conditions

Labour

Number of new graduates with degrees in sciences relevant to the pharmaceutical industry.

Capital;

Venture capital invested in the pharmaceutical/biotechnology industry.

Basic Research Infrastructure

(a) Government expenditure on R&D in medical and biological sciences;
(b) Scientific research publications per head;
(c) Clinical research infrastructure: UK percentage of patients enrolled in international studies, normalized by population.

Demand and Regulatory Conditions

(a) Uptake: Population adjusted standard units sold per month of a sample of major new NHS-reimbursed products launced within last 5 years; monthly sales measured at 1 year and 3 years after launch in the UK and comparator countries;

(b) Price/profit regulation: Companies free to set the launch prices of new medicines? (Y/N).

Research and Medicines Regulation

Overall time taken from first submission of protocols to final medicines regulatory approval (CTX), REC approval and NHS hospital approval to proceed with clinical trial at first site.

Industry Outputs: Innovation

(a) Proportion of world first patents filed for marketed NMEs divided by proportion of world R&D spend;
(b) UK-based companies' number of "global top 75" NASs;
(c) Percentage of world pharmaceutical R&D spend.

Macroeconomic Contribution

Gross value added.

Source: PICTF (2001), table 8.1.

Annex V

APPLICATIONS OF INDUSTRIAL CLUSTER ANALYSIS

Industrial cluster analyses have been conducted in many nations, regions, states and cities all over the world (see table 1). The scope of industries analyzed ranges from the perceived "low-tech" footwear and wine industries to the "high-tech" electronics and biotechnology industries. The scale of analysis ranges from rural small and medium-sized enterprises (SMEs) to metropolitan transnational corporations, and from city to multi-national regions. The purposes of these analyses range from scholarly research to direct application, including strategic planning, regional economic development, and investment decisions made by policy and/or industry officials.

TABLE 1. INDUSTRIAL CLUSTER-BASED ECONOMIC DEVELOPMENT ANALYSIS AND INITIATIVES*

Multi-country regions	Nations	Regions/States/Provinces	Cities/Metropolitan areas
Africa	Andorra	Arizona	Austin
Central America	Bermuda	Atlantic Region (Canada)	Bogota
Latin America	Bolivia	Basque Region (Spain)	Boston
Middle East	Brazil	California	Charlotte
	Bulgaria	Catalonia	Christchurch
	Canada	Colorado	Long Island
	Chile	Connecticut	Minneapolis
	Columbia	Chihuahua	Rotterdam
	Costa Rica	Florida	San Diego
	Denmark	Los Angeles	Silicon Valley
	Egypt	Massachusetts	Sonoma
	El Salvador	Minnesota	Tampa
	Finland	New York	Tucson
	Hong Kong	North Carolina	Wellington
	India	Ohio	Wichita
	Indonesia	Oregon	Worcester
	Israel	Quebec	
	Jordan	Rhode Island	
	Korea	Scotland	
	Malaysia	Virginia	
	Mexico		
	Morocco		
	Northern Ireland		
	Norway		
	Netherlands		
	New Zealand		
	Pakistan		
	Panama		
	Portugal		
	Peru		
	Republic of Ireland		
	South Africa		
	Sweden		
	Tatarstan		
	Venezuela		

Source: Adapted from Porter (2000).

* Table 1 is not intended to be an exhaustive list.

The concept of industrial clusters in general, and industrial cluster analysis in various forms in particular, is being applied more and more frequently to regions of various sizes, from cities to multi-national

areas. This includes developed countries and increasingly developing ones. Many national and international organizations, notably UNIDO, are emplying industrial cluster analyses as a foundation for the development of technology policies and economic development initiatives (Altenberg and Meyer-Stamer, 1999; Andersen, 1994; Austrian, 2000; Bell and Albu, 1999; Ceglie and Dini, 1999; Humphrey and Schmitz, 1995; Ivanova et al., 1998; McCormick, 1999; Nadvi, 1995, 1999; Porter, 2000; Waits, 2000; Weijland, 1999).

However, due to the lack of precision in both definition and understanding of concepts, as well as in approaches and methodologies, the full benefits of the theory and application have not been realized. New methodologies incorporating quantitative and qualitative approaches and new methods of presentation are needed to further research and results in this field. Methods of presentation need to be developed that can illustrate the results of analysis in a clear and easy to interpret way. Further, an effort towards acceptance of a standard methodology would also benefit the field. It would allow for greater comparisons and generalizations, both in terms of the clusters themselves and in terms of the success or failure of resultant economic development initiatives.

PART TWO
APPLICABILITY OF THE CLUSTER METHODOLOGY FOR THE ASSESSMENT OF PERFORMANCE OF SELECTED EXISTING INDUSTRIES: CASE STUDIES FROM LEBANON AND JORDAN

I. INTRODUCTION

Attempts are being made to use cluster methodologies to assess the performance of various sectors (including manufacturing activities) in some countries of the region. In particular, Jordan and Lebanon are at various stages of application of these methodologies, and are fast coming to practical recommendations in a few sectors. For Jordan, the methodology associated with Professor Michael Porter of Harvard is being applied, while in the case of Lebanon a somewhat different cluster approach, that of US consultants Stanford Research Institute International, (SRI) has been chosen.

The following report presents case studies on the application of cluster approaches in assessing the performance of selected industrial branches in the ESCWA region. Examples from Lebanon and Jordan are chosen to assess the applicability of the Porter and SRI methodologies. Cases are reviewed, analyzing the potential for the promotion of sustainable industrial development and offering conclusions regarding the application of cluster models in the region.

II. JORDAN

The Jordanian case considered here grew out of a large scheme that was initially proposed by Professor Porter and started in several countries with the sponsorship of the government of the Netherlands. Using the framework designed by Professor Porter for assessing competitiveness, implementation of the project was entrusted to the Jordanian National Competitiveness Team (JNCT) established at the Jordanian Ministry of Planning (MoP) in 1997. The JNCT co-ordinator and leader is the Director of the Technical Support Unit in the MoP.

The stated purpose of the project is to assist in enhancing the competitiveness of the Jordanian economy through:

(a) Creating an action plan to increase productivity;

(b) Strengthening the productive and competitive business environment;

(c) Developing and upgrading industry clusters;

(d) Creating a framework of policies, institutions, and infrastructure that will improve productivity, encourage private investment, and stimulate trade;

(e) Facilitating the development of a cohesive competitiveness agenda.

The project consists of three phases:

1. Diagnosis:

(a) Assessing Jordan's business environment;
(b) Analyzing a sample of existing and emerging industry clusters in Jordan;
(c) Establishing cluster-based working groups;
(d) Conducting national mindset questionnaire;
(e) Developing priority areas for improvement in each area.

2. Recommendations and Implementation: based upon the recommendations for the working groups several changes are advocated.

3. Dissemination of information and knowledge through courses at universities.

The JNCT assumes the following tasks:

(a) Conducting a preliminary investigation of six clusters;

(b) Conducting interviews with more than 20 firms within a cluster;

(c) Mapping clusters and identifying linkages;

(d) Analyzing diamonds and industry structure for each core industry;

(e) Analyzing government policy and regulations affecting the cluster;

(f) Identifying strengths and weaknesses affecting competitiveness;

(g) Prioritizing reason of improvement to ease constraints, reduce bottlenecks and enhance productivity;

(h) Establishing a dialog between all national components of the project.

A Working Group was established for each cluster, comprising 8-12 public and private sector leaders and representatives of organizations such as firms, relevant ministries, and major related and supporting industries, academic/vocational training institutions, and trade unions. Tasks of the group included identifying key cluster issues and recent or possible future impediments to the success of the cluster, building

a process for a dialog with decision makers and cluster components, and proposing action steps/policy recommendations. The JNCT provides feedback for the group from the international team, and brings additional insights from other countries while maintaining a dialog among all national components of the project.

The data is gathered and analyzed by the JNCT in co-operation with the involved parties from the private sector to come up with the best strategy concerning the studied clusters. At later stage of analysis, decision-makers in the public sector work closely with the private sector to improve the performance of these clusters by coming up with suitable recommendations and procedures that are applicable.

The JNCT's studies are meant to be important to investors and other concerned parties, providing them with necessary information about different sectors examined, or directing them to ways to obtain other specific required data.

The JNCT analysis seeks to determine where the cluster stands in Jordan, in the region, and the world. Macro-economic indicators and international comparisons are used, such as contribution to GDP, exports, employment, etc.

Key issues are determined using tools and models developed by Professor Porter. These are The Diamond Model, the Cluster Map, and the Five Competitive Forces. These tools are used to understand the current strategy of an industry as well as specifying the major key issues affecting the industries.

Further strategy, recommendations, and an action plan are set based on brainstorming sessions that incorporate representatives from both private and public sectors.

This JNCT began by studying the competitive advantage for several industrial clusters in the Jordanian economy, including Mining, Pharmaceuticals, Textiles, Cement, Tourism, Dead Sea Cosmetics, Higher Education, Banking, and Construction. Of these, the case of the Dead Sea Cosmetics cluster will be considered below, as it offers features unique to Jordan.

The case of the Dead Sea Cosmetics Cluster

The Dead Sea cosmetics industry is based on extracted mineral salts (carnallite) and mud. Interest in the use of Dead Sea minerals for producing modern cosmetics began in Jordan in 1986. Although this Jordanian cluster is relatively new, it is believed to have a promising and prosperous future if managed properly.

The Jordanian Dead Sea Cosmetics Cluster was analyzed by the JNCT in terms of the Porter competitive advantage. The results were as follows:

(A "+" sign indicates that the item offers a competitive advantage, and a "-" sign a competitive disadvantage, while having both signs "+/-" implies competitive advantage and disadvantage simultaneously.)

(a) *Government*

- The Jordanian public sector holds a monopoly as a supplier in the market for Dead Sea minerals;
- Intellectual property rights exist in Jordan but they are not properly enforced;
- Tight monetary and fiscal policies of the Jordanian authorities discourage investment.

(b) *Factor conditions*

+ Dead Sea minerals are an abundant and unique natural resource;
+ Transportation and communication are adequate, and there is room for their development;
+/- Abundance of cheap, unskilled labor;
-Simple technology needs to become advanced for future competitiveness.
-Aqaba Port is expensive compared with other regional ports (in Syria, Saudi Arabia and Egypt).

(c) *Strategy, structure, and rivalry*

+/- 90 per cent of the firms employ 15 or fewer workers;
+ Plan to increase production capacity and product lines to better serve foreign markets;
+ Health rivalry among producers;
- Highly fragmented-$4.7 million in sales shared among 20-30 producers.

(d) *Demand conditions*

+ Sophisticated demand in European countries;
- Foreign demands for products exceed current production capacity;
- Demand from Gulf countries is unpredictable owing to political tension between them and Jordan;
- Small local demand.

(e) *Supporting and related industries*

- Monopoly status of APC and Numeria creates tension in cluster;
- Lack of quality domestically produced packaging.

Following the above framework, specific detailed issues emerging from the JNCT analysis of the Dead Sea Cosmetics Cluster included the following:

(a) *Government*

The role of the government within Porter's diamond is to create a healthy competitive and investment friendly environment for both domestic and foreign investors. This allows all diamond constituents to interact and work in accordance to transparent rules and in harmony.

However, as the analysis revealed, this was not the case in Jordan's Dead Sea cosmetics cluster. One governmental function within the actual Jordanian cluster is to regulate the supply of Dead Sea minerals. A factor playing a major role in shaping this part of the cluster is the existence of a subsidiary of the Arab Potash Company (APC), Numeria, as the only supplier of Dead Sea raw materials namely carnallite and mud. APC extracts the mineral salt (carnallite) used as a raw material for the cosmetics and supplies it to Numeria. This gives it monopoly power over the market for the key raw material used in the cluster.

Numeria's main goals comprise organizing the process of selling carnallite, minimizing the waste of carnallite, lowering transportation costs, and upgrading the process of cleaning and dying the carnallite. Before the establishment of Numeria, the price of carnallite from APC was $126 per ton, while the mud was free. Presently, Numeria sells mud for $253.5 per ton and carnallite for $218 per ton.

This monopoly factor caused further concerns and fear for Jordanian producers in 1998 upon the entry into the market of a new producing firm, ISAL, which is 90 per cent owned by Numeria. Hence, the main supplier for raw materials in the industry became the main competitor. Consequently, tension dominated the cluster sabotaging any potential for good supplier-producer relations. Jordanian producers have viewed this as a threat and joined forces to change Numeira's objectives. That activity was the first cooperative effort among Jordanian producers in the Dead Sea cosmetic cluster that resulted in increased co-operation

Finally, the passive role of the Ministry of Tourism and Antiquities in promoting the Dead Sea as a whole worldwide is being criticized as relatively weak. Strong promotion in this case is particularly important in that it helps crate awareness and demand for Dead Sea related products.

(b) *Factor conditions*

Positive factor conditions in favor of Jordan's Dead Sea Cosmetics cluster include the abundance of unique Dead Sea minerals and mud, the availability of cheap unskilled labor, an adequate transportation and

communication infrastructure, and Jordan's significantly lower price for such materials relative to the only competitor in terms of possession of raw materials, Israel.

Negative factor conditions include high interest rates on loans, weak marketing programs at Jordanian colleges and universities, and relatively high shipping costs at the port of Aqaba compared to other regional ports. In addition, presently some Jordanian producers' efforts are directed towards preventing traders from exporting mud in bulk since it is considered to be an ineffective and inefficient use of resources.

(c) *Strategy, structure, and rivalry*

Jordanian producers of Dead Sea cosmetics are small-sized firms mainly family owned businesses concentrating on production in bulk. To be specific 80-85 per cent of Jordan's sales is bulk. This strategy is based on the perceived belief that it leads to the accumulation of capital needed for upgrading into higher, value added cosmetic products. This belief has led to limited market efforts to increase customer awareness about Dead Sea product benefits, and insufficient research and development for new high quality product lines.

Jordanian producers tend not to reach end consumers. Jordanian producers' exports of Dead Sea bulk materials are only directed to cosmetic factories, spas, and wholesalers operating in foreign markets, who in turn manufacture end products sold to retailers to reach final consumers.

By taking American distribution channels as an example, the role of Jordanian producers seems very small. Jordanian producers sell their Dead Sea products to wholesalers for only $7 per 400g of mud. Wholesalers then sell the Dead Sea product retailers for $30, who in turn sells it to the consumer for $60. This is almost nine times the original price the Jordanian producers ask for. In short, Jordanian reducers can multiply their profits by getting closer to the end consumer through the distribution channel. Only one Jordanian firm is currently attempting to achieve this by recently establishing its own marketing research activity in the US for Dead Sea products.

As a result of current strategies adopted in this cluster, such as producing low value added products or weak co-operation among Jordanian producers, Jordan's contribution in high value added Dead Sea cosmetic produces to foreign markets remain extremely low in that it does not exceed 1per cent. Whereas Israel; Jordan's sole rival in ownership of Dead Sea raw materials, contributes about 58 per cent of high value added products, in comparison to the rest of the world that amounted to 42 per cent.

Therefore, capturing the value of Dead Sea minerals is regarded as a missed opportunity in the sector. For example, Jordan sells 150g presentations of fairly good packaged mud in tubes with a moderately acceptable scent to wholesalers in international markets for $1.75. However, if Jordan is to sell 150g presentations of high quality packaged mud in tubes with an attractive scent, Jordan could increase the price to $2.60.

Even if the quality of mud was to stay the same, significantly higher revenues can still be achieved by simply packaging mud into 150g tubes for example, rather that resorting to sales in bulk. To be specific, selling a ton of mud in 150-gram packages produces a sharp rise in total revenues from $2050 to $11666. This amount of capital allows brand names to be built.

Similarly, as an alternative to selling carnallite in bulk for $480, more profits can be made by packaging carnallite into 500g tubes worth $0.9 or better yet 1000g tubes worth $1.6. Consequently, total revenues per ton rise from $480 to $1600 by using 500g tubes, and $1800 when using 1000g tubes.

Another key requirement for successful firm strategy is, understanding potential customer segments. By analyzing and defining the end consumer, the production of goods meeting consumer demand and taste, and lying within consumer purchasing power, becomes significantly easier to accomplish, thereby creating greater chances for success in the market. In brief, a greater understanding of consumers and their needs helps understand demand in the market thereby reducing risk for producers in terms of low sales revenues.

The importance of firm strategy and structure is expressed in the following example, which can also be used as an indicator of the level of strategy in the Jordanian cluster. One of the leading competitors in the world market for cosmetics is the international firm L'Oreal. Its brand name is both widely recognized and respected worldwide. It held the second highest sales value in recent years among the thirty top international cosmetic firms in the world.

L'Oreal recently entered the industry by undertaking a joint venture project with an Israeli firm rather than considering Jordan as a potential future base for investment. Investment decisions of this sizable nature are often based on open long-term opportunities with the minimum amount of associated risk. International firms such as L'Oreal wanting to invest in firms, usually seek strong firm structure with apt strategies that are implemented both properly and carefully.

In spite of the significant problems facing this cluster especially in terms of strategy, very few Jordanian producers did succeed in penetrating foreign markets and receiving recognition abroad. In 1998, a Jordanian firm received a US award for quality, as well a European one for best trade name. In addition, one Jordanian mud product was given full points for quality and certified as "best buy" by the widely acclaimed *Style* magazine, after being tested and compared to other non-Jordanian Dead Sea mud products.

(d) *Demand conditions*

Regarding demand conditions in the local market, there appears to be a potential customers segment consuming imported high quality cosmetics. This segment is a potential target for Jordanian producers who are facing major obstacles in terms of marketing their products. However, the Jordanian market for these particular products remains very small and there is significance lack of trust in domestic production. Lack of promotion and advertising plays a major role to this factor. On the other hand, some consumers prefer on obtain mud directly from the Dead Sea for free rather than purchase packaged products.

Longer-term world demand for Dead Sea products is believed to be relatively strong, in part due to their being composed of natural ingredients. In general, the world market for cosmetics is huge, with Japan, France. Germany and the US the largest per capita spenders.

The case of the largest world per capita consumer of cosmetics, the Japanese, was found to illustrate further the weakness of Jordanian exporters. Japanese consumers tend to prefer sophisticated cosmetics and acknowledged brand names, which Jordan cannot yet supply. Any decision to purchase such products is based on the combination of product quality and packaging, in which Jordan is still not strong. Penetration by Jordan of the Japanese market is thus still weak, while Israel is doing much better.

The world's second highest per capita market France is also an example of how Jordan fails to take advantage of opportunities in the international market. In 1998, Jordan's skin cream exports to France were worth a total of $3,940 in comparison to Israel's, which were worth $575,531. Additionally, Jordan imported skin cream from France worth a total of $59,661.

This and many other cases emphasize the poor international performance of the Jordanian Dead Sea cluster, especially in contrast to Israel. The role of Israel as a competitor has also been very important for the Jordanian Dead Sea cosmetics industry. Producing and marketing cosmetics and toiletries embodying Dead Sea minerals in a variety of products is taking place in Israel at a quantitatively and qualitatively higher level than in Jordan. The Israelis, who began working in this specific field a few decades ago, now play the major role in the world market for Dead Sea products. Based on the scientifically proven activity of minerals that are present in these products, producers in Israel have been constantly developing new formulas for hair care, body lotion and skin care along with other toiletries and products of similar nature to compete in the international market.

Israel seems to have a better grasp of the situation of Dead Sea cosmetics as a whole than that of the Jordanian industry. As similar as they may seem in terms of products and raw material, there is a big difference between Jordan and Israel's performance as individual clusters. A comparison between the entire Jordanian cluster and the largest Israeli manufacturer AHAVA shows that its sales reached $2.3 million only

three years after its establishment in 1988. In 1999, they amounted to an estimated $16.5, while sales for the whole sector in Jordan for that year reached only $4.1 million. To illustrate further AHAVA's success in comparison to the Jordanian Dead Sea cluster, AHAVA sales grew by 591 per cent from 1991 to 1998. Total sales for AHAVA were expected to reach $21.1 million in the year 2000.

By contrast with Israel, most Jordanian producers still adopt the strategy of producing low value added products. This occurs in spite of the quality of Jordanian raw material being superior to that of Israel's, due to the high percentage of magnesium in Jordanian carnallite. In addition to the low cost of raw carnallite in Jordan ($218 per ton as opposed to $ 750 in Israel) and the low cost of mud in Jordan ($253.5 per ton in comparison to Israel's $1000).

(e) *Supporting and related industries*

Although, local advertising costs are relatively low, while the Jordan Export Development and Commercial organization plays a significant role in export promotion due to its regular participation in international exhibitions, the industry still suffers from crucial weaknesses creating barriers to success in foreign markets. One of the most important problems in this respect is the absence of high quality Jordanian packaging firms and package design services. Local plastic manufactures exist in Jordan, but suffer from poor quality, delivery times, and lack high-end-design capabilities.

At the same time, packaging for cosmetics and toiletries is a growing industry in the world market particularly since it was valued at $9 billion in 1999 and expected to rise to $10.5 billion in 2002. In 1998, approximately 31 billion plastic pack units were used in the cosmetics and toiletries industry. The demand for such packs is expected to reach 44.5 billion in 2005.

Thus, in correlation with the main and related supporting industry relationship, the growth of the cosmetic industry will lead to a growth in the packaging industry and vice versa. This relationship depicts the importance of related and supporting industries in that their poor performance can negatively affect the performance of the main industry. The significance of packaging is expressed by one producer saying that, as competition increases in the personal care market, manufacturers are relying more on packages to get their products off the shelves and to consumers. This opens opportunities for investments in upgrading the packaging industry, particularly plastics.

The JNCT using the Porter cluster analysis the Jordan Dead Sea cosmetics cluster came to several general conclusions, including the following:

1. A healthy environment for competition in the Jordan Dead Sea cosmetics cluster is lacking due to the dominant role of the government within the industry. This continuously creates tension in the private sector and a lack of trust between Numeria and other private producers.

2. Firms within this cluster lack basic knowledge critical to their success. Examples are knowledge concerning customer needs and taste, basic distribution channels, the necessary marketing mix etc. In addition, there are no medical research centers for Dead Sea products. Such centers are necessary to improve product quality, increase promotion, and create consumer loyalty thus leading to stronger and more consistent sales.

3. As a result of these and other problems, the Dead Sea cosmetics industry as it now exists in Jordan is weak and does not function as a true dynamic cluster. Although important potential exists, if present policies and trends continue, the industry will not be able to emulate Israel's success in this respect.

As a result, several recommendations were made for the Dead Sea cosmetics cluster, including the following:

(a) To produce higher value Dead Sea products and improve the general standard of quality including that of packaging. Centers for worker training should be established, and there should be increased advertising and promotion in the local market;

(b) Increasing co-operation between producers must be undertaken, especially in marketing and advertising. Producers should discuss common marketing strategies and advertisement campaigns in Jordan and abroad. This can take place in co-operation with the Ministry of Tourism and Antiquities, as part of Jordan's tourism promotion agenda;

(c) Centers for Dead Sea medical research must be established, since firms cannot properly sell their products in foreign markets or even locally without providing customers with information concerning the medical benefits and use for their products. Such research centers can be established through joint finance by all Jordanian produces.

However, the practical application of these and other goals needed to ameliorate the performance of this particular cluster has proved to be difficult. As a result, it has now been recognized in Jordan that though the Porter approach provides partial help in diagnosing industrial problems, the search for a solution may have to be sought using other methodologies.

In the case of Jordan, the role of the government in this process has been central, but help by the government alone is not enough. This should be coupled with the producers wanting to improve their current status. This can come about through a joint effort in investing in value added products.

Change in the Jordanian packaging industry has been identified by the Porter analysis as one of the key elements in promoting the Dead Sea cosmetics cluster. This has placed more emphasis on the packaging industry as a whole, irrespective of considerations involving the Dead Sea cosmetics cluster.

At the same time, requests have come to the JNCT from the private sector asking for work to be done on the country's packaging industry. The JNCT has thus started to consider the country's packaging cluster. Other recent areas of concentration include the information technology cluster, agriculture in the Jordan Valley (with special emphasis on citrus production in the northern part of the region), the medical cluster, and Jordanian emigrant and expatriate community networks. However, these new areas of emphasis are not necessarily being dealt with according to the Porter methodology.

III. LEBANON

The Lebanese case of the application of cluster methodologies consists of a two-phased initiative sponsored by the US Agency for International Development Mission (USAID) in Lebanon designed to promote accelerated and sustainable economic growth in the country. USAID/Lebanon is collaborating with private sector and government stakeholders to help stimulate accelerated growth in three of Lebanon's leading export industries - Agri-industry, Financial and Business Services, and Tourism. Working through SRI International, a Lebanese consulting group, and the Lebanese American University (LAU), USAID has been employing the industry cluster development strategy used in the US and worldwide. The key goal of USAID activities in this area is to catalyze Lebanese industry groups to identify key challenges and opportunities, and then to act collaboratively to enhance their competitiveness and productive investment. Stakeholders in each of the three target industry clusters have identified initiatives to improve Lebanon's growth potential, and now are implementing some of them. The goal of USAID activities in this area is to catalyze Lebanese industry groups to identify key challenges and opportunities and act collaboratively to enhance competitiveness and productive investment.

The first phase consisted of a diagnostic assessment of Lebanon's economic conditions, constraints, and opportunities. This aimed primarily at identifying needs to be addressed during the second phase of the initiative. A key emphasis of the inquiry was placed on Lebanon's economic and commercial policies.

The second phase has been the preparation of industry cluster development plans for three sets of activities that offer strong growth potential for Lebanon: tourism, regional financial and business services, and light industry and agri-industry. Working groups with both private sector and public sector participation have prepared these cluster strategies.

SRI International carried out the overall project, in collaboration with LAU. SRI International, formerly known as Stanford Research Institute, is one of the largest non-profit research and consulting organizations in the US, and is a leader in the field of economic development and industry cluster growth strategies.

The joint SRI/LAU team noted that Lebanon's policymakers embrace the desirability of private sector-led growth, and voice a common view against government intervention in the economy. These leaders are supported by a widespread national consensus in favor of private enterprise.

The project team examined Lebanon according to the Commercial Policy Model developed by SRI International. This model provides for the scoring of commercial policies in nine categories: Import, Export, and Tax Policies, Investment Incentives, Foreign Investment Restrictions, Business Start-Up Procedures, Pricing and Interest Policies, the Foreign Exchange System, and Labor Policies. Once scored with values ranging between 0 and 100, countries can than be compared to regional competitors and international best practices.

Lebanon scored high on its commercial policies, achieving a score of 81 (the highest global score is 92 held by Singapore). Lebanon offered the best commercial policy environment among the region's countries used as benchmarks (Bahrain, Cyprus, Egypt, Jordan, Morocco, and Tunisia). Jordan was the closest competitor with a score of 77. Lebanon performed well in tax, export, import, foreign exchange, and labor policies relation to its regional competitors. The major general policy problem to address is the need to improve business start-up procedures.

The team then examined Lebanon's special factors or drivers that need to be taken into consideration in the design and implementation of an effective economic strategy. These include both constraints that need to be addressed and opportunities upon which a plan should capitalize. The following were identified:

(a) *Constraint drivers*

(i) Externally imposed political risk;
(ii) The cost of physical reconstruction;

(iii) The need to modernize soft infrastructure;
(iv) The small size of the market;
(v) Lack of consensus on Lebanon's economic future.

(b) *Opportunity drivers*

(i) The pro-market orientation of the government and people;
(ii) The heritage of entrepreneurship;
(iii) The overseas Lebanese community.

The economy's overall strengths and weaknesses were gauged through a balance sheet assessment, which identifies both assets and liabilities in key input areas, such as natural resources, labor, capital, infrastructure, and so forth.

This assessment found that Lebanon's most important economic asset is its labor force, which is highly educated and motivated. Offsetting this strength, however, is the relatively high cost of labor at all levels in relation to regional competitors. Lebanon has little in the way of natural resources except its moderate agricultural capacity and water supplies, and its regional location.

Lebanon is by regional standards strong in capital resources (both availability of capital and sophistication of the financial markets), but investment is stymied by high interest rates. The country's technology base is generally an asset; yet many industries require significant investments in new technologies in order to enhance their competitiveness. Finally, the infrastructure base remains weak due to war damage, but is recovering rapidly. Overall, Lebanon's economic balance sheet suggests that the country should concentrate on the production and sale of high value, niche goods and services.

Based on this, a proposed economic growth strategy and initiative was drawn up. During the course of the investigation, it became increasingly clear that the substantial scope of phase two of this initiative should focus on efforts to stimulate productive activities and investments in industries with major growth potential. The team found that numerous important commercial policy impediments remained in place, and that it would be more useful to address the issue of commercial policy constraints within the context of constraints facing productive enterprise growth-oriented industries. A key constraint to new investments in productive activities can be summarized as lack of confidence. This can be attributed in part to factors that are beyond the control of business (e.g., regional political uncertainty, deficits and indebtedness) but also a lack of consensus on a vision for the economy and hence insufficient investment in modernization in many industries.

Based on these considerations, it was decided to organize the second phase activities around the concept of industry cluster strategies. The methodology used by SRI states that industry clusters are attracted to or grow within specific regions or countries. Clusters rely on an active set of relationships among themselves to ensure individual and collective efficiency and competitiveness. They are linked and held together by buyer-supplier relationships (forward and backward linkages), competitor relationships, common customers, flows of factors (labor, technology, capital) between firms, and other factors such as the increasingly important role of service providers.

The team then engaged in the preparation of three industry cluster strategies, one each for light industry and agri-industry, regional business services, and tourism. Each of these clusters fits Lebanon's economic assets and is important to the future of the economy. Small working groups were established for each industry cluster. The working groups included participants from the private sector, government, and academic institutions. Participants were selected as individuals who have a strong knowledge and understanding of their respective industry cluster and the conditions it faces, demonstrate a commitment to overall Lebanese economic growth (beyond that of their agency, association, or firm), and display willingness to collaborate with their fellow participants on an objective basis.

Industry cluster strategies begin with the identification and definition of industry clusters holding strong prospects. The project team based its cluster selection analysis on available statistics and research, as

well as on viewpoints expressed during substantive reviews. In addition, the team employed three criteria on which to base its proposed clusters:

(a) The activities should offer clear promise for growth, thus leading to expand and new investments in productive Lebanese enterprises;

(b) The activities should be capable of creating considerable employment opportunities, tax revenues and foreign exchange earnings for Lebanon - key economic objectives of the country;

(c) The clusters of activities should be sufficiently broad to permit the identification of broad arrays of structural and policy reform needs.

Each of these clusters offers an export orientation as well as direct benefits for the domestic economy.

Tourism

Before 1975, Lebanon was a leading tourism destination in the region, offering an impressive array of attractions for respective market segments - pleasant climate and attractive nature, entertainment and culture, high quality hotels and restaurants, shopping, and a rich historical heritage. Many of these attractions were destroyed or deteriorated during the war, but could be restored. Tourism is a major global growth industry, and offers considerable employment opportunities for unskilled and semi-skilled labor. Tourism can also serve as a platform for the development of other industries through backward linkages and associated international services.

Restoration of tourism as a major factor in Lebanon's economy requires a concerted and broad-based effort. Careful analysis needs to be made of which market segments are most suitable for Lebanon, and which attractions should be offered. For example, it was asked whether Lebanon depends solely on business travel, or should it seek those interested in antiquities or different cultures and cultural events. What can be done to improve the supporting infrastructure and facilities? What improvements are needed in visa and customs formalities, tour facilities, production of goods attractive to tourist, restaurants, and a framework in which effective development can take place?

Lebanon's tourism activities have recovered and are growing rapidly as new hotels and tourism activities are introduced. The country has considerable potential, but tourism is constrained by a number of issues. Cluster action initiatives include updating the hotel classification system, improving the quality and quantity of human resources, identifying and enhancing tourism attractions, and preparing regional tourism strategies.

As part of this work, the following reports were produced:

(a) Tourism Promotion Agencies: International Experience and Best Practices;
(b) Modernizing Lebanon's Tourism Classification System;
(c) Inventory of Lebanon's Tourism Education and Training Programs;
(d) Tourism Workforce Development for Cluster Competitiveness;
(e) Middle Metn Regional Tourism Assessment and Strategic Plan Presentations.

The latter in particular gave a regional geographical orientation to work on the tourism cluster, covering the touristically important Middle Metn district to the northeast of Beirut. At the same time, this became linked with another cluster, namely that of agri-industry. This was done through the promotion of artisanal production of foodstuffs targeting tourists.

Light industry and agri-industry

This cluster is directed at Lebanese industry broadly defined to include light manufacturing and food processing. Lebanon has historically been a service economy, but it can be argued that its socio-economic conditions require a stronger industrial base, with its potential for employment, and a revived agricultural

sector, which can contribute to employment opportunities and better utilization of agricultural areas, reducing social pressures and rural-urban migration.

Lebanese industrial exports are varied, indicating an ability to identify specific niches in overseas markets. Historically, food products have been among the most important industries. Lebanon needs to build on its apparent comparative advantages in this area by aggressively seeking new export markets and at the same time bracing for the very likely decline of protection, leading to intense competition for those domestic industries not able to match global standards for price and quality.

Lebanon is not likely to prove competitive in world markets for mass produced manufactures, and it is not advisable to engage in manufacturing processes that are energy-intensive and thus at a comparative disadvantage to several of its neighbors. As a small, touristic country in which natural beauty is a major attraction, the country can ill afford aggravating its already existing environmental problems. Lebanese industry should seek product areas that involve flexible manufacturing and substantial value added in the form of technical input, design, and quality. Selling these features successfully in regional markets will place heavy emphasis on marketing skills.

In the food and beverage areas, Lebanese producers need to develop access to quality raw materials at reasonable cost, either through encouraging the cultivation of selected fruit and vegetable items or more productive animal husbandry and fishing activities within Lebanon or, very importantly, assuring access to imported raw material, most likely from neighboring countries in the region. Final products could include soft drinks, processed meat, cereals, fruits and vegetables, sauces and food preparations, confections, dairy products, wines, and olive and other edible oils. Potential markets would include the local Lebanese market, especially supplying the tourist industry in a positive form of import substitution, and international markets with emphasis on ethnic foods, as well as convenience or health oriented products. The potential for Lebanon in developing this sector is important, as it will encourage employment generation in rural areas and more economic use of arable land.

Achieving growth in manufactured goods exports required not only the careful identification of appropriate market niches, but also, measures to reduce local costs and inefficiencies in general, such high import duties on inputs, high-cost transportation, inefficient port handling, inadequate labor conditions, regulatory obstacles or lack of adequate technology.

Lebanon was formerly the source of considerable exports of food (both fresh and processed), now outpaced by foodstuff imports. Lebanon has the potential for reducing imports of food by sourcing locally, as well as for raising exports of high quality processed food products. Cluster initiatives in this area include identifying high-value export opportunities, promoting local sources of supply, and improving food quality standards.

Reports produced in this regard included:

(a) Lebanon High Value-Added Agricultural Products Export Initiative;
(b) Lebanon Agribusiness Import Substitution Initiative;
(c) Exports and Import Substitution in the Lebanese Agricultural Sector: A Field Survey;
(d) Inventory of Lebanon's Light Manufacturing and Agri-industry Quality Training Program.

As a result of this work, several Light Industry/Agri-industry Cluster Initiatives were proposed. These included the following:

Light Industry/Agri-industry Cluster Initiative No. 1: High Value Added Export

Lebanon has a promising agricultural base and a few examples of high value produce and food processing operations that add value to these produce. Presently the agricultural industries can provide products to the local markets; it also has a good potential to export specialty high-value food products to Middle Eastern countries and to Europe.

While there is basic potential to support a high-value agriculture industry, the long war and resulting technology weaknesses have prevented it from taking full advantage of this potential. This initiative would replace commodity products currently grown in Lebanon with high value produce.

The proposed programme would assure the selection and propagation of unique high quality fruits and vegetables for exports. In addition, it is believed that some fruit growing areas of Lebanon are particularly suited for the production organically grown fruits and vegetables. Such crops are highly valued in certain markets and this opportunity should be explored.

This initiative will require assistance to farmers in the selection of the proper plant varieties, the development off proper agricultural practices and assistance in export marketed development.

Under this initiative, experimental stations will be established to select and propagate high value fruit and vegetable varieties. At the beginning of the programme expert personnel -familiar with local plant varieties and environmental conditions- will be hired.

Concurrently market research will be conducted to identify attractive niche export markets for high quality or unique Lebanese crops.

After the selection of high value crops, the experimental station will propagate plants and supply farmers with seeds or plants. In addition, these experts will provide training to farmers on the specific agriculture technologies that required for successful production.

Finally, the initiative will provide assistance to farmers to sell their crops in export markets and to develop a brand identity for high value Lebanese produce. Airfreight firms will play a key role in transporting the high value added produce, working with producers to identify most promising markets and to meet their airfreight needs.

Under this pilot initiative, high value added fruits and vegetable crops would be selected, planted, and promoted for export niche markets. Varieties suitable for agri-processing will also be selected. This initiative would help phase out and replace lower-value commodity products currently grown in Lebanon that face stiff competition in the world market.

The pilot initiative includes three components.

Research: The research component identifies highest value crops, their market characteristics, and their agronomic and climatic requirements.

Extension: High-yielding varieties would be grown or propagated at nurseries and research stations and distributed or sold to Lebanese growers. Farmers would be instructed in how to grow the new crops.

Promotion: The initiative would also have a promotion component focusing on helping growers to market their crops in export markets. Eventually the programme would help develop brand identities for unique Lebanese varieties of fruits and vegetables.

Initiative mission

The mission of this initiative is to develop unique high quality fruits and vegetables with high potential for exports. The initiative would create a pilot local support for the selection and propagation of these unique high value Lebanese fruits and vegetables.

High quality local varieties of avocadoes, olives, figs, grapes, papaya, artichokes, and asparagus are among the fruits and vegetables that may be sold as branded Lebanese export products.

Initiative elements

Phase 1:

(a) Establishment of small experimental stations for the selection of fruits;

(b) Hiring dedicated personnel familiar with the local fruit varieties;
(c) Identifying attractive fruit and vegetable varieties that can be sold in niche markets;
(d) Conduct market research on export prices, volumes, and market preferences.

Phase 2:

(a) Propagate rootstocks;
(b) Train farmers to apply the proper agriculture.

Phase 3:

(a) Identify high prospect markets;
(b) Promote products in export markets;
(c) Develop brand identities for unique Lebanese products.

Initiative timing

Phase 1: 24 months;
Phase 2: 18 months;
Phase 3: 24 months (depending on outcome of first two phases).

Progress will be measured by a monitoring and evaluation system, starting with baseline production of high value products, incremental production, numbers of growers participating, and export volumes and values.

In fact, progress has been made in this initiative, especially in so far as it is linked with elements of the Tourism cluster.

Light Industry/Agri-industry Cluster Initiative No. 2: Prepared Food Supply for Food Service Operations

Raw material needs of the rapidly growing food service industry (e.g. fast food outlets, hospitals, airlines, etc.) represent an attractive business opportunity for Lebanese farmers and food processors. The food service industry requires regular daily supply of a variety of prepared food products.

Franchised international fast food firms such as McDonalds, Pizza Hut, KFC, Subway, etc. are advancing now in Lebanon and other Middle East countries. In addition to international brand names, there are a number of local fast food chains that are participating in this high growth market.

Currently the international food service chains are mainly dependent on expensive imported food supply. Combined with the rapid expansion of the fast food industry in the region, this represents an opportunity for Lebanese food producers.

Assuming producers can meet the rigorous price, quality and delivery requirements of the major chains, substantial business could be realized in supplying food service units with pre-cut salads, fresh cut-fruits, fruit juices, baked bread and buns, prepared potatoes, frozen hamburger patties, frozen chickens and many other food items.

International fast food franchises normally begin working with local supply contractors on smaller orders, particularly in fresh fruit and vegetable product areas. These items cannot be easily imported from their large American or European suppliers without an important risk of degradation. Building on successful smaller orders of fresh fruits and vegetables for nearby outlets, Lebanese suppliers have an opportunity to expand. Eventually the producers would have the possibility of becoming a preferred supplier for the high-volume contracts covering larger geographic areas in nearby countries.

Prepared food supply for the rapidly growing food service industry, particularly fast food outlets and major supermarket chains represent attractive new business opportunities for the Lebanese farmers and food procreators.

The mission of this initiative is to investigate the current supply procedures of the major food service chains and evaluate be suitability of the Lebanese food firms of becoming a supplier for them. The project will result local production substituting for food imports by the local fast food chains and supermarkets.

Initiative elements

(a) Compile a list of potential food products that can be produced in Lebanon at competitive prices, while meeting the required quality and delivery standards;

(b) Contact fast food chains and secure an agreement, initially for small orders of selected food items;

(c) Work toward becoming a preferred supplier for a major chain, covering the entire Middle East region.

Progress will be measured by the annual sales value to fast food industry. In fact, some progress has been made in this regard.

Financial and business services

This cluster consists of a potentially wide array of activities, including regional banking and financial services, trading, communications, media advertising/printing, and other business services. In theory, it could also be expanded at some stage to include regional education and health services, both were previously major foreign exchange earning activities in Lebanon. This cluster is intended to test the hypothesis that Lebanon can restore its role as a regional business center. These activities face the prospect of significant growth in the Middle East region, and offer high value employment and income producing opportunities.

Regaining Lebanon's previous pre-eminence in regional entrepot activities will not be easy. Financial services offer the greatest potential for growth. However, the banking and non-bank financial institution as well need to grow in size and improve their product offerings if they hope to support overseas business activities.

Other areas of potential service cluster growth include advertising, finance, insurance, printing, and publishing. To succeed in these areas, Lebanon needs to differentiate its product from that available in world centers, whether by language, cultural affinity or in-depth knowledge of the region's requirements. Potential clients have to feel more comfortable dealing in Lebanon than in Europe, for example, and confident as well that the level of service they receive is world class. Again, the legal and regulatory framework has to be right and the technical level of service competitive with world best practices.

Lebanon used to serve as the major hub for financial, business, advertising, and educational services in the Middle East; the country's economic foundations (e.g., banking expertise, high quality of education, etc.) offer prospects for restoring Lebanon's role as a regional business center. Cluster action initiatives include catalyzing business contacts among the Lebanese Diaspora, improving financial and business service competitiveness, and inaugurating efforts to re-establish regional educational activities.

Reports produced in this regard covered the following topics:

(a) Inventory of Lebanese Training Institutions in Management and Finance;
(b) Lebanese International Business Network;
(c) Lebanon Services Industry Task Force Implementation Plan.

The Lebanese banking industry flourished during the pre-war era to the point of becoming the premier banking center for the region. While it was capable of surviving a long destructive war, the sector's regional finance role collapsed. The banking industry is rebuilding itself today in an effort to regain a leading role in regional and international markets.

About 5 per cent of Lebanon's GDP originates in the banking sector. Presently, there are 1.7 bank branches per 10,000 inhabitants, a ratio that is in line with international standards. The number of branches between 1974 and 1998 has more than doubled. Lebanese banks possess more than 48 implantations abroad, in different forms, including representation offices, branches, offshore banking units, etc.

During the 1990s, the consolidated assets of Lebanon's banking sector have increased by more than six-fold. This impressive growth has been largely due to substantial increases in customer deposits, which have been fueled by the repatriation of funds. Customer deposits now account for over 80 per cent of consolidated assets, a ratio that has been broadly stable in recent years.

Some forward-thinking banks have started to tackle funding issues through international debt and equity issues. This will improve their long term lending capabilities and will allow them to deepen their involvement in consumer finance and mortgages, both of which are fast growing areas. The recent introduction of foreign currency Certificates of Deposit also indicates that attitudes to funding are changing.

As a result of both government regulations and attractive return, banks have traditionally invested the in Lebanese pounds in local government paper. This has been highly profitable for the banks but has limited local currency credits to the private sector. Traditionally, most bank credits to the private sector go to financing trade, services, and construction (65 per cent), with industry and agriculture receiving as little as 14 per cent. Moreover, most banking activity is concentrated in Beirut and its suburbs (accounting for 81.5 per cent of total credits).

Liquidity levels, as measured by the ratio of net liquid assets to customer deposits, averaged 68 per cent in the late 19990s, making Lebanese banks some of the most liquid in the world. Although present liquidity levels are damaging to both profit and loss accounts and the economy, it is expected that they will be maintained in the immediate future.

By regional and international standards, rates of return on both assets (RoA) and equity (RoE) have been outstanding in recent years. The average RoA at Lebanon's top ten banks is 1.5 per cent, while the average RoE is about 38.7per cent.

Bank services in Lebanon have continued to evolve to meet customers' changing demands. A much greater range of products and services is now available for specific customer needs. The diversity of products and services include:

(a) Specialized saving plans for retirement, education and housing;
(b) Mortgages, car loans, leases;
(c) Investment services: pension and mutual funds;
(d) Sophisticated detail payment methods.

The total number of bank employees is 15,000, representing 1.2 per cent of the country's labor force, including 39.5 per cent female employees. The value added per bank employee has increased from $12,000 in 1992 to $50,000 in 1997, and 72 per cent of the labor force in the banking sector has formal training or university degrees.

A range of choices is provided to users of payment services characterized by product differentiation in a highly competitive market. This competitive environment has led banks to develop a variety of competing systems especially in debit and credit cards. The use of Automated Teller Machines, cash dispensers, and standardized checks with magnetic ink character recognition is now widely spread throughout the country. In addition, banks are increasingly using SWIFT services to communicate and transfer funds locally and

across borders. Direct debit payments are becoming a relatively important method of making payments (public utility bills, taxes, etc.)

The future will witness the growing use of automated or electronic communications methods to make payment orders, especially since Lebanese banks are investing heavily in new and sophisticated information and communication technology.

However, despite the various promising elements in the Lebanese banking industry, work in this regard has not progressed strongly and the application of various elements of cluster methodologies has not been notably successful.

IV. CONCLUSION

Despite the above activities in Jordan and Lebanon, at the official as well as the popular levels, the concept of the cluster as a methodology for industrial development has yet to establish itself firmly in the ESCWA region.

Nevertheless, in both Jordan and Lebanon, some progress has been made in the fruitful use of the cluster concept. In Jordan, analysis based on the model advanced by Professor Porter for examining clusters has yielded a wealth of useful data concerning various aspects of the kingdom's economy. However, Jordan seems to be as far as ever from applying the cluster idea to raise productivity or output in any individual sector. One of the problems seems to be that, with a few exceptions, the private sector of the country has not responded as strongly as it should have to the cluster initiatives of the MoP and the JNCT. Meanwhile, the latter is looking to expand and broaden the perspective of its tools and models used beyond the Porter approach. In particular, the ideas of Michael Enright, among others, are being adopted to aid in the practical application of the cluster methodology and a continuation of the work of the JNCT.

In Lebanon, the approach taken by SRI seems to have had more success. Though the idea of business services cluster does not appear to have made much practical headway, the tourism and the agri-industry clusters are closer to bearing fruit. Preliminary practical steps have been taken in both areas to use the cluster approach advocated by SRI in creating fruitful linkages among businesses and enhancing productivity and growth. However, this process is in its early stages and much remains to be done to realize the goals of the work begun by the SRI/LAU teams on various clusters.

A major problem seems to be to balance a higher degree of competitiveness in each economy with certain kinds of co-operation among firms, and between the public and private sectors. On the whole, this seems to be easier to achieve in Lebanon than in Jordan. In the latter, and despite some change for the better, the role of the state is still not the ideal one sought in Porter's model, as witnessed for example by the activities of the Jordanian public sector in the Dead Sea cosmetics cluster. In Lebanon on the other hand, the state's role has been less obtrusive, while at the same time the private sector is more dynamic, and some of its business associations, for example in the agrifood sector, working to promote co-operation within a cluster.

For these and other reasons, the application of cluster methodologies in Lebanon so far appears to be somewhat more successful than in Jordan. This is not to say that the Porter methodology is less suitable to Jordan than the SRI one is to Lebanon, though this may in fact be the case.

In any case, the crucial issue of competitiveness, central to both the Porter and SRI approaches, is once again to be addressed in the region, this time through the work of the World Economic Forum (WEF), which is undertaking an Arab Middle East and North Africa (AMENA) competitiveness study. The AMENA study is about to be launched in various countries of the region, including Lebanon and Jordan, and will be presented in a WEF/Arab League conference in Cairo in March 2002. The AMENA study uses the established approach of the WEF's annual *World Competitiveness Report*, and should lead to further insights concerning the regional economy as well as those of individual countries. In turn, this should help to develop the application of the cluster concept, something that remains in its infancy in the region.