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EX-POST TRADE IMPACT ANALYSIS: A METHODOLOGICAL NOTE

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Abstract

This paper aims at providing technical details on trade indicators that are commonly and frequently used in ESCWA studies and assessments. The indicators presented in this paper are divided into three groups: *i*) region-level indicators; *ii*) reporter-partner level indicators; and iii) reporter-product level indicators. Most of these indicators are being used by the regional integration section at ESCWA in producing the trade structure and performance profiles for member states. These profiles, which represent an extension and not a replication of the existing profiles published by ITC and WTO, introduce a significant value added to the ongoing debate on the benefits and/or costs of trade integration schemas followed by most Arab countries since the conclusion of the Uruguay Round in 2014 and the creation of the WTO in 1995.

1 Introduction

ESCWA is often approached by its member states to provide technical assistance on assessing the impact of different prospective or in force trade agreements. Designing, negotiating, entering into and staying in a trade agreement depend crucially on a detailed assessment of trade performance prior to implementation, in the process of full implementation, and after the agreement is fully implemented. This can be achieved in a relatively comprehensive and communicable manner employing appropriate trade indicators. The objective of this paper is to present a battery of trade indicators commonly used in the ex-post assessment of trade performance. Some of these indicators are featured in the trade performance and structure profiles prepared by ESCWA.

This technical document is prepared by the regional integration section (RIS) of the Economic Development and Integration Division (EDID) of the United Nations Economic and Social Commission for Western Asia (ESCWA) as a manual to assist interested readers on the tools used by UNESCWA for its activities on assessing in force trade agreements. This is a second technical paper prepared by ESCWA in an effort to present tools and indicators used in trade performance analysis. The first one focuses on ex-ante, rather than ex-post, assessments of trade performance analysis. The current paper aims at providing technical details on trade indicators that are commonly and frequently used in ESCWA studies and assessments. The indicators presented in this paper are divided into three groups: *i*) region-level indicators; *ii*) reporter-partner level indicators; and iii) reporter-product level indicators[1].

2 Region-level indicators

An important mandate of ESCWA is to support member countries in regional economic integration initiatives, which prominently feature referential trade agreements. Gauging the extent to which such agreements deepen trade linkages among countries in the region involves calculating indicators measuring the regional orientation of trade flows. The intraregional trade share is possibly the most straightforward of those indicators.

2.1 Intraregional trade share

$$Intraregional\ Trade\ Share = \frac{T_{ii}}{T_i}$$

where T_{ii} denotes total exports plus total imports of region *i* to region *i* and T_i denotes the total exports and imports of region *i* to the world.

The intra-regional trade share essentially gauges the level of regional integration for a given region or bloc[2]. It takes values between 0 and 1, with a higher share indicating greater tendency towards engaging with partners within the region or bloc more intensely. Nevertheless, this simple indicator does not take into account the region's importance in world trade and the scope for intraregional trade in economically big regions.

The trade intensity index, described below, controls for the region's importance in world trade. An index of more (less) than one indicates a bilateral trade flow that is larger (smaller) than expected, given the partner country's importance in world trade.

[1] The level of disaggregation could be augmented, and the list of categories could be expanded. For expositional purposes, the list of categories is limited to three types of indicators in the current study. For instance, reporter-partner-product level indicators exist, and a separate category could possibly be introduced, if needed.

[2] This indicator could easily be modified to capture a region's share in a country's trade.

2.2 Intraregional trade intensity index

$$Intraregional\ Trade\ Intensity\ =\ \frac{\frac{T_{ii}}{T_i}}{\frac{T_i}{T_w}}$$

where T_{ii} represents total intra-regional exports and imports of region i , T_i denotes total exports and imports region i as a whole to the world and T_w denotes total world exports and imports.

The Intra-regional trade Intensity Index calculates regional trade share in terms of world's trade share for a given country in a given year. It measures whether a given country tends to trade with a specific regional trade in reference to country's trade with the world.

Accordingly, values equal to one indicates regional trade intensity is of equal importance as country's world trade, whereas values greater than 1 point to an intraregional preference for trade. As indicators' values approaches 0, regional trade in term of world trade becomes of less importance.

2.3 Regional Trade Introversion Index

$$Regional\ Trade\ Interoversion\ Index = \frac{(HI_i - HE_i)}{(HI_i + HE_i)}$$

where $HI_i = \frac{\frac{T_{ii}}{T_i}}{\frac{To_i}{T_O}}$

$$HE_i = \frac{1 - \frac{T_{ii}}{T_i}}{1 - \frac{To_i}{T_O}}$$

T_{ii} denotes total exports plus total imports of region i to region i .
T_i denotes total exports plus total imports of region i to the world.
T_{oi} denotes total exports and imports of region i to countries outside region i .
T_o denotes total exports and imports of outsiders.

In order to circumvent problems associated with the latter two indicators whereby trade indicator can decrease (increase) by simply adding countries to the region under consideration but have no (strong) regional tendency to another partnering region (GAFTA, EU, ASEAN, etc), then introversion index assesses regional trade inclination by taking into consideration both intra and extra regional trade weights of the region (country) under consideration.

The Index takes values between -1 and +1, in which values greater than zero indicates an intra-regional preference, negative value indicates preference toward extra-regional partner, and 0 values indicate a neutral tendency to trade with a partner (region) versus the rest of the world.

3 Reporter-partner level indicators

3.1 Trade Margins

Bilateral extensive margin (e.g. new exporters) defined as the weighted count of the sectors in which the exporter exports to the importer in a given year (Hummels, 2005). Weights correspond to the relevance of the exported sectors in total exports from the world to the importer

(excluding exports from the exporter) in a given year. More precisely EM_{ijt}, the extensive margin between exporter i and importer j in year t, is:

$$EM_{ijt} = \frac{\sum_{s \in S_{ijt}} Exports^{s}_{kjt}}{\sum_{s \in S} Exports^{s}_{kjt}} \quad (1)$$

Where k is the "rest of the world" by including all exporters to j except for i. $S_{ijt}$is the set of sectors s in which exporter i exports to j in year t. The numerator of EM_{ijt}measures exports from the rest of the world to the importer j in those sectors s in which i exports to j in year t. The denominator includes all exports from the rest of the world to j in all sectors S in year t. If all sectors s have equal importance for j during t, then EM_{ijt} is the fraction of sectors in which i exports to j during t. In general weights on sectors reflect their relevance in k's exports to j.

Interpretation: EM_{ijt} is between 0 and 1, the more the export margin is above zero indicates an increase in the number of new exporters, a zero score indicates that there is no new exporters in the market, in other words the more firms do trade, the more goods are trade, and consequently, the extensive margin is greater than zero, an extensive margin equal to 1 means that all firms in the economy engage in export operations

The bilateral intensive margin (e.g. the volume exported by an exporter) measures exports from the exporter to the importer relative to total exports to the importer (excluding exporter's exports) in those sectors in which the exporter exports to the importer in a given year. In particular:

$$IM_{ijt} = \frac{\sum_{s \in S_{ijt}} Exports^{s}_{ijt}}{\sum_{s \in S_{ijt}} Exports^{s}_{kjt}} \quad (2)$$

IM_{ijt} measures the intensive margin between i and j in t by comparing exports from i to j in t with exports from the rest of the world to j in t in the sectors s in which i exports to j in t.

Interpretation: $IM_{ijt}$is positive and can be below or above 1, the intensive margins can be seen as an increase in the economic scale, as the quantity traded increases the more the trade cost decreases, the greater the intensive margins is, the more trade quantities are.

As defined by Hummels and Klenow, (Hummels, 2005) the product of both margins delivers overall bilateral exports from i to j in t,OT_{ijt}, as the ratio of exports from i to j in t over exports from the rest of the world to j in t (numerator of EM_{ijt} is equal to denominator of IM_{ijt}):

$$OT_{ijt} = EM_{ijt} \times IM_{ijt} = \frac{\sum_{s \in} Exports^{s}_{ijt}}{\sum_{s \in S} Exports^{s}_{kjt}} \quad (3)$$

Note that Hummels and Klenow (2005) work on decomposing the measure of OT_{ijt} intoextensive margin and intensive margin. This work will study the relative importance of thetrade margins on the absolute level of bilateral trade flows, T_{ijt}, as opposed to the relative trade measure OT_{ijt}. Such strategy will allow us to tie our findings with previous work on the response of T_{ijt} to fluctuations in the bilateral real exchange rate. In order to do such decomposition of the variation of bilateral trade flows T_{ijt} we state the relationship between T_{ijt} and OT_{ijt}. Note that

$T_{ijt}$is the numerator of the defined IM_{ijt} in equation (2) (and is also the numerator in equation (3)). Therefore, defining $\sum_{s\in S} Exports_{kjt}^{s}$ asX_{kjt}, we can express T_{ijt} as:

$$T_{ijt} = OT_{ijt} \times \sum_{s\in S} Exports_{kjt}^{s} = EM_{ijt} \times IM_{ijt} \times X_{kjt} \quad (4)$$

Given the definitions of margins used, bilateral trade flows T_{ijt} can be decomposed intoextensive margin, intensive margin andX_{kjt}. Therefore variations in bilateral trade flowsT_{ijt} will be explained by variations in the margins of trade (as defined by Hummels and Klenow (2005)) and also variations in X_{kjt}. Where X_{kjt}, measures exports from the rest of the world to j in all sectors in year t.

Alternatively, it is of interest to explore what drives change in a country's exports in terms of existing markets and products or new ones, as well as discontinued products or markets. To this end, the change in exports of a country in question between two periods, *t* and t_0, can be decomposed into exports to existing markets and of products already in the export basket (intensive margin), exports to new markets and of new products (extensive margin). The decomposition can be represented in the following terms:

$$\Delta x_{ij}^{t,t_0} = \Delta x_{ij}^{t,t_0,OP,OM} + \Delta x_{ij}^{t,t_0,OP,NM} + \Delta x_{ij}^{t,t_0,NP,OM} + \Delta x_{ij}^{t,t_0,NP,NM} + DD^{t,t_0}$$

where $\Delta x_{ij}^{t,t_0}$ is the change in the value of merchandise exports of reporter country *i* to partner *j*, $\Delta x_{ij}^{t,t_0,OP,OM}$ is of old products to existing markets, $\Delta x_{ij}^{t,t_0,OP,NM}$ is of old products to new markets, $\Delta x_{ij}^{t,t_0,NP,OM}$ is of new products to existing markets, $\Delta x_{ij}^{t,t_0,NP,NM}$ is of new products to new markets in period *t* and DD^{t,t_0} represents discontinued products or markets. New-old products and markets defined vis-à-vis the initial period, t_0. Also, both sides of the equation could be divided by the change in total bilateral merchandise exports of the reporter country *i* to partner *j* to express the bilateral exports of new-old products and markets as a share of the total, adding up to one.

In practice, this decomposition can be carried out using different levels of disaggregation for the exports data at the product level, with highly granular data better capturing the dynamism of the exporter countries' initiatives to expand into new markets and products.

While the definitions of intensive and extensive margins appear fairly straightforward, alternative definitions of new markets and products could be employed. A new market could be defined as a partner to which no product was exported in the reference year but some products are exported in the year for which exports are decomposed. Alternatively, a new market could instead be defined in product-centric manner by referring to a market as a new market if it is a destination for a product even though it was not in a reference year. Under this definition, a market can be classified as new even if there were other products exported to the particular destination.

Similarly, a new product could be defined with respect to the partner or in a more ambitious manner regardless of the partner. Under the partner-specific definition, a new product is referred as one that was not exported to the partner in the reference year but exported in the year for which exports are decomposed. Under the ambitious definition, a new product could be defined as a product that was not exported to any partner in the reference year but exported to some destinations in the year for which exports are decomposed. It should also be noted that, depending on the

choices new product and market definitions, some of the components in the equation above could become redundant and calculations should be adjusted accordingly.

*3.2 **Export Sophistication***

It is widely believed that technology-intensive exports imply greater development benefits to exporting countries: they often reflect higher skill and technical endowments that consequently imply more rapid transfer and diffusion of new technologies. There is therefore considerable interest in analyzing the technological structure of exports in developing as well as developed countries. In the latter, it is now commonplace to compare shares of technically advanced products in production and exports and several institutions – like the US National Science Board, the OECD and the EU – do so regularly. There is also interest among developing countries in entering production networks that have the potential to raise exports and transfer new skills and technology. While product taxonomies are useful for analysis and policy, existing classifications have limitations, largely inherent in the industry-level data from which categories are drawn. Export sophistication is increasingly receiving interests from both analysts and policy makers as a powerful indicator of economic transformation and diversification performance. In general, some products are more sophisticated, in the sense that they are associated with higher productivity levels, and those countries that latch on to such products will perform better. Over time, the sophistication of a country's production structure may evolve.

To formalize the notion of sophistication, economic literature provided a measure of export sophistication (EXPY). Using the framework developed in Hausmann, Hwang and Rodrik (Haussman, 2007), this index aims to capture the productivity level associated with a country's export and is a proxy for the through either an increase in the quality of previously produced goods, or a move into new, more sophisticated products. The proposed methodology consists of four main and inter-linked steps.

In the first step, we will calculate the total exports of category p from each country over the world during the selected period. If countries are indexed by j, products indexed by l and p represents an export category, total exports of category p from each country are given by:

$$x_j^p = \sum_l x_{jl}^p$$

The second step consists of calculating the productivity level associated with each product. To do so, let Yj denote the per-capita GDP of country j. Then the productivity level associated with product k in category p, equals the weighted average of per capita GDPs, where the weights represent the revealed comparative advantage of each country in that product:

$$\mathrm{PRODY}_{\mathrm{k}}^p = \sum_i \frac{(x_{jk}^p / X_j^p)}{\sum_j (x_{jk}^p / x_j^p)} \times y_i$$

The numerator of the weight (x_{jk}^p / X_j^p) is the value-share of the product in the country's category p export basket. The denominator of the weight $\sum_j (x_{jk}^p / x_j^p)$ aggregates the value shares across all countries exporting that product in that category.

In the third step, we will derive the export sophistication index. To do so, the PRODY's used to compute the productivity level associated with country j's export basket of goods,

manufactured goods, or services, (export sophistication). Specifically, $EXPY_j^p$ is the average income and productivity level associated with all products in each category exported by a country. It is computed as the weighted average of all relevant PRODY"s, where the weights represent the share of the relevant product in the country's export basket. Thus,

$$\mathrm{EXPY}_i^p = \sum_i \frac{x_{il}^p}{X_i^p} \times \mathrm{PRODY}_\mathrm{i}^p$$

EXPYs are constructed for each country and for each year with available data.

Interpretation: both PRODY and EXPY range between 0 to +∞. A higher PRODY indicates a more sophisticated product. A high EXPY indicates a more sophisticated export portfolio.

Limitations: PRODY values for a product can be skewed upwards simply because high income countries produce them (e.g. agricultural products). Furthermore, sophisticated products such as computers may have relatively low PRODY values because they are assembled in and ultimately exported from low-income countries. EXPY does not account for quality, and so over estimates the importance of sophisticated products from low-income countries. EXPY also may be skewed by labor-intensive assembly of high-tech products performed in low-wage countries.

*3.3 **Trade costs***

Direct evidence on trade costs comes in two major categories, costs imposed by policy (tariffs, quotas and the like) and costs imposed by the environment (transportation, insurance against various hazards, time costs). In any case, one of the major problem is estimating trade costs is the multiple difficulties faced by economists in obtaining accurate measures of trade costs (see Anderson and van Wincoop, 2004) (Anderson, 2004). To overcome these limitations, specific economic models have been developed to provide an estimation of these costs both at aggregated and sectoral level. Gravity models are being used extensively for this purpose. In this respect, a variety of ad hoc trade cost functions have been used to relate the unobservable cost to observable variables.

The selected methodology in this paper follow the UNESCAP-World Bank methodology for estimating trade costs at bilateral and sectoral level. This methodology is fully consistent with a broad range of leading trade theories including Ricardian, the Heckscher-Ohlin model and heterogeneous firms' model (Novy, 2011). Moreover, this measure is useful in practice since it can be implemented easily once adequate data is made available. This method is known as the indirect method, which unlike the direct approach which includes time invariant cost components, it is a function of time varying variables and hence can serve as a tool to trace the evolution of bilateral trade costs over time. The bilateral trade costs in this report are hence measured by the following formula:

$$\boldsymbol{\tau_{ijt}^k = \left(\frac{x_{iit}^k \times x_{jjt}^k}{x_{ijt} \times x_{jit}^k}\right)^{\frac{1}{2(\sigma^k - 1)}} - 1}$$

At time t for sector k

Where,

$\tau_{ijt}^{k}$is the tariff equivalent trade cost from country to country at time for sector ,
$x_{iit}^{k}$and x_{jjt}^{k} is the domestic trade of sector in country and , respectively,
x_{ijt}^{k} and x_{jit}^{k} is the bilateral trade of sector , for country and , respectively,
σ^{k} is the elasticity of substitution between goods in sector

In this equation, the tariff equivalent trade cost measure is obtained by deducting one from the geometric mean of bilateral trade costs relative to domestic trade costs. Hence, the value of $\tau_{ijt}^{k}$is provided in ad valorem equivalent form. In other words, it gives the additional cost to the value of goods that are produced by sector k in country i and are exported to country j as compared to when country i trade these goods within its borders. The reading of the micro-founded trade cost measure is straightforward. Low values of τ_{ijt}^{k} corresponds to low trade costs which is the case when bilateral trade flows $x_{ijt}^{k}x_{jit}^{k}$ increase relative to domestic trade flows$x_{iit}^{k}x_{jjt}^{k}$.

In other words, as the ratio $\left(\frac{x_{iit}^{k}\times x_{jjt}^{k}}{x_{ijt}\times x_{jit}^{k}}\right)$ falls and countries trade more internationally than domestically, international trade costs must be falling relative to domestic trade costs. Whereas, τ_{ijt}^{k} values are high when countries tend to trade more with themselves than they do with each other and are infinite for any pair of countries that do not trade at all.

Intuitively, if a country sells relatively more of its production internationally than domestically, it must be because international trade costs have fallen relative to domestic trade costs, holding other factors constant. Similarly, if a country sells relatively more of its goods domestically than internationally, it must be because international trade costs have increased relative to domestic trade costs, holding other factors constant.

3.4 Trade Specialization index

$$Trade\ Specialization\ Index = \frac{X_{cg} - M_{cg}}{X_{cg} + M_{cg}}$$

Where
X_{cg} denotes exports of product g by country c.
M_{cg} denotes imports of product g by country c.

Trade specialization index varies between -1 and 1. It reveals the degree of specialization of a given economy in export production or an import consumption. TSI values that are close to -1 indicate to low level of specialization in an economy.

4 Product-level indicators

4.1 Revealed Comparative Advantage

$$Revealed\ Comparative\ Advantage = \frac{\frac{X_{cg}}{X_{c}}}{\frac{X_{wg}}{X_{w}}}$$

where X_{cg} denotes exports good g by country c, X_c denotes total exports of country c, X_{wg} denotes world's exports of good g, X_w denotes total world's exports.

This index is rooted in the principle of comparative advantage in which trade between countries is attributed to differences in factor endowments. The index is constructed in a way to measure a country's comparative advantage in a product vis-a-vis the international comparative advantage in the product in question. The index takes on positive values. If the index exceeds 1, then a country is said to have a revealed comparative advantage in that product. For instance, in 2016, Egypt exhibits a comparative advantage in agriculture products (Vegetables HS06- HS15) in relation to the world to register 3.16 on RCA scale (WITS: https://wits.worldbank.org/2018). The latter points to Egypt's comparative advantage in the aforementioned products as it engages in trade in the international market.

4.2 Regional orientation

$$Regional\ Orientation = \frac{\frac{X_{cgr}}{X_{cr}}}{\frac{X_{cg-r}}{X_{c-r}}}$$

where X_{cgr} denotes exports of good g by country c to region r, X_{cr} denotes total exports of country c to region r, X_{cg-r} denotes exports of good g by country c to countries outside region r, X_{c-r} denotes total exports of good g to countries outside region r.

Regional orientation index assesses the degree of country's products (exports) orientation towards a region under consideration. It varies between 0 and infinity, where values beyond 1 indicate that product(s) are more oriented towards a specific region than outsiders. For instance, the fact that Tunisia registered a regional orientation index of 5.53 in relation with Turkey in 2016 for product code HS9018 reveals a regional inclination to trade with Turkey for this specific product.

4.3 Export Market Penetration Index

Another It is the share of the actual number of export relationships (at the country-product level) forged by Country A in the maximum possible number of export relationships it can form given the number of its exports. The denominator is calculated by summing the number of countries that import each product that Country A exports.

4.4 Product space Maps

The sequential evolution of the developed economies from the production of less sophisticated to more sophisticated activities shows that economic development is not only a process of continuously improving the production of the same goods, but also one that requires structural transformation; that is, the accumulation of the capabilities needed to upgrade production toward activities associated with higher levels of productivity. This shift is in effect what leads to fast and sustained growth. This also implies that development is a path-dependent process and the only way to traverse it is through significant structural transformation. The work of Hidalgo (2007), among others, gives emphasis to the role of structural transformation in inducing growth and development. Specifically, they show that different products have different consequences for. This implies that development has to be understood as a process that involves not only the

production of more of the same set of products, but also the introduction of new ones. Thus, a sustained growth involves the accumulation of more complex sets of capabilities. To analyze development and structural transformation from this perspective, Hidalgo (2007) developed an analytical tool called the "product space".

The product space is a network representation of all the products exported in the world. Central to the construction of the product space are two ideas: (i) that the ability of a country to export a new product is dependent on its ability to export similar products; and (ii) that commodities requiring similar capabilities are more likely to be exported together. Hidalgo (2007) captures this notion of similarity between two products by observing trade outcomes rather than by looking at physical similarities between products or their inputs. They argue that the production (and export) of different products requires different and very specific capabilities, such as human or physical capital, knowledge of markets, legal systems, institutions, etc. What differentiates these capabilities is that some of them can be easily redeployed into the production and export of many other products; that is, there are some goods that are "closer" to other goods. Likewise, there are many other products that are "far away" and distant from other products. One example is the case of natural resources such as oil, which requires very specific capabilities that cannot be easily redeployed. They used the data on international trade from the "World Trade Flows: 1962-2000" which provides data on imports and exports for all countries, by country of origin and destination, at the level of disaggregation SITC revision 4, four-digit level that has been built using the United Nations COMTRADE database[3].

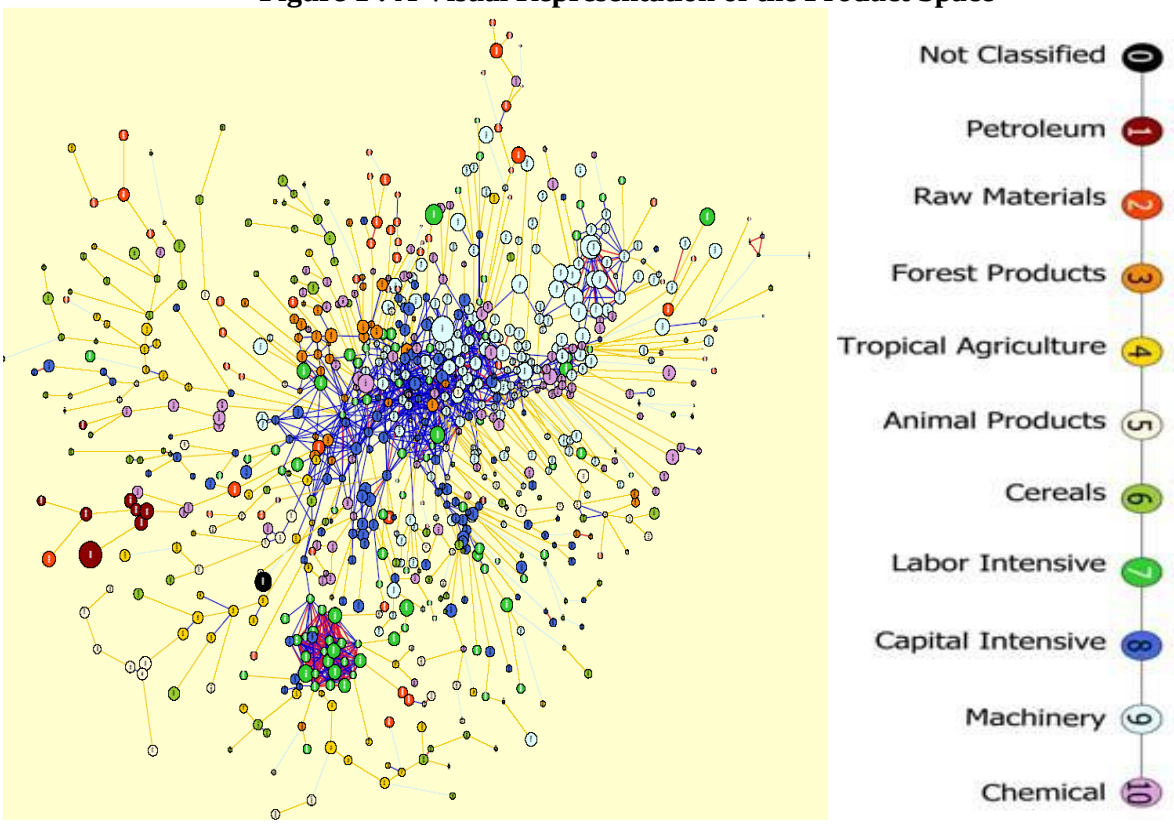
Given that the product space concept is based on the Relative Comparative Advantage (RCA) approach, a stringent measure of exports as an initial input is required for its building. As the approach is not based on marginal exports, but rather to confirm that a country exports a product whenever it has an established RCA in it. The equation below reflects such assumption where the numerator is the share of a country's total exports of the commodity of interest in its total exports. The denominator is the share of world exports of the same commodity in total world exports.

$$RCA(c,i) = \frac{\frac{x(c,i)}{\sum_i x(c,i)}}{\frac{\sum_c x(c,i)}{\sum_{i,c} x(c,i)}}$$

It takes a value between 0 and +∞ where x(c,i) is the value of the exports of country c in the ith good. Basically, RCA is larger than 1 when the share of exports of a country of a given product is larger than the share of that product in global trade. For Hidalgo (2007), this definition of RCA allows for setting a high threshold for countries' exports. When RCA(c,i) is greater or equal to 1, a country c exports product i. However, when RCA(c,i)<1 the corresponding country is not a competitive exporter of that product despite the fact that the same country could be an exporter for other goods. Numerous reasons could provide an explanation. The most important factors are trade diversion from the most competitive exporters in favour of less or non-competitive exporters as a result of preferential trade agreements. The second factor could be lower transaction costs that may compensate for the competitiveness gaps with competitors. The third reason may be related to the existence of informal and border trade.

[3] The database is an open source available at: http://cid.econ.ucdavis.edu/data/undata/undata.html

Figure 1 : A Visual Representation of the Product Space



Source: Haussmann and Klinger (2007)

Figure 1 shows the visual representation of the product space. Each node is a product; its share of world trade determines its size. In these figures, physical distances between products are meaningless; color-coding of the linkages between pairs of products shows proximity. A light-blue link indicates proximity of under 0.4, a beige link shows a proximity between 0.4 and 0.55, a dark-blue link indicates a proximity between 0.55 and 0.65, while a red link indices a proximity greater than 0.65. Links below 0.55 are shown only if they compose the maximum spanning tree, that is, they are the closest link between one of the products and the rest of the space. In order to differentiate sectors, products are colour-based according to commodity group.

It is immediately apparent in the figure below that the product space is highly heterogeneous. There are peripheral products that are only weakly connected to other products. There are some groupings among these peripheral goods, such as petroleum products (the large red nodes on the left side of the network), seafood products (below petroleum products) and garments (the very dense cluster at the bottom of the network), and raw materials (the upper left to upper periphery). Furthermore, there is a core of closely connected products in the center of the network, mainly of machinery and other capital-intensive goods.

This heterogeneous structure of the product space has important implications for structural transformation. If a country is producing goods in a dense part of the product space, then the process of structural transformation is much easier because the set of acquired capabilities can be easily re-deployed to other nearby products. However, if a country is specialized in peripheral

products, then this redeployment is more challenging, as there is no set of products that requires similar capabilities. The process of structural transformation can be impeded due to a country's orientation in this space (Hausmann and Klinger, 2007).

5 Cross country indicators

5.1 Bilateral concentration index of merchandise exports

$$Bilateral\ Concentration\ Index\ of\ Merchandise\ Exports = \sum_{g=1}^{n_c} \frac{\left(\frac{\mathrm{X_{cg}}}{X_c}\right)^2 - \frac{1}{n_c}}{1 - \frac{1}{n_c}}$$

where X_c denotes total exports of the reporter country c, $\mathrm{X_{cg}}$ denotes value of exports of good g by country c, n_c denotes total number of exported good by country c.

Also referred to as "normalized Herfindahl-Hirschman product concentration index", it is constructed to measure the level of trade dispersion across country's trade partners. The index can take on values between 0 and 1, with values close to unity pointing to exporter reliance on fewer trading partner, in turn, jeopardizing exporter's trade pattern in case of partners impose trade barriers/restrictions.

5.2 Intra-industry trade index

$$Intra\ industry\ Trade\ Index = 1 - \frac{\sum_{g=1}^{N}\left|X_g - M_g\right|}{\sum_{g=1}^{N} X_g - M_g}$$

where X_g denotes exports of good g by the reporter country, M_g denotes the total imports of good g by reporter country.

Intra-industry trade index measures the level to which products that belong to the same industry were being traded between two countries. With values between 0 and 1, values close to 1 corresponds to high level of intra industry trade. On the other hand, values close to 0 correspond to a high level of inter-industry trade for a given country.

5.3 Merchandise trade specialization correlation index

$$Merchendise\ trade\ specialization\ correlation\ index =$$

$$\frac{\sum_{g=1}^{N}\left(TSI_{cg} - \overline{TSI_c}\right)\left(TSI_{kg} - \overline{TSI_k}\right)}{\sqrt{\left(\sum_{g=1}^{N}(TSI_{cg} - \overline{TSI_c})^2\right)} * \sqrt{\left(\sum_{g=1}^{N}(TSI_{kg} - \overline{TSI_k})^2\right)}}$$

where TSI_{cg} denotes trade specialization for country c and good g, TSI_{kg} denotes trade specialization index for country k and good g, $\overline{TSI_c}$ denotes average trade specialization for country c and goods g, $\overline{TSI_k}$ denotes average trade specialization for country c and goods k

Merchandise trade specialization correlation index assesses the degree of trade specialization between two countries using product's trade specialization index. It varies between

-1 and +1 with high correlation values correspond to similar line of product specialization in the two countries.

5.4 Export similarity and export complementarity

$$Exports\ Similarity\ Index = \sum_{g=1}^{N} min\left\{\frac{X_{rg}}{X_r}; \frac{X_{cg}}{X_c}\right\}$$

where X_{rg} denotes exports of good g by region r, X_r denotes total exports of region r. X_{cg} denotes exports of good g by country c, X_c denotes total exports by country c.

Export similarity index assesses the degree of export profiles similarity between two countries. It ranges between 0 and 1 where 0 indicates no overlap in country's exports in relation to another country exports' profile and 1 indicates a perfect overlap of exports profiles between two countries. That said; countries that are competitors in the international market and/or within trade bloc register a high degree of exports similarity. Lebanon, per say, has exhibited a low degree of export similarities in relation to GAFTA bloc to register 0.15 on similarity index, whereas it registered 0.27 in same period in relation with Turkey. These results points to a more exports similarities in the export profiles for Lebanon with Turkey than GAFTA.

5.5 Trade Complementarity Index

$$Trade\ Complementarity\ Index = 1 - \left[\frac{\sum_{g=1}^{N} abs\ \left[\frac{M_{rg}}{M_r} - \frac{X_{cg}}{X_c}\right]}{2}\right]$$

where M_{rg} denotes imports of good g by region r, M_r denotes total imports of region r, X_{cg} denotes exports of good g by country c, X_c denotes total exports by country c.

The Complementarity Index measures the degree to which an export profile in a given country matches import profile of another country or region. It ranges between 0 and 1. The higher the index, the higher gains two countries can reap from trading with each another.

6 Conclusions

A large number of trade indicators and their context-specific variants are developed and presented in the literature. The indicators covered in this paper are by no means an exhaustive list but are selected on the basis of relevance for Arab countries. These indicators are used in ESCWA publications and readers interested in the technical details of how indicators are calculated should consult this study.

Nevertheless, ESCWA might build on this initial set of trade indicators and introduce new indicators, depending on the issues that come to the forefront in trade policy debates in the region. As new issues draw greater attention, ESCWA is planning to take into consideration new or modified trade indicators.

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