EXPORT PROMOTION

A Decision Support Model Approach

Editors

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Chapter 4

The methodology of the decision support model (DSM)

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4.1 Introduction

In Chapter 3 it was concluded that the DSM methodology is unique and specifically useful to guide export promotion organisations (EPOs) in more effective country-level export promotion activities. Therefore, in this chapter, a detailed description of the methodology of the DSM as well as other studies that support the use of the different variables used in the filters of the DSM, will be described.

4.2 The Walvoord fundamental framework of the DSM

The fundamental framework of the DSM was based on Walvoord's 1980 model for selecting foreign markets (Walvoord as in Jeannet & Hennessy, 1998:137-140, see also Chapter 3.3.1). The basic idea of Walvoord's model was that a screening/filtering process be used to assess international market opportunities. This process involves gathering relevant information on each market under investigation and filtering out less desirable markets. The screening process includes four filters in which uninteresting countries are quickly eliminated on the basis of general macro-indicators in the first filter in order to concentrate in detail on a more limited set of export opportunities in subsequent filters. Walvoord's model is illustrated graphically in Figure 4.1:

Figure 4.1. Walvoord's model for selecting foreign markets.

Source: Jeannet & Hennessey, 1988:139.

Filter 1 entails macro-level research to assess the general market potential of each of the countries under investigation in order to identify a set of preliminary opportunities. Macro-economic statistics such as GDP and GDP per capita are used in this filter to be able to assess the size of the different markets. The political environment, social structure and geographic factors of the different countries under investigation are also assessed in this first filter (Jeannet & Hennessey, 1998:137-140).

In Filter 2 product-related criteria are assessed in order to eliminate markets (product-country combinations) that do not show adequate size and growth. Cultural acceptance of products, the stage of development of the product and taxes and duties applied to the product in the various importing countries are also considered in this filter (Jeannet & Hennessey, 1998:137-140).

In Filter 3 micro-level research is conducted to investigate specific factors that might affect the marketing and sales of a product. Existing and potential competition, cost and ease of entry, reliability of information, sales projections, probable product acceptance and profit potential for each product-country combination under consideration are taken into consideration in this filter. It is argued that micro-level factors will influence the export success or failure of a specific product in a country and that marketers should assess only a small number of product-country combinations in this filter to make it feasible to get more detailed, up-to-date information (Jeannet & Hennessey, 1998:137-140).

In Filter 4 the factors that may affect market entry into the selected countries, for the specific company for which the model is applied, are taken into consideration. An evaluation and ranking of the potential markets are, therefore, based on the specific company's resources, objectives and strategies (Jeannet & Hennessey, 1988:137-140).

No example of an application of Walvoord's model could be found in the literature. It is, therefore, assumed that the model serves as a theoretical framework to be used as a guideline for the selection of foreign markets.

Although Walvoord's model focuses on selecting foreign markets for a "firm", Cuyvers *et al.* (1995:173-186) used its basic framework to construct a country-level market selection model specifically designed to support the planning and assessment of export promotion activities by government export promotion institutions. They called this a decision support model (DSM) to identify realistic export opportunities for a specific exporting "country". As mentioned in Chapter 1, the DSM was applied for Belgium (Cuyvers *et al.*, 1995), Thailand (Cuyvers, 1997; 2004) and South Africa (Viviers & Pearson, 2007; Viviers *et al.*, 2009; 2010). Although Cuyvers *et al.* (1995:173-186) used Walvoord's model as a framework for the DSM, many of the variables proposed in the Walvoord model could not be used in DSM

because of its firm-specific nature and the non-availability of data for the large number of product-country combinations assessed in the DSM. Examples of such variables include the stage of development of the product, sales projections, probable product acceptance and profit potential. An overview of the filters of the DSM will be subsequently provided.

4.3 The sequential filtering process of the DSM

The decision support model (DSM) starts with the assumption that all world markets hold potential export opportunities for a particular exporting country and, therefore, all possible product-country combinations enter the filtering process (Cuyvers, 2004:256). After every filter, a number of opportunities is rendered uninteresting and is not considered in subsequent filters. The sequence of the filters is illustrated in Figure 4.2.

4.3.1 Filter 1: Identifying preliminary market opportunities

In Filter 1 of the DSM, countries are eliminated that hold too high a political and/or commercial risk to the exporting country (Filter 1.1) and do not show adequate macro-economic size or growth (Filter 1.2). The rationale for this is that, with all the countries of the world as a starting point, Filter 1 enables the researchers to eliminate uninteresting countries in order to concentrate in detail on a more limited set of product-country combinations in the consecutive filters. Countries that lack general potential are, therefore, eliminated in this filter.

4.3.1.1 Filter 1.1: Political and commercial risk assessment

The first criterion that is considered in Filter 1 is the “political and commercial risk” that exporters would face in doing business with the foreign countries under investigation.

Commercial risk can be defined as the risk resulting from the deterioration of the importer’s financial situation, leading to the impossibility to pay for a consignment (ONDD, 2011). Indicators that are used to measure the overall commercial risk of a country include:

- (i) “economic and financial indicators” that affect all companies’ corporate results and balance sheets (e.g. devaluation of the currency, real interest rates, GDP growth and inflation);
- (ii) indicators reflecting the country’s “payment experience” (the ONDD and other credit providers’ past experience with the country); and
- (iii) indicators characterising the “institutional context” in which local companies operate (e.g. corruption index, transition economy) (ONDD, 2011).

Figure 4.2. Sequence of filters in the DSM.

Source: Own figure constructed from Jeannet & Hennessey, 1988:139.

Political risk is defined as any event occurring in the importing country assuming the nature of *force majeure* for the importer, such as wars, revolutions, natural disasters, currency shortages and government action (ONDD, 2011). Indicators that are used to measure the political risk of a country include,

- (i) an assessment of the "economic and financial situation";
- (ii) an assessment of the "political situation"; and

(iii) a “payment experience” analysis.

The assessment of the “financial situation” is based on external debt ratios and liquidity indicators such as the level of foreign exchange reserves. A country’s “economic situation” is evaluated by using three sets of indicators, namely indicators of economic policy performance (e.g. fiscal policy, monetary policy, external balance, structural reforms), indicators of the country’s growth potential (e.g. income level, savings, investments) and indicators of external vulnerability (e.g. export diversification and aid dependency). The assessment of the political situation in a country is based on a quantitative analysis of the “political risks” associated with doing business in the country (not specified by the ONDD) and the “payment experience” analysis is based on data of the ONDD and other credit insurers’ past encounters with the country (ONDD, 2011).

Many academic, private and government institutions around the world rate countries on the basis of the political and commercial risks that an exporter in these countries would face¹.

In the previous applications of the DSM, the country risk ratings of the Belgian public credit insurance agency, Office National du Ducroire (ONDD) were used in this part of Filter 1. The rating methodology of ONDD was adopted by OECD and the ratings conform to the OECD’s Arrangement on Guidelines for Officially Supported Export Credits² and are not conducted from the point of view of a specific exporting country. These ratings can readily be consulted at the ONDD website³. They can, therefore, be used by any exporter that wants to establish the degree of risk involved in dealing with a specific country.

The ONDD rates countries on a scale of 1 to 7 for political risk, where 1 indicates a low political risk and 7 indicates a high political risk. Political risk ratings are provided for the short, medium, and long term. The commercial risk rating is presented as either an “A”, “B”, or “C”, where an “A” indicates low commercial risk and a “C” indicates high commercial risk (ONDD, 2011). The three political risk ratings for each country under investigation are transformed from a 1 to 7 scale to a 1 to 10 scale, whereas the commercial risk country rating is transformed in such a manner that a score of 3.33 is assigned to an “A” rating, a score of 6.67 is assigned to a “B” rating and a score of 10 is assigned to a “C” rating. This transformation is necessary to construct an overall country risk score. Firstly, an average political risk score (simple average of the three political risk scores) is calculated for each country under investigation. Secondly, the average political risk score and the commercial risk score are weighted equally to calculate an overall country risk score for each country under investigation. This country risk score is used to determine a critical value to eliminate

1 See <http://www.countryrisk.com>.

2 For more information see Cutts & West, 1998:12-14; Moravcsik, 1989:173-205.

3 <http://www.delcredere.be>.

less interesting countries from the analysis. Countries are eliminated if they belong to the two highest credit-risk groups of the ONDD, namely 6 C and 7 C.

To illustrate the process, consider country X with the following political and commercial risk ratings as an example.

Table 4.1. Country X's risk ratings.

	Political Risk: short term	Political Risk: medium term	Political Risk: long term	Commercial Risk
Country X	4	5	3	C

In order to construct the country risk score, the country risk ratings should be transformed as discussed in the previous paragraph. The transformed risk ratings for country X are given as:

Table 4.2. Country X's transformed risk ratings.

	Political Risk: short term	Political Risk: medium term	Political Risk: long term	Commercial Risk
Country X	5.71	7.14	4.29	10

By following the method described above, country X's average risk score is 7.86.⁴

When a particular country's risk score exceeds the critical value of 9.286 (short, medium and long-term political risk score equals 6 and commercial risk is rated as C), this country is excluded from further analysis of potential export opportunities. Country X in Table 4.2 would therefore be included in the further analysis of potential export markets, because its average risk score of 7.86 is below 9.286.

4.3.1.2 Filter 1.2: Macro-economic size and growth

The second criterion that is used to screen the remaining countries in Filter 1 of the DSM is a "country's macro-economic size" measured by GNP and GNP per capita (Cuyvers, 1997:4; 2004:256). Data on GNP and GNP per capita for each country for a specified period are gathered from the World Economic Outlook (IMF, 2010) and World Development Indicators (World Bank, 2010) databases and a cut-off point is identified in order to eliminate countries that do not show large enough overall potential (Cuyvers, 1997:4; 2004:258). Cuyvers *et al.* (1995:177) warned that a cut-off point should be determined in a conservative way to avoid

4 The average political risk score is calculated by $[(5.71 + 7.14 + 4.29) / 3]$ and equal to 5.71. The average of the average political risk score and the commercial risk score is then calculated by $(5.71 + 10)/2$ and equal to 7.86.

eliminating too many countries. The cut-off point or critical value (CV) for the GNP and GNP per capita values is defined as:

$$CV = \bar{X} - \alpha \sigma_x$$

where $\bar{X}$ is the average of X (GNP or GNP per capita) and σ_x is the standard deviation of X (Cuyvers, 1997:4; 2004:258). α is a factor which is determined in such a way that a marginal change would cause a dramatic drop in the number of countries selected, or when a comparable number of countries is eliminated for both GNP and GNP per capita within a small range of α -values. A sensitivity analysis is, therefore, carried out, starting from $\alpha = 0.1$ and increasing it consecutively by 0.001, where the number of countries eliminated for each value of α is monitored (Cuyvers, 2004:258). It is clear that if $\alpha = 0$, the cut-off point would be the average, in which case half of the countries included in Filter 1 would be eliminated (if the data are distributed normally) (Cuyvers, 2004:256). When the α -value is increased, the number of countries eliminated will decrease gradually and the α -value that is selected would be the last one before there is a clear break in the number of countries eliminated (Cuyvers, 2004:256).

Countries are selected if:

$$X_j \geq CV$$

for at least two consecutive years of the most recent three-year period for which data are available, where X_j is the GNP or GNP per capita for country j (Cuyvers, 1997:4; 2004:258). If a country, for instance, has sufficient GNP or GNP per capita values for two subsequent years, but not for a third year, it will still pass the first filter. This ensures that countries that do not meet the requirements for only one year would not be eliminated for subsequent analysis (Cuyvers *et al.*, 1995:178).

4.3.2 Filter 2: Identifying possible opportunities

In Filter 2 an assessment of the various product categories for the remaining countries is done to identify product-country combinations (markets) that show adequate import size and growth.

Two criteria are used in this filter, namely “import growth” and “import market size”. Import data were gathered from the World Trade Analyzer database of the International Trade division of Statistics Canada (SITC 4-digit) and the United Nations Comtrade Database (HS 6-digit)⁵ (UNCTAD, 2010). The short- and long-term growth rate and the size of imports of

5 Given the objectives of the DSM and intended use of the results for government export promotion purposes, the databases used in the DSM should be sufficiently reliable and the use of the data

the different product-country combinations that entered Filter 2 are assessed (Cuyvers *et al.*, 1995:178; Cuyvers, 1997:5; 2004:257).

Three variables are, therefore, calculated for each product-country combination, namely “short-term import growth”, “long-term import growth” and “import market size”. “Short-term import growth” is considered to be the most recent available simple annual growth rate in imports. “Long-term growth” is calculated as the compounded annual percentage growth in imports over a period of five years. Finally, the relative “import market size” is calculated as the ratio of imports of country *i* for product category *j* and the total world imports of product category *j* (Cuyvers *et al.*, 1995:178; Cuyvers, 2004:259-260).

Subsequently, a cut-off value for Filter 2 needs to be calculated. Cuyvers *et al.* (1995:179) argued that if the exporting country under consideration was already specialised in exporting a particular product category, the cut-off point for these markets had to be less stringent. Therefore, the Specialisation Index (SI) or Revealed Comparative Advantage (RCA) Index (Balassa, 1965) is used to define cut-off points for each of the above-mentioned sub-criteria.

$$RCA = \left(\frac{X_{i,j}}{X_{w,j}} \right) / \left(\frac{X_{i,tot}}{X_{w,tot}} \right)$$

where:

$X_{i,j}$: exports of country *i* (which is the exporting country for which realistic export opportunities are identified) of product *j*;

$X_{w,j}$: worldwide exports of product *j*;

$X_{i,tot}$: total exports of country *i*; and

$X_{w,tot}$: worldwide exports of all product categories.

An RCA index of 0 means that country *i* either does not export, or exports very little of the product category. An RCA index larger than or equal to 1 means that country *i* is relatively specialised in exporting the product category under consideration (Cuyvers *et al.*, 1995:179).

Cut-off values for the variables of Filter 2 are defined as follows (Cuyvers, 1997:5; 2004:260):

For “short- and long-term import growth” a scaling factor, s_j , is firstly defined (Willemé & Van Steerteghem, 1993, as quoted by Cuyvers, 1997:5; 2004:260) in order to take the

should not lead to incorrect or unintentional analyses and interpretations. Due to the fact that the data used in the DSM is available in international data sources, the DSM can be applied to any exporting country for which international trade data is available.

exporting country's degree of specialisation in the exports of product category j into account when defining cut-off values:

$$s_j = 0.8 + \frac{1}{(RCA_j + 0.85) \exp^{(RCA_j - 0.01)}}$$

The cut-off values were then defined as (Willemé & Van Steerteghem, 1993:6-7, as quoted by Cuyvers, 1997:5; 2004:260):

$$g_{i,j} \geq G_j ;$$

with $g_{i,j}$ being the import growth rate of product category j by country i ; and

$$G_j = g_{w,j} s_j, \text{ if } g_{w,j} \geq 0 ; \text{ or}$$

$$G_j = g_{w,j} / s_j, \text{ if } g_{w,j} < 0$$

with $g_{w,j}$ being the total world imports of product category j . Table 4.3 illustrates these cut-off points.

This procedure is carried out for both "short-term" and "long-term growth" rates (Cuyvers, 1997:6; 2004:260). If the above-mentioned criteria are met by a particular country for a specific product, a "1" is assigned in the "short-term" and/or "long-term import growth" columns in Table 4.5. A "0" is assigned in the case where the criteria are not met.

Furthermore, "the relative import market size" of country i for product category j was considered sufficiently large if (Cuyvers, 1997:6; 2004:260):

$$M_{i,j} \geq S_j$$

where $M_{i,j}$ is the import market size of country i for product category j ; and

$$S_j = 0.02 M_{w,j}, \text{ if } RCA_j \geq 1 ; \text{ or}$$

$$S_j = [(3 - RCA_j) / 100] M_{w,j}, \text{ if } RCA_j < 1$$

Table 4.3. Illustration of cut-off points for short- and long-term growth.

	$0 \leq RCA < 1$ (The exporting country for which the model is applied is not specialised in exporting product j.)	$RCA \geq 1$ (The exporting country for which the model is applied is specialised in exporting product j.)
$g_{wj} > 0$ (World short- or long-term growth rate in product j is positive.)	Country i 's short- or long-term import growth rate of product j (g_{ij}) must be between one and two times the world growth rate for product j . For example: If $RCA = 0$ and $g_{wj} = 5\%$, then $s_j = 1.988$ and G_j (cut-off point) = 9.94% If $RCA = 0.5$ and $g_{wj} = 5\%$, then $s_j = 1.25$ and $G_j = 6.25\%$	Country i 's short- or long-term import growth rate of product j (g_{ij}) is allowed to be a bit lower than, or equal to, the world growth rate for product j . For example: If $RCA = 1$ and $g_{wj} = 5\%$, then $s_j = 1$ and $G_j = 5\%$ If $RCA = 1.5$ and $g_{wj} = 5\%$, then $s_j = 0.895$ and $G_j = 4.475\%$
$g_{wj} < 0$ (World short- or long-term growth rate in product j is negative.)	Country i 's short- or long-term import growth rate of product j (g_{ij}) must be higher than the world growth rate for product j . For example: If $RCA = 0$ and $g_{wj} = -5\%$, then $s_j = 1.988$ and $G_j = -2.5\%$ If $RCA = 0.5$ and $g_{wj} = -5\%$, then $s_j = 1.25$ and $G_j = -4\%$	Country i 's short- or long-term import growth rate of product j (g_{ij}) is allowed to be a bit lower than, or equal to, the world growth rate for product j . For example: If $RCA = 1$ and $g_{wj} = -5\%$, then $s_j = 1$ and $G_j = -5\%$ If $RCA = 1.5$ and $g_{wj} = -5\%$, then $s_j = 0.895$ and $G_j = -5.59\%$

Source: Own table based on Cuyvers (1997:5; 2004:260).

Table 4.4 illustrates the implication of the above-mentioned cut-off points.

Table 4.4. Illustration of cut-off points for import market size.

$0 \leq RCA < 1$ (The exporting country for which the model is applied is not specialised in exporting product j .)	$RCA \geq 1$ (The exporting country for which the model is applied is specialised in exporting product j .)
Country i 's imports of product j (M_{ij}) must be between 2% and 3% of total world imports of product j . For example: If $RCA = 0$, then S_j (cut-off point) = $0.03 M_{wj}$ (3% of total world imports of product j) If $RCA = 0.5$, then $S_j = 0.025 M_{wj}$ (2.5% of total world imports of product j)	Country i 's imports of product j (M_{ij}) must be greater or equal to 2% of total world imports of product j .

Source: Own table based on Cuyvers (1997:6; 2004:260).

Again, each product-country combination is assigned a "0" or a "1" in the relative "import market size" column of Table 4.5, based on whether the above conditions as illustrated in Table 4.4 are fulfilled or not.

The selection of markets in Filter 2 is based on the categorisation illustrated in Table 4.5.

A product-country combination is selected to enter Filter 3 if it falls in category 3, 4, 5, 6 or 7 (Cuyvers, 1997:6; 2004:261). A market should therefore at least be growing adequately in the short or long term (see Table 4.3) and/or be of adequate size (see Table 4.4) to be considered for further analysis. The remaining product-country combinations subsequently enter Filter 3.

Table 4.5. Categorisation of product-country combinations in Filter 2.

Category	Short-term import market growth	Long-term import market growth	Relative import market size
0	0	0	0
1	1	0	0
2	0	1	0
3	0	0	1
4	1	1	0
5	1	0	1
6	0	1	1
7	1	1	1

Source: Cuyvers (1997:7; 2004:261).

4.3.3 Filter 3: Identifying probable and realistic export opportunities

According to Cuyvers *et al.* (1995:180), it holds true that being selected on the basis of size and growth does not necessarily mean that markets can be easily penetrated. In Filter 3 trade restrictions and other barriers to entry are considered to further screen the remaining possible export opportunities. Two categories of barriers are considered in this filter, namely the “degree of concentration” (Filter 3.1) and “trade restrictions” (Filter 3.2) (Cuyvers *et al.*, 1995:180; Cuyvers, 1997:7; 2004:261).

4.3.3.1 Filter 3.1: Degree of import market concentration

According to Cuyvers *et al.* (1995:180), a market that is very “concentrated” is difficult to enter. A particular import market is considered to be concentrated if only a few exporting countries hold a relatively large market share and therefore have a lot of market knowledge and are well known by local customers. To confirm their argument, Cuyvers *et al.* (1995:180) carried out a partial analysis that revealed a negative correlation between export performance and market concentration. Cuyvers *et al.* (1995:180) concluded that it would be inefficient for export promotion organisations with limited resources to focus on heavily concentrated markets for which the chances of successful exporting are relatively small.

In the DSM the Herfindahl-Hirshmann-index (HHI) of Hirshmann (1964) is used to measure the degree of concentration in a market. The index is calculated as follows⁶:

6 The trade data needed to calculate this index were gathered from the World Trade Analyzer database of the International Trade division of Statistics Canada (SITC 4-digit) and the United Nations Comtrade Database (HS 6-digit) (UNCTAD, 2010).

$$HHI_{ij} = \sum \left(\frac{X_{k,ij}}{M_{tot,ij}} \right)^2$$

where:

$X_{k,ij}$: the exports of country k to country i for product category j ; and

$M_{tot,ij}$: country i 's total imports of product category j .

A HHI of 1 indicates that the importing market is only supplied by one exporting country and a HHI closer to 0 indicates a lower market concentration (importing market supplied by many exporting countries). It would, therefore, be more difficult for an exporting country to penetrate a particular market if the HHI for that market is relatively high (closer to 1) (Cuyvers *et al.* 1995:180; Cuyvers, 1997:7; 2004:261).

A cut-off point for market concentration had to be derived. Cuyvers *et al.* (1995:180) stated that it had to be kept in mind that concentration can be considered a bigger problem in a non-growing market (in which a market share will have to be won from often firmly established competitors) than in a large, growing market. Therefore, the cut-off point for market concentration was designed to be dependent on the category to which the various markets were assigned to in Filter 2 (see Table 4.5).

The cut-off points were defined as follows (Cuyvers, 1997:8; 2004:262):

$$h_k \geq HHI_j$$

with:

$$h_k = \bar{x}_h - 0.05\alpha\sigma_h, \text{ for category 3}$$

$$h_k = \bar{x}_h + 0.05\alpha\sigma_h, \text{ for category 4, 5 and 6}$$

$$h_k = \bar{x}_h + 0.15\alpha\sigma_h, \text{ for category 7}$$

where:

$\bar{x}_h$: average of the HHI-values of all product-country combinations under investigation; and

σ_h : standard deviation of the HHI-values of all product-country combinations under investigation.

It is clear that a larger degree of concentration is tolerated for larger, growing markets. An α -value is selected where there is a “jump” in the number of product-country combinations selected (Cuyvers, 1997:8; 2004:262).

4.3.3.2 Filter 3.2: Trade barriers

The second set of accessibility criteria used in Filter 3 is “trade barriers”. An index for “revealed absence of barriers to trade” was used in the Belgian and Thai studies as a proxy for trade barriers. The reason for this was that, at the time, for a large number of product-country combinations, no data were available on tariff and non-tariff barriers. Furthermore, the information that could be gathered was not available on the same product classification level (e.g. SITC 2-digit or SITC 4-digit level) as the trade data used in the rest of the DSM and it was very difficult to aggregate the information to the appropriate level (Cuyvers *et al.*, 1995:180). There was, therefore, a need to follow a different approach, and the hypothesis was formulated that if the neighbours of Belgium or Thailand could establish a relatively strong market position in a particular market, it means that trade barriers in this market would not be too difficult for Belgium or Thailand to overcome (Cuyvers *et al.*, 1995:181; Cuyvers, 1997:7; 2004:262). The revealed absence of barriers to trade (M_{ij}) is calculated as follows⁷:

$$M_{ij} = \frac{\frac{X_{Neighbour1,i,j}}{X_{Neighbour1,j}} + \frac{X_{Neighbour2,i,j}}{X_{Neighbour2,j}} + \frac{X_{Neighbour3,i,j}}{X_{Neighbour3,j}} + \dots}{\frac{X_{World,i,j}}{X_{World,j}}}$$

with:

M_{ij} : the corrected market share of the neighbours of the country for which the model is applied in country i 's imports of product category j ;

$X_{Neighbour,i,j}$: the exports of each of the neighbouring countries of the country for which the model is applied, of product category j to country i ;

$X_{World,i,j}$: total world exports of product category j to country i .

Again, a cut-off point for this criterion of Filter 3 had to be identified. The cut-off point was defined with the assumption in mind that a higher relative share M_{ij} reflects a relative lack or a revealed absence of barriers to trade (Cuyvers *et al.*, 1995:181). Therefore, the higher

7 The trade data needed to calculate this index were gathered from the World Trade Analyzer database of the International Trade division of Statistics Canada (SITC 4-digit) and the United Nations Comtrade Database (HS 6-digit) (UNCTAD, 2010).

the $M_{i,j}$ -value, the easier it would be for the country for which the model is applied to access the market in question (Cuyvers *et al.*, 1995:181). Cuyvers (1997:8; 2004:263) stated that no α could be determined unambiguously and that he was therefore compelled to apply the following rule of thumb to define a cut-off point for this criterion:

$$M_{i,j} \geq 0.95$$

This implies that, with a margin of error of 5%, if at least one of the neighbouring countries of the exporting country for which the model is applied, has a “revealed comparative advantage” (RCA) in exporting to a particular market, it is assumed that there are no “revealed barriers to trade” for the exporting country for which the model is applied in that market (Cuyvers, 1997:8; 2004:263).

To enter Filter 4, product-country combinations need to have adequately low market concentration and barriers to trade. Both the conditions in Filter 3 have to be met in order for a market to enter Filter 4.

4.3.4 Filter 4: Final analyses of opportunities

In the last stage of the analysis the realistic export opportunities identified in Filters 1 to 3 are categorised and prioritised and no markets are eliminated.

According to Cuyvers *et al.* (1995:181), the strength of an exporting country’s position in a foreign market can be derived from criteria that determine its competitive advantage. For each of the markets that entered Filter 4, the relative market share of the exporting country (country n) of product category j in country i is calculated as follows:⁸

$$\mu_{n,ij} = \left(\frac{X_{n,ij}}{X_{w,ij}} \right) / \left(\frac{X_{n,j}}{X_{w,j}} \right)$$

where:

$X_{n,ij}$: country n ’s exports of product category j to country i ;

$X_{w,ij}$: world exports of product category j to country i ;

$X_{n,j}$: country n ’s total exports of product category j ; and

$X_{w,j}$: world exports of product category j .

8 The trade data needed to calculate this index were gathered from the World Trade Analyzer database of the International Trade division of Statistics Canada (SITC 4-digit) and the United Nations Comtrade Database (HS 6-digit) (UNCTAD, 2010).

This is the same Specialisation Index (SI)/Revealed Comparative Advantage (RCA) that was used in Filter 2. It is now only calculated on a per market basis. The hypothesis of Cuyvers *et al.* (1995:182) was that a country has a comparative strength in doing business in a market if it has succeeded in obtaining a strong position in that market.

Subsequently, the relative market share of the exporting country ($\mu_{n,ij}$) is calculated for all markets that entered Filter 4. Also, the relative market share of the six countries with the largest exports in each product-country combination ($\mu_{six,ij}$) is calculated. A comparison can then be made between the relative market share of country n in each market that entered Filter 4 and the relative market share of the six largest exporting countries in these markets. By calculating the difference between country n 's relative market share and that of the six dominant exporting countries of product j to country i , it is possible to determine country n 's market importance in each market under consideration (Cuyvers, 1997:14; 2004:267).

The following categories of market importance are identified (Cuyvers, 1997:14; 2004:267):

$\mu_{six,ij} - \mu_{n,ij} > 3$: Country n 's relative market share is relatively small.

$1.5 < \mu_{six,ij} - \mu_{n,ij} \leq 3$: Country n 's relative market share is intermediately small.

$0 < \mu_{six,ij} - \mu_{n,ij} \leq 1.5$: Country n 's relative market share is intermediately large.

$\mu_{six,ij} - \mu_{n,ij} \leq 0$: Country n 's relative market share is relatively large.

The entire filtering process leads to the following matrix (Table 4.6) to categorise the realistic export opportunities that were identified in Filters 1 to 3 in terms of size and growth in demand and the exporting country's current market share in these markets.

It can be seen that the classification in the rows of Table 4.6 is obtained from Filter 2 (see Table 4.5), which indicates the size and growth of imports of the different markets, while the columns are based on the relative market share of the exporting country calculated in Filter 4.

From Table 4.6 it is evident that a total of 20 different kinds of markets are distinguished and the markets that entered Filter 4 are each assigned to one of these markets (Cuyvers *et al.*, 1995:182; Cuyvers, 1997:15; 2004:269). Each product-country combination that is identified by the DSM as an export opportunity is assigned a cell. The exporting country for which the model is applied will, therefore, know what the potential (demand) in the market is (import size and growth) and whether the exporting country has already utilised this opportunity or not (based on the relative market share already established). If a product-country combination is classified in Cell 5, for instance, it means that the demand in that

market is large and growing in the short and long term, but the exporting country for which the model is applied has a relatively small market share in that market. This is, therefore, a market opportunity that is not exploited to its full potential by the exporting country.

Table 4.6. Final categorisation of realistic export opportunities.

Size and growth of importing market	Market share of country <i>n</i> (Filter 4)			
	Relatively small	Intermediately small	Intermediately large	Relatively large
Large product market	Cell 1	Cell 6	Cell 11	Cell 16
Growing (short- and long-term) product market	Cell 2	Cell 7	Cell 12	Cell 17
Large product market with short-term growth	Cell 3	Cell 8	Cell 13	Cell 18
Large product market with long-term growth	Cell 4	Cell 9	Cell 14	Cell 19
Large product market with short- and long-term growth	Cell 5	Cell 10	Cell 15	Cell 20

Source: Cuyvers, 2004:269.

Export promotion organisations can also use these cells to formulate export promotion strategies for the markets (product-country combinations) identified in the DSM as realistic export opportunities. Cuyvers *et al.* (1995:183) suggest that an offensive market exploration export promotion strategy be used for export opportunities in Cells 1 to 10, based on the exporting countries' relatively small market share in these markets. An offensive market expansion strategy is suggested for export opportunities in Cells 11 to 15. Due to the fact that the exporting country already has an intermediately large market share in these markets and the demand in these markets is large and/or growing, market expansion is recommended. For export opportunities in Cells 16 to 20, a defensive export promotion strategy of market maintenance is recommended by Cuyvers *et al.* (1995:183).

It is, however, important to take the number of resources available by the export promotion organisation into consideration when choosing different export promotion strategies. As resources are limited, export promotion organisations are advised by Cuyvers (1997:14-15; 2004:270) not to actively promote export opportunities in Cells 1 to 10, but rather to gather market information on these opportunities and distribute this information to the relevant exporters. Such export promotion organisations can then rather focus on expanding markets in Cells 11 to 15 and maintaining markets in Cells 16 to 20.

In section 4.4 support from the international market selection literature for the variables used in the different filters of the DSM is summarised.

4.4 Support from the international market selection literature for the different filters of the DSM

Table 4.7 refers to other studies (firm-level and country-level, see also Chapter 3.2) from the international market selection literature that support the use of the different variables included in the DSM.

Table 4.7. Other literature supporting the use of the DSM variables.⁹

Filter/procedure used in the DSM:	Studies supporting:
Screening process (elimination of uninteresting opportunities)	Cavusgil (1985:29) Kumar <i>et al.</i> (1993:29) Jeanet & Hennessey (1998:138-142) Rahman (2003:120)
Filter 1: Country risk GDP / GNP / GDP per capita / GNP per capita / GDP / GNP growth	Verno (2008) (see section 3.3.8) Cavusgil (1985:29) Russow and Okoroafo (1996:50) (see section 3.3.3) Hoffman (1997:70) Arnold & Quelsh (1998:7-20) (see section 3.3.6) Papadopoulos <i>et al.</i> (2002:170-171) (see section 3.3.4) Rahman (2003:121-122) DTI (2004) (see section 3.3.7) Sakarya <i>et al.</i> (2007:209) (see section 3.3.6) Verno (2008) (see section 3.3.8)

⁹ An earlier version of this table was also published as conference proceedings of the International Academy of Business and Economics conference in Barcelona, Spain, June 2011 and published in the *Journal of International Business and Economics* (Cuyvers, L., Viviers, W. & Steenkamp, E.A (2011). The utilisation of export opportunities in the world market: a comparison of Belgium, South Africa and Thailand).

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4.5 Refinements to the DSM methodology

As mentioned in Chapter 1, the DSM was originally developed by Cuyvers, De Pelsmacker, Rayp and Roozen and applied to Belgium in 1995. It was then applied to Thailand in 1997 and again in 2004. The model was refined and applied to South Africa in 2007 and 2009. In 2010 the DSM was run on a HS 6-digit level for the first time for South Africa and in order to do a comparative study (see Chapter 8), it was also applied on a HS 6-digit product level for Belgium and Thailand.

Throughout the years, five main refinements were made to the original methodology of the DSM as described. These include:

- (i) including GDP and GDP per capita growth values into the analysis in Filter 1.2;
- (ii) using the Harmonised System (HS) six-digit level trade data instead of the SITC 2- or 4-digit data;
- (iii) calculating a potential export value for each selected product-country combination in order to prioritise between export opportunities;
- (iv) taking the exporting country's production capacity into account; and
- (v) determining a new method of measuring the market accessibility of South Africa in the different product-country combinations (Filter 3.2).

In sections 4.5.1 to 4.5.5 a discussion of each of these refinements follows.

4.5.1 Including GDP growth and GDP per capita growth in Filter 1.2

In the applications of the DSM for South Africa in 2007, 2009 and 2010 as well as the 2010 applications for Belgium and Thailand, GDP and GDP per capita values were used instead of GNP and GNP per capita values. Also, GDP growth and GDP per capita growth rates were added as part of Filter 1.2. This was done to include countries that showed above average GDP and GDP per capita growth for three years in a row, even if the size of the market (GDP or GDP per capita) is not sufficient. Countries were, therefore, selected based on GDP growth and GDP per capita growth if the growth values were above the world average growth rates for the most recent three years for both growth measures. A country was selected to enter Filter 2 if it either qualified in terms of GDP or GDP per capita values or GDP growth and GDP growth values (Viviers & Pearson, 2007; Viviers *et al.*, 2009; 2010).

4.5.2 Using HS 6-digit product data

Harmonised System (HS) 6-digit level trade data were used in the 2010 applications of the DSM for Belgium, South Africa and Thailand instead of the SITC 2- and 4-digit data used in the previous applications of the model. This adjustment was made due to the fact that exporters mostly use the Harmonised System (HS) product classification to specify their goods in export ventures and documentation (Tempier, 2010). The HS 6-digit level product classification is also the most disaggregated level of product specifications that is standardised¹⁰ throughout the world (Tempier, 2010). The introduction of HS 6-digit level trade data, therefore, contributes to the effective use and application of the results of the DSM by export promotion agencies and exporters.

4.5.3 Calculating a potential export value for each selected product-country combination

Although the previous applications of the model provided a list of realistic export opportunities; it did not give an indication of which opportunities are of a higher value than others. It was therefore difficult to prioritise between the identified export opportunities. For example, in the 2009 application of the DSM for South Africa, Turkey ranked in the seventh place with 261 products identified as export opportunities and the USA only ranked 14th with 230 products. It might, however, be that the potential export value of the 230 products in the USA exceeds the potential export value of the 261 products in Turkey. Therefore, the number of opportunities of a country is not necessarily an indication of the potential export value. Another example is small wares and toilet articles, which have export opportunities in 41 countries and rank second when compared with other products, while motor vehicles for the transportation of goods or materials ranked 20th with opportunities in 35 countries. Again, the size of the export opportunities was not considered and a ranking based on the number of opportunities is not accurate.

The potential export value for each product-country combination identified export opportunity was, therefore, calculated as follows in the 2010 applications of the DSM for Belgium, South Africa and Thailand (see Chapter 6):

$$\frac{\text{The total imports of country } i \text{ of product } j}{\text{number of countries that contributes 80\% of these imports} + 1}.$$

10 Standard product codes are used all over the world on a HS 6-digit level. For any higher level of product specification (8-, 10- or 12-digit level) the codes used are not standardised over the world and the code for a particular product, namely the national tariff line (NTL), in one country could differ from the NTL code used in another country.

This estimation of export potential gives an indication of the size of the import demand for each product-country combination and takes into consideration the possibility of South Africa being added (therefore, the plus one in the formula) to the group of countries which collectively represents 80% of the imports of product j to country i .

4.5.4 Taking the exporting country's production capability into consideration with RCA

So far, the DSM approach mostly focuses on the demand potential (size, growth, competitors, market access) for products in different countries and do not take into consideration the production capacity of the exporting country. It may therefore be that the DSM so far identifies export opportunities for a specific product in many countries, but the exporting country might not have the excess capacity to produce more of this product. However, by considering the exporting country's revealed comparative advantage (RCA) in producing and exporting the different products under consideration, it is ensured that only products in which the exporting country is relatively specialised are selected as export opportunities.

The revealed comparative advantage is an indication of the exporting country's relative specialisation in the production and exportation of a particular product (Balassa, 1965; Krugell & Matthee, 2009). The formula used to calculate exporting country n 's revealed comparative advantage is:

$$RCA_j = \left(\frac{X_{n,j}}{X_{World,j}} \right) / \left(\frac{X_{n,tot}}{X_{World,tot}} \right)$$

where $X_{n,j}$ is the exporting country n 's exports of product j , $X_{n,tot}$ is country n 's total exports of all products, $X_{World,j}$ is the world's exports of product j and $X_{World,tot}$ is total world exports of all products (Balassa, 1965; Krugell & Matthee, 2009). In the 2010 applications of the DSM an additional criterion was introduced which involves that the exporting country should have a revealed comparative advantage of at least 0.7 (see Chapter 6) in a particular product in order for markets to be selected in the model.

4.5.5 Determining a new method of measuring the market accessibility of South Africa in the different product-country combinations (Filter 3.2)

An index for "revealed absence of barriers to trade" was used as a proxy for trade barriers in Filter 3.2 in the Belgian and Thai studies (see section 4.3.3.2). It was argued that if Belgium's (or Thailand's) neighbours could successfully export a particular product to a country, it would not be too difficult for Belgium (or Thailand) to also be able to overcome the trade barriers in that market (Cuyvers *et al.*, 1995:181; Cuyvers, 1997:3-21; Cuyvers, 2004:262). In the application of the DSM to identify realistic export opportunities for South Africa specifically, this second part of Filter 3 could not be applied in the same way. Therefore, a

different approach to the revealed absence of barriers proxy had to be followed in the South African study.

In the 2007 application of the DSM for South Africa, Viviers and Pearson (2007) used crow-fly distances between Pretoria, South Africa, and the capital cities of the countries that entered Filter 3 as a measure of trade barriers. After assessment of this proxy, it was found that this cannot be considered a very good estimation of market accessibility, and another proxy for market accessibility was developed (Viviers *et al.*, 2009:68). In the 2009 application of the model for South Africa, a new index for market accessibility was constructed by using distance, transport cost, the World Bank Logistics Performance Index (LPI), average applied tariffs per country and the frequency coverage ratio of non-tariff barriers per country (Steenkamp *et al.*, 2009; Viviers *et al.*, 2009).

Although this index overcame the limitations of using only distance as a measure of trade barriers, this index still had its own limitations. The main limitation of this measure of market accessibility (or barriers to trade) is that the index was only calculated on a country level and not a product-country level. A country can, therefore, perform well overall in terms of this measure/index, but specific products can still be highly protected or restricted in that country. With the purpose of the DSM to identify product-country combinations with the largest export potential, this country-level measure of market accessibility was not ideal.

Therefore in the 2010 application of the DSM for South Africa, a new way of measuring South Africa's market accessibility on a product-country level was, therefore, devised. The new index included the following variables:

- (i) "international shipment time" (ocean freight) from Durban harbour to the main port in the destination country (Linescape, 2010);
- (ii) "international shipment cost" (ocean freight) from Durban harbour to the main port in the destination country (quotes obtained from three main shipping lines per country);
- (iii) "domestic time to import" including the time required for obtaining all necessary documents, inland transport and handling, customs clearance and inspections and port and terminal handling (Doing Business Report, The World Bank, 2009);
- (iv) "domestic cost to import" including the costs associated with all documentation, inland transport and handling, customs clearance and inspections, port and terminal handling and official costs (Doing Business Report, The World Bank, 2009);
- (v) "logistics performance index" measuring the efficiency of the customs clearance process; quality of trade and transport-related infrastructure; ease of arranging competitively priced shipments; competence and quality of logistics services; ability to track and trace

- consignments; and the frequency with which shipments reach the consignee within the scheduled or expected time (Arvis, Mustra, Ojala, Shepherd & Saslavsky, 2010);
- (vi) *ad valorem* equivalent tariffs per product-country combination (Market Access Map, ITC Comtrade database, 2010a);
 - (vii) *ad valorem* equivalent non-tariff barriers per product-country combination (Kee, Nicita & Olarreaga, 2008).

An index value for measuring market accessibility, incorporating all seven the above-mentioned variables, was calculated per product-country combination by means of a principle components analysis. Three factors that measure the market accessibility of a market were identified in the principle components analysis, namely a “domestic” factor that incorporates domestic time and cost and the LPI; an “international” factor that includes international shipping time and cost; and a “barrier” factor that includes tariff and non-tariff barriers. The three factor scores were then added¹¹ to arrive at a market accessibility index for each product-country combination that entered Filter 3. This market accessibility index provides a score for each product-country combination relative to all other product-country combinations included in the analysis. Each index value is, therefore, not very meaningful on its own. It places the position of each product-country combination relative to all other product-country combinations. For the purposes of this study, where the product-country combinations with the least accessibility for South Africa needed to be identified and eliminated, this index for market accessibility proved to be useful.

4.6 Conclusion

In this chapter, the development of the DSM methodology over time, and the adaptation and refinement thereof in various applications thereof, were discussed. Moreover, some new concepts, such as the average export value associated with each realistic export opportunity are unambiguously defined (see section 4.5.3).

In Part II the applications of the DSM approach, as applied to several countries between 1991 and 2010, will be discussed.

11 Since longer times to import, higher cost to import, higher tariffs and non-tariff barriers affect market accessibility negatively and a higher logistics performance index affects market accessibility positively, the signs of these variables were taken into consideration in the addition of the factor scores to calculate a market accessibility index value.

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