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Thailand's export opportunities and export potentials in the world : a quantitative assessment using the DSM approach

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1. Introduction

Since the early-1980s Thailand has aspired to become a new “Asian tiger”, following an outward-oriented development strategy. This strategy has been strengthened in the last two decades by the deepening regional integration process under AFTA.

In the present paper, we endeavor to make a quantitative assessment of Thailand’s export opportunities in the world, based on international statistical data of 2003 up to 2008.

In the next section we outline the methodology used to identify Thailand’s export opportunities, and review the relevant literature. Apart from some revisions, to which we shall return soon, the same methodology was used for the same purpose before by one of the authors (Cuyvers, 1996, Cuyvers, 2004), thus also allowing some comparison with previous results. The methodology is outlined in detail for the reader’s convenience.

In the third section we discuss the results of the sequential statistical “filtering” process, after which in the fourth and fifth section, the distribution of Thailand’s export opportunities at product level and on a geographical basis respectively is reviewed and discussed. The paper ends with conclusions.

2. Methodology: decision support model approach

A small but growing literature addresses the question of how to identify opportunities for exporters (for an overview we refer to Steenkamp, Viviers and Cuyvers, 2012). The bulk of this literature focuses on attempts to segment export markets or focus on the decisions of firms entering export markets.

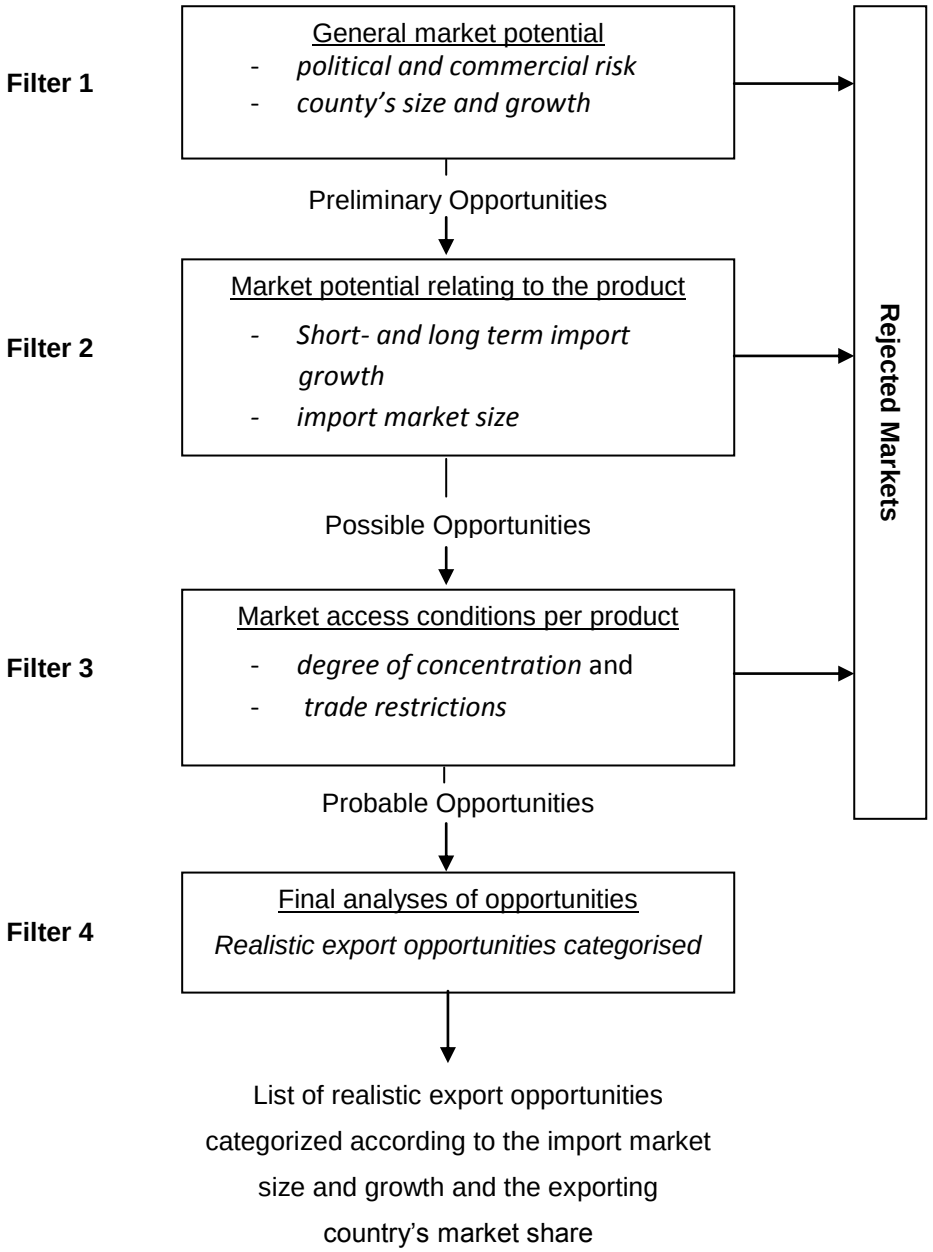
The DSM methodology (Cuyvers et al., 1995:175, Cuyvers, Steenkamp and Viviers, 2012a) used here was developed based on similar methodologies in the international marketing research literature. It consists of consecutive steps which select markets and products based on the most recent statistical data, in such a way that it leads to a list of product:country combinations of realistic export opportunities. The methodology is summarized in the Figure 1.

The basic idea of the DSM is derived from Walvoord’s (1983:83) model, which is a screening process to be used to assess international market opportunities. This would involve gathering relevant information on each market under investigation and filtering out less desirable markets (Jeannet and Hennessey, 1998:137-140). It is argued that when a filtering process is used, uninteresting countries can be quickly eliminated on the basis of general macro-indicators in the first filter in order to enable the researcher to concentrate in detail on a more limited set of export opportunities in subsequent filters.

In *filter 1* of the DSM, countries are eliminated that hold too high a political and/or commercial risk to the exporting country and do not show adequate size or economic growth. The rationale for this is that, with

the 241 countries of the world as a starting point[4], 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.

Figure 1: The basic methodology of the DSM



In *filter 2* an assessment of the various product categories for the remaining countries is made to identify product:country combinations which show adequate import size and growth. 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. Therefore, in *filter 3* trade restrictions and other barriers to entry are considered to further screen the remaining possible export opportunities. Two categories of barriers

[4] Which constitutes to a total number of 237,626 possible export opportunities (986 SITC 4-digit level products multiplied by 241 countries in the world).

are considered in this filter, namely, the *degree of concentration* and *trade restrictions* (Cuyvers, 2004:261). In the *last stage* of the analysis, the realistic export opportunities that were identified in filters 1 to 3, are categorized (see Tables 2a-2c and 3a-3c)[5].

Table 1 refers to other studies from the international market selection literature that support the use of the different variables included in the DSM.

Table 1: Support from other literature for the different variables used in the filters of the DSM

Filter / procedure used in the DSM:	Studies supporting:
Screening process (elimination of uninteresting opportunities)	Cavusgil (1985:29) Kumar *et al.* (1993:29) Jeanet and Hennesey (1998:138-142) Rahman (2003:120)
Filter 1: GDP / GNP / GDP per capita / GNP per capita / GDP / GNP growth	Cavusgil (1985:29) Russow and Okoroafo (1996:50) Hoffman (1997:70) Arnold and Quelsh (1998:7-20) Papadopoulos *et al.* (2002:170-171) Rahman (2003:121-122) Sakarya *et al*. (2007:209)
Filter 2: Import market size and growth	Cavusgil (1985:29) Green and Allaway (1985:85-86) Kumar *et al.* (1993:33, 37) Russow and Okoroafo (1996:50) Rahman (2003:121-122) Williamson *et al*. (2006:74) Freudenberg *et al*. (2008:11-12)
Filter 3 Market concentration (competitor analysis)	Cavusgil (1985:30) Kumar *et al.* (1993:33, 38) Jeanet & Hennessey (1998:144) Papadopoulos *et al*. (2002) Rahman (2003:121-122) Williamson *et al*. (2006:78-79) Sakarya *et al*. (2007:218-219)
Market accessibility / trade barriers	Cavusgil (1985:30) Kumar *et al.* (1993:33,38) Papadopoulos *et al.* (2002:170-171) Rahman (2003:121-122) Williamson *et al*. (2006:79) Freudenberg *et al*. (2008:11-12)

It is important to note that these are not the only studies using the same variables as the DSM in their proposed international market selection methods. Many of these refer to yet another set of studies using these variables.

[5] For a more detailed explanation of the methodology of the DSM and the determination of cut-off values in each filter, see Cuyvers *et al*., 1995: 173-186, Cuyvers, 2002: 255-278 and Cuyvers, Steenkamp and Viviers, 2012a: 57-84.

3. Application of the DSM methodology

3.1 Filter 1

As indicated above, Filter 1 of the DSM consists of two sets of importing country criteria that are investigated. We first analyse importing country risks for 241 countries, after which macro-economic performance of importing countries are looked at.

Country ratings will form the base for the first elimination process of the DSM. Country risk ratings provide information regarding the political and commercial risk associated with a specific country. As in previous studies based on the DSM, we are using this information of the Office National du Ducroire (ONDD, 2009), the Belgian credit insurance agency. ONDD developed a methodology for assessing such risks, which is also adopted by the OECD.

The ONDD provides risk assessment on export transactions in terms of political risk in the short, medium and long term as well as commercial risk of the country. From these country risk ratings a country risk score will be calculated. The country risk score will be used to determine whether a country should be further investigated as a potential export market or not.

The ONDD political risk rating rates countries on a scale of 1 to 7, where 1 indicates a low political risk in a specific category and 7 indicates a high political risk in a specific category (short, medium and long term) for the particular country. The commercial risk rating differs from that of the political risk rating. The commercial risk rating is presented either as an A, B or C, where A indicates that the country is experiencing low commercial risk and C that the country is experiencing a high commercial risk. We have transformed the three political risk ratings 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, B and C represents 3.33, 6.67 and 10 respectiely. This transformation is necessary to construct a compound country risk score from the short, medium and long term political as well as commercial risk ratings. We will use this country risk score to determine a critical value which aims at eliminating less interesting export markets.

In order to obtain a compound country risk score for a particular country an equally weighted index is constructed from these transformed country risk ratings of the specific country under investigation.

When a particular country's risk score exceeds the critical value of 9.286[6], this country will not be included in the further analysis of potential export markets for Thailand. Applying this threshold value leaves us with 209 countries.

Macro-economic performance of these 209 importing countries as potential export markets is assessed by using 2005 to 2007 indicators on whether the particular markets are large enough or show relative growth. As in previous studies using the DSM, current GDP and current GDP per capita, as well as GDP growth and GDP growth per capita were chosen as a starting point for the filtering process in terms of

[6] This value corresponds to a short, medium and long-term political risk score of 6 and a commercial risk score of C). In previous studies using the DSM a lower threshold value of 8.93 was used.

macro-economic indicators (Cuyvers *et al*., 1995:177). However, due to lacking macro-economic data for 13 countries, these had to be left out.

A critical value (CV) or cut-off point is used to identify the number of potential export markets that should be further investigated in terms of the two macro-economic variables, namely GDP and GDP per capita, as follows:

$$CV = \overline{x_t} - \alpha\sigma_{x,t} \qquad (1)$$

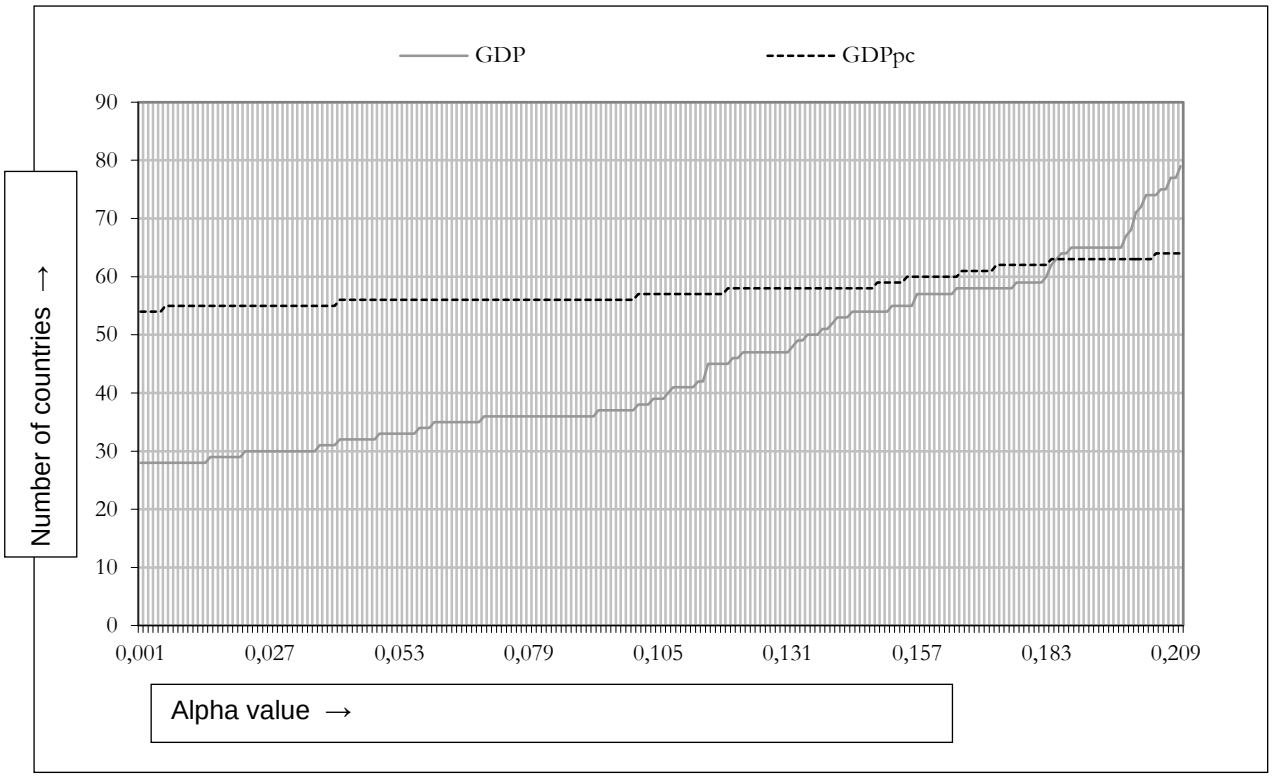
where $\overline{x_t}$ is the average value and $\sigma_{x,t}$ the standard deviation of the indicator under investigation for year *t* respectively. The value of α is chosen by means of a iterative simulation process where the alpha value is varied between 0 and 1 by increments of 0.001. With the use of visual inspection an alpha value is chosen (see Figure 1).[7] The alpha value chosen for GDP and GDP per capita is 0.07. The number of countries selected in terms of GDP and GDP per capita is 36 and 56 respectively.

The average and the standard deviation of the distribution are calculated for all the 196 countries in the 3 years under consideration. The critical value is determined for each of the years. A country would be selected in terms of its GDP (GDP per capita) if the country's GDP (GDP per capita) is greater than the critical value for at least 2 of the 3 years under consideration. To be selected on the basis of both GDP and GDP per capita, the country should at least be selected in terms of one of these two indicators.

Weaker performing countries could be eliminated in filter 1 on the basis of GDP and GDP per capita analysis, but still show export potential in certain product groups. Therefore, countries not included during the first phase of filter 1 can still be considered for further analysis if their average growth rate percentage for the two indicators (GDP growth and GDP per capita growth) is both higher than the average of all the countries for each of the individual years under consideration.

[7] The factor α that is finally adopted is the last factor before further variation would provoke a clear break in the number of observations rejected.

Figure 1: Determining the Alpha value for GDP and GDP per capita in Filter 1



After this first filtering process, we retained 106 countries that passed the two sets of criteria employed.

3.2 Filter 2

In Filter 2 2003 to 2007 UN Comtrade import trade data at HS 6 digit level are analyzed for the countries that passed Filter 1. However, for some of these countries no import data were available, such as for Antigua and Barbuda, Puerto Rico, the Channel Islands, but also Taiwan. For some other countries, no 2007 international trade data were found, in which case the latest year was taken (e.g., 2006 for Vietnam and Macao, but e.g., 2005 for the United Arab Emirates). We finally are investigating in Filter 2, the 545,703 product:country combinations according to their size and their growth rates.

A given country's imports for a specific product will be considered as offering interesting export potential for Thailand if they show either sufficient volume and/or import growth in the short and longer term.

Critical values are calculated for each product group *j* at HS 6 digit level. To determine short-term growth of imports between 2006 and 2007, the simple percentage growth rate for each product group *j* in country *i* is calculated. As for the medium term growth of imports, the compound percentage growth rate between 2003 and 2007 is calculated for each product group *j* in country *i*.

We want the critical value for a product to be more restrictive if the degree of specialisation of Thailand for that product is smaller. This degree of specialisation is measured by the revealed comparative advantage index (RCA):

$$RCA = \left(\frac{X_{TH,j}}{X_{W,j}} \right) / \left(\frac{X_{TH,tot}}{X_{W,tot}} \right) \qquad (2)$$

where X_{THj} is Thailand's exports of product *j* and $X_{TH,tot}$ Thailand's total exports. $X_{W,j}$ is the world's exports of product group *j* and $X_{W,tot}$ is the world's total exports (Balassa, 1965). If the RCA > 1, it indicates that Thailand is relatively specialised in the exports of that particular product. If the RCA $\leq$ 1, it indicates that it is not or not sufficiently specialised in that product.

A scaling factor is calculated to determine the specialisation in exports for Thailand for each product group *j*, as follows (see Willemé and Van Steerteghem, 1993):

$$s_j = 0.8 + \frac{1}{(RCA_j + 0.85)\exp^{(RCA_j - 0.01)}} \qquad (3)$$

To determine whether a particular market shows potential in the growth of imports in the short and long term, a critical value should be calculated with the use of this scaling factor. The critical value is given as:

$$g_{ij} \geq G_j \qquad (4)$$

where g_{ij} denotes the rate of growth of imports either in the short or long term of product group *j* by country *i*. If $g_{W,j}$ stands for the rate of growth of total world exports of product group *j* then

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

The growth of imports in the short and long term was considered as a measure to eliminate less interesting export markets[8]. To determine whether a particular market shows potential in terms of the relative import market size, another critical value can be calculated as follows:

$$M_{i,j} \geq S_j \qquad (5)$$

where $M_{i,j}$ is the relative import market size of country *i* for product *j* and if S_j denotes the cut-off point for relative import market size, taking into account the degree of specialization of Thailand in product *j* such that:

$$S_j = 0.02 M_{W,j}, if\ RCA_j > 1$$

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

where $M_{W,j}$ is the total import market of the world for product *j*. A market will be judged large enough if condition (5) is fulfilled. In line with our previous studies, we do not consider as having potential the

[8] The usefulness of the model would increase if data on future imports demand could be added. Such forecasts exist at industry level, but not for imports.

product:country combinations that show neither sufficient size, nor sufficient growth in the short and long run. Nor are we further considering the product:country combinations that only show sufficient short-term growth.

Using the above criteria we selected 226,446 product:country combinations, as possible realistic export opportunities for Thailand in the world market.

3.3 Filter 3: import market concentration

Filter 3 evaluates a country's ability to penetrate foreign markets. This ability depends on various trade barriers and restrictions.

The Herfindahl-Hirschmann Index (HHI) (Hirschmann, 1964) measures the degree of market concentration, as follows:

$$HHI_{ij} = \sum \left(\frac{X_{k,ij}}{M_{tot,ij}} \right)^2 \qquad (6)$$

where $X_{k,ij}$ is country *k*'s exports of product group *j* to country *i* and to country *i*'s total import of product group *j*. If the *HHI* is low for a particular importing country, Thailand will likely find it easier to penetrate that specific market, being less concentrated in terms of imports supply. As can be seen in (6), the concentration ratio only considers import competition.[9]

As in the previous filters a critical value will be determined for the degree of market concentration, as follows.

$h_k = \overline{x_h} - 0.1\alpha\sigma_h$, for large volume product:country combinations

$h_k = \overline{x_h} + 0.1\alpha\sigma_h$, for other (not-large) product:country combinations showing growth in the long and short term, or large product:country combinations which combine either short or long term growth

$h_k = \overline{x_h} + 0.3\alpha\sigma_h$, for large product:country combinations which also show short and long term growth.

The formulas for the critical values are different for the various categories, with the first mentioned (product:country combination showing only a large size of imports) being allowed less market concentration, than the second group of categories. These, in turn, are considered as less interesting than the last mentioned category (product:country combinations showing large size of imports, together with sufficiently high growth rates in the short and the long term) and for which the formula for h_k allows the highest concentration ratio of all. In other words, our filtering process is least restrictive for that category and most restrictive for the first mentioned above.

[9] Strictly speaking, the concentration ratio should also take domestic competition into account, which, however, poses insurmountable data problems, not just relating to availability of such data, but also to comparability (imports data being in SITC, but domestic production data based on e.g. ISIC or another industrial classification code.

To determine the number of country/product combinations to be included for further analysis a value for α should be determined, following a similar procedure as before.

To determine whether or not a particular country/product combination will be included for further analysis, the following condition has to be fulfilled:

$$h_k \geq HHI_{ij} \qquad (7)$$

with h_k the cut-off point for market concentration.
If condition (7) is fulfilled, those country/product combinations will be included for further analysis.

The selection of α was done heuristically by looking for breaks in the number of "eliminated" product:country combinations when α increases. This number of "eliminated" product:country combinations mostly decreases monotonously for increasing α, apart from a small downward jump if we increase α from 0.4 to 0.5, leading to 49,207 eliminations (coming from 49,587) and another even smaller one when α is increased from 4.25. It was decided to choose α = 0.43, leading to the h_k cut-off values as defined above, of :
h_k = 0.4869, for large volume product:country combinations
h_k = 0,4993, for other (not-large) product:country combinations showing growth in the long and short term, or large product:country combinations which combine either short or long term growth
h_k = 0.5117,for large product:country combinations which also show short and long term growth.

Using these cut-off values, leads us to select 91,583 product:country combinations as showing import market concentration ratios which are smaller than the respective h_k's.

3.4 Filter 3: import market access restrictions

As in our previous research on realistic export opportunities of Belgium and Thailand (Cuyvers, 1996, Cuyvers, 2004, Cuyvers et al., 1995, Cuyvers and Dumont, 2008) we have refrained from attempting to quantify market access barriers, and instead have used an index m_{ij} of "revealed absence of barriers to trade" as proxy:

$$m_{ij} = \frac{\frac{Xmij}{Xmj} + \frac{Xpij}{Xpj} + \frac{Xiij}{Xij} + \frac{Xsij}{Xsj}}{\frac{Xwij}{Xj}} \qquad (8),$$

with X_{mij} = the exports of Malaysia (the Philippines (X_{pij}), Indonesia (X_{iij}) or Singapore (X_{sij}), respectively) of product group *j* to country *i*,
X_{mj} = the total exports of Malaysia (the Philippines (X_{pj}), Indonesia (X_{ij}) or Singapore (X_{sj}), respectively) of product group j,
X_{wij} = the total exports of the world of product group j to country i,
X_{wj} = the total world exports of product group j.

This index shows the share of Thailand's fellow ASEAN-5 countries' exports to country i of product group j in their respective exports of product group j, corrected for the share of that country i in world trade of

product group j. As in our previous "runs" of the DSM, no α could be determined unambiguously here, we were compelled to use the rule of thumb :

$m_{ij} \geq 0.95$ (9)

which implies that, apart from a margin of error of 5 %, Thailand is assumed to have no "revealed barriers to trade" in a market if at least one of the four other ASEAN-5 countries has a "revealed comparative advantage" in exporting to that market.

Applying this criterion, leads to the selection of 92,495 product:country combinations with an apparent market accessibility which is similar to that which at least one of Thailand's neighboring countries is experiencing for the same product group in the same importing country.

As for realistic export opportunities (REOs), it is assumed that the respective import markets are sufficiently accessible and reasonably competitive (less concentrated), the union of the product:country combinations selected on the basis of import market concentration and market accessibility leads to the list of such REOs. The union thus constructed contains 55,259 REOs.

3.5 Filter 4: the categorization of Thailand's realistic export opportunities according to import market characteristics and import market share

The last step of the DSM methodology categorizes the REOs identified in the previous steps according to the import market characteristics and the import market share for each REO taken separately. This categorization is done by constructing Tables 2a and 2b. Figure 2 below summarizes the filtering process followed and relates this to that categorization.

Whereas the import characteristics are those defined in Filter 2, the categorization according to import market share needs some further explanation, as it is linked to $\mu_{n,i,j}$, the degree of market importance of country n's exports of product group j to country :

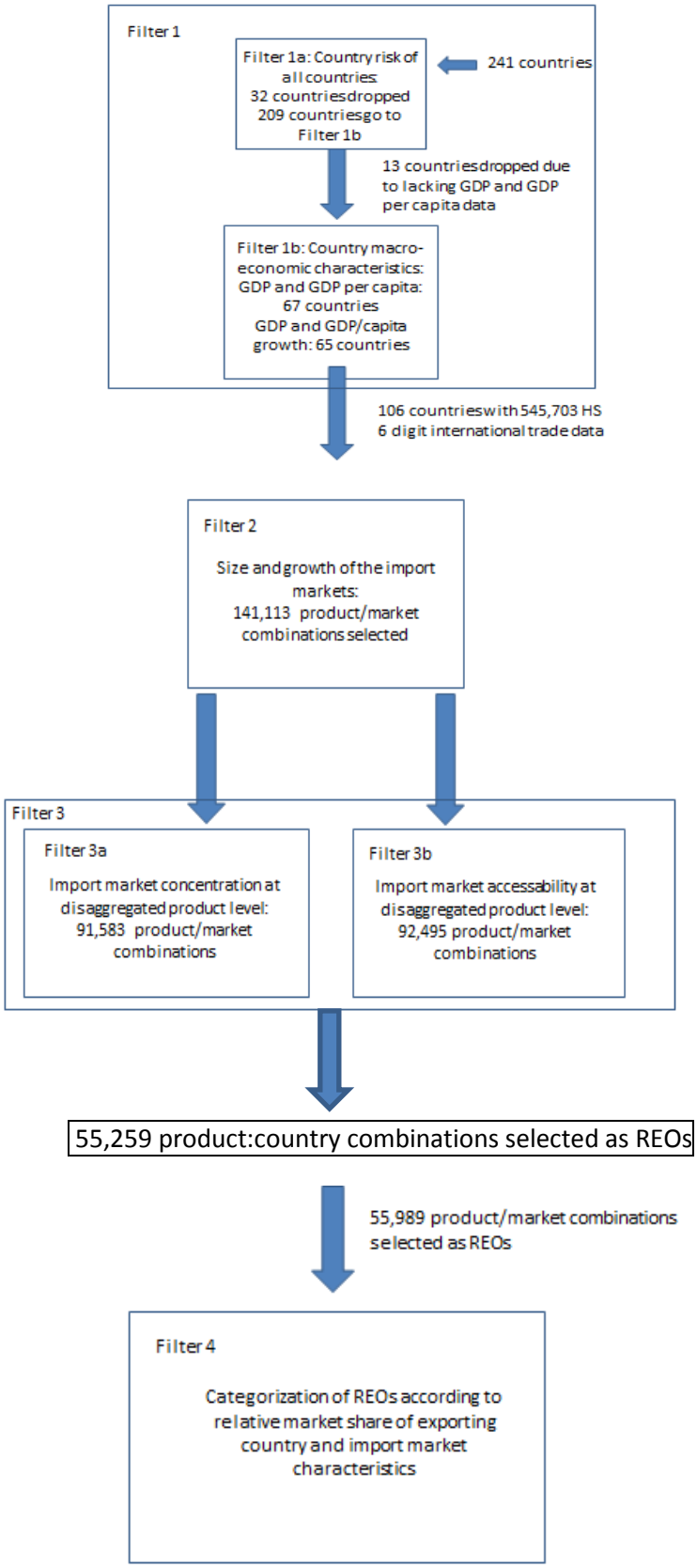
$$\mu_{n,i,j} = \frac{X_{n,i,j}/X_{World\ ,i,j}}{X_{n,j}/X_{World\ ,j}},$$

where $X_{n,i,j}$ is country n's exports of product group j to country i, $X_{World\ ,i,j}$ is the world's exports of product group j to country i, $X_{n,j}$ is country n's total exports of product group j, and $X_{World\ ,j}$ is the world's total exports of product group j.

In order to indicate whether Thailand's market share is small or large, or intermediately small or large, for any particular product:country combination selected as REO, $\mu_{Thailand\ ,i,j}$ is compared with $\mu_{Six,i,j}$, the combined degree of market importance of the six exporting countries with the largest exports of the product category to the country in question, after which the following rules of thumb are used (Cuyvers et al., 1995, Cuyvers, 2004):

- $\mu_{Six,i,j} - \mu_{Thailand\ ,i,j} > 3$: the relative market share of Thailand is relatively small;
- $1.5 \leq \mu_{Six,i,j} - \mu_{Thailand\ ,i,j} \leq 3$: the relative market share of Thailand is intermediately small;
- $0 < \mu_{Six,i,j} - \mu_{Thailand\ ,i,j} \leq 1.5$: the relative market share of Thailand is intermediately high; and
- $\mu_{Six,i,j} - \mu_{Thailand\ ,i,j} \leq 0$: the relative market share of Thailand is relatively high.

Figure 2: Summary of the DSM filtering process as applied to Thailand



4. Thailand's realistic export opportunities in the world according to Thailand's market share and import market characteristics

Table 2a distributes the 55,259 REOs in the world according to import market characteristics (rows) and Thailand's relative market share (columns), whereas Table 2b shows that distribution of the REOs for which Thailand has a reasonably high comparative advantage. In order to construct Table 2b, we have imposed, somewhat arbitrarily, on the REOs the condition that Thailand should have for the respective product:country combinations a "revealed comparative advantage" index of at least 0.7 (RCA ≥0.7).

Table 2a: Distribution of Thailand's "potential" realistic export opportunities according to relative market position and market characteristics

	Market share of Thailand relatively small	Market share of Thailand intermediately small	Market share of Thailand intermediately high	Market share of Thailand relatively high	Total
Large product/market	(Cell 1) 5976 (10.8%)	(Cell 6) 1061 (1.9%)	(Cell 11) 940 (1.7%)	(Cell 16) 479 (0.9%)	**8.456** **(15.3%)**
Growing (long- and short term) product/market	(Cell 2) 30028 (54.3%)	(Cell 7) 1154 (2.1%)	(Cell 12) 909 (1.6%)	(Cell 17) 917 (1.7%)	**33.008** **(59.7%)**
Large product/market short term growth	(Cell 3) 3017 (5.5%)	(Cell 8) 585 (1.1%)	(Cell 13) 457 (0.8%)	(Cell 18) 191 (0.4%)	**4.250** **(7.7%)**
Large product/market long term growth	(Cell 4) 1802 (3.3%)	(Cell 9) 371 (0.7%)	(Cell 14) 292 (0.5%)	(Cell 19) 119 (0.2%)	**2.584** **(4.7%)**
Large product/market short- and long term growth	(Cell 5) 4748 (8.6%)	(Cell 10) 1050 (1.9%)	(Cell 15) 875 (1.6%)	(Cell 20) 288 (0.5%)	**6.961** **(12.6%)**
Total	**45571** **(82.5%)**	**4221** **(7.6%)**	**3473** **(6.3%)**	**1994** **(3.6%)**	**55259** **(100%)**

Table 2b: Distribution of Thailand's "actual" realistic export opportunities with RCA ≥ 0.7, according to relative market position and market characteristics

	Market share of Thailand relatively small	Market share of Thailand intermediately small	Market share of Thailand intermediately high	Market share of Thailand relatively high	Total
Large product/market	(Cell 1) 852 (3.9%)	(Cell 6) 361 (1.6%)	(Cell 11) 288 (1.3%)	(Cell 16) 121 (0.6%)	**1.622** **(7.5%)**
Growing (long- and short term) product/market	(Cell 2) 12094 (56.0%)	(Cell 7) 755 (3.5%)	(Cell 12) 584 (2.7%)	(Cell 17) 465 (2.2%)	**13.898** **(64.3%)**
Large product/market short term growth	(Cell 3) 705 (3.3%)	(Cell 8) 288 (1.3%)	(Cell 13) 199 (0.9%)	(Cell 18) 72 (0.3%)	**1.264** **(5.9%)**
Large product/market long term growth	(Cell 4) 645 (3.0%)	(Cell 9) 245 (1.1%)	(Cell 14) 169 (0.8%)	(Cell 19) 58 (0.3%)	**1.117** **(5.2%)**
Large product/market short- and long term growth	(Cell 5) 2164 (10.0%)	(Cell 10) 760 (3.5%)	(Cell 15) 615 (2.9%)	(Cell 20) 172 (0.8%)	**3.711** **(17.2%)**
Total	**16460** **(76.2%)**	**2409** **(11.2%)**	**1855** **(8.6%)**	**888** **(4.1%)**	**21612** **(100.0%)**

We call the REOs for which Thailand shows a "revealed comparative advantage" index of at least 0.7, "actual" REOs. The set of "actual" REOs is thus a subset of all REOs, which we call "potential" REOs. A comparison of Table 2a and 2b reveals that by imposing the condition RCA ≥ 0.7, the number of REOs decreased from 55,259 "potential" REOs to 21,612 "actual" REOs. Of course, the percentage distribution of the "potential" REOs of Table 2a also shows a bias towards the REOs with small if not negligible market share of Thailand (column 1). Strikingly, the percentage of "potential" REOs corresponding to large product:country combinations is double (cells 1), and the percentage of "potential" REOs corresponding to large product:country combinations which are also showing growth in the short and long run (cells 5), is lower than the corresponding percentage share of the "actual" REOs. Yet for 76% of all REOs of Thailand (see Table 2b) that can be considered as "actual" and present export opportunities, Thailand has acquired only negligible, if any, import market share, thus tentatively indicating a source of rapid success for Thailand's export promotion.

Whereas Table 2a and 2b relate to numbers of REOs identified, Table 3a shows the distribution of the REOs according to potential export values. In an attempt to make a rough estimate of the potential export values behind the REOs, we calculated, following Viviers et al. (2010), per REO the average value of imports from the exporting countries which represent 80 % of these imports, assuming that this average approximates sufficiently Thailand's export potential, measured in US$. Instead of adding up numbers of REOs, we then proceed by adding up the potential export values of the REOs thus estimated.

Table 3a: Distribution of the estimated US$ values (thousand US$) of Thailand's "potential" realistic export opportunities according to relative market position and market characteristics

	Market share of Thailand relatively small	Market share of Thailand intermediately small	Market share of Thailand intermediately high	Market share of Thailand relatively high	Total
Large product/market	(Cell 1) $ 134,185,036 (15.8%)	(Cell 6) $ 72,932,927 (8.6%)	(Cell 11) $ 113,801,722 (13.4%)	(Cell 16) $ 25,231,367 (3.0%)	**$ 346,151,052 (40.8%)**
Growing (long- and short term) product/market	(Cell 2) $ 72,713,961 (8.6%)	(Cell 7) $ 10,743,581 (1.3%)	(Cell 12) $ 9,746,373 (1.2%)	(Cell 17) $ 5,464,856 (0.6%)	**$ 98,668,771 (11.6%)**
Large product/market short term growth	(Cell 3) $ 71,765,907 (8.5%)	(Cell 8) $ 63,370,439 (7.5%)	(Cell 13) $ 19,030,617 (2.2%)	(Cell 18) $ 8,556,182 (1.0%)	**$ 162,723,145 (19.2%)**
Large product/market long term growth	(Cell 4) $ 22,157,712 (2.6%)	(Cell 9) $ 11,206,217 (1.3%)	(Cell 14) $ 13,343,584 (1.6%)	(Cell 19) $ 5,050,266 (0.6%)	**$ 51,757,79 (6.1%)**
Large product/market short- and long term growth	(Cell 5) $ 75,171,765 (8.9%)	(Cell 10) $ 33,962,184 (4.0%)	(Cell 15) $ 62,005,782 (7.3%)	(Cell 20) $ 18,496,769 (2.2%)	**$ 189,636,500 (22.3%)**
Total	**$375,994,381 (44.3%)**	**$192,215,348 (22.6%)**	**$217,928,078 (25.7%)**	**$62,799,440 (7.4%)**	**$ 848,937,247 (100.0%)**

From Table 3a it can be concluded that Thailand's "potential" REOs represent some 849 million US$, However, the potential US$ value of each REO should not be considered as a true estimate of the export value that can be attained, but rather as a means to weigh each REO against all others.

Comparing Table 2a with 3a, we can clearly see how weighing the REOs by the assumed US$ value of the export potential, makes quite a difference in the distribution of the REOs. Particularly, it appears that the importance of the REOs with a small or negligible market share of Thailand (cells 1 to 5), is much lower, although still representing 44 %, which implies that in this column we find many "potential" REOs with small potential export value. From the point of view of public export promotion, these REOs are not only the more difficult ones to tap, since Thailand's experience in exporting these products to the relevant markets is small, if existing at all, but as they mostly stand for relatively low potential export proceeds, there is not much point in promoting these REOs vigorously. Rather an export product strategy of offensive market exploration is appropriate (Cuyvers et al., 1995; Cuyvers, Viviers, Sithole-Pisa, Kühn, 2012). The reduction of the share of Cells 1-5 is largely due to the impact of weighing on Cell 2, which now represents only 8.6 %, as compared to 54 % if unweighted.

Table 3b: Distribution of the estimated US$ values (thousand US$) of Thailand's "actual" realistic export opportunities (RCA ≥ 0.7), according to relative market position and market characteristics

	Market share of Thailand relatively small	Market share of Thailand intermediately small	Market share of Thailand intermediately high	Market share of Thailand relatively high	Total
Large product/market	(Cell 1) $ 14,927,758 (5.2%)	(Cell 6) $ 30,981,856 (10.7%)	(Cell 11) $ 23,584,215 (8.2%)	(Cell 16) $ 8,438,337 (2.9%)	**$ 77,932,166 (26.9%)**
Growing (long- and short term) product/market	(Cell 2) $ 29,041,991 (10.0%)	(Cell 7) $ 7,262,419 (2.5%)	(Cell 12) $ 6,500,768 (2.3%)	(Cell 17) $ 3,712,825 (1.3%)	**$ 46,518,003 (16.1%)**
Large product/market short term growth	(Cell 3) $ 13,400,429 (4.6%)	(Cell 8) $ 8,938,444 (3.1%)	(Cell 13) $ 4,437,307 (1.5%)	(Cell 18) $ 2,314,298 (0.8%)	**$ 29,090,478 (10.1%)**
Large product/market long term growth	(Cell 4) $ 8,044,438 (2.8%)	(Cell 9) $ 7,857,207 (2.7%)	(Cell 14) $ 7,805,201 (2.7%)	(Cell 19) $ 3,596,489 (1.2%)	**$ 27,303,335 (9.4%)**
Large product/market short- and long term growth	(Cell 5) $ 29,022,641 (10.0%)	(Cell 10) $ 23,529,956 (8.1%)	(Cell 15) $ 48,497,814 (16.8%)	(Cell 20) $ 7,623,651 (2.6%)	**$ 108,674,062 (37.5%)**
Total	**$ 94,437,257 (32.6%)**	**$ 78,569,882 (27.1%)**	**$ 90,825,305 (31.4%)**	**$ 25,685,600 (8.9%)**	**$ 289,518,044 (100.0%)**

Table 3b shows the potential export values, categorized by the respective import market characteristics (rows) and Thailand's market shares (columns) at REO level of these opportunities for which Thailand has a sufficiently important comparative advantage (RCA ≥ 0.7), the so-called "actual" REOs. In sum, these opportunities add up to some 290 billion US$, which represents 34.1 % of the potential export value of all ("potential") REOs in the world as indicated in Table 3a. A comparison of Table 3a and 3b also shows that the distribution of the REOs is somewhat different, with 40.3 % of the potential value of the "actual" REOs in the world now belonging to the category where Thailand's relative market share is high or moderately high (as compared to 33.1 % of the potential export value of the "potential" REOs in the world). In particular, the "actual" REOs in the imported product markets which are large in import value and with market growth in the short and long term represent 37.5 % of the potential export value of the "actual" REOs in the world (as compared to a share of 22.3 % of this group in the potential export value of the "potential" REOs in the world). This is mostly due to the much higher percentage share of the potential export values of the REOs in these import markets where Thailand has a moderately high market share (16.8 % of the potential export value of the "actual" REOs worldwide, against only 7.3 % of that of the "potential" REOs – see cells 15) , thus showing interesting potential for increasing exports using an offensive export promotion strategy of market expansion and "jumping on the bandwagon" (for further details on such export promotion strategies and a first application to South Africa, see Cuyvers,

Viviers, Sithole-Pisa and Kühn, 2012). In this respect it is revealing to see that among the Top 30 REOs (according to potential export value) belonging to Cell 15 of Table 3b, 9 are in Asia, of which 6 in China, 1 in Singapore, 1 in Hong Kong and 1 in Malaysia. We explore Thailand's export opportunities and potentials in the ASEAN+3 countries further in a separate paper (Cuyvers, Steenkamp and Viviers, 2012b).

5. An analysis of Thailand's export potential per broad product category and import region

In this section, we limit ourselves to a brief overview of the characteristics of the list of REOs identified, based on the product composition and export destination. Of course, a much deeper overview and analysis is possible, but would lead us much too far. We now proceed to analyze Thailand's REOs according to the geographical region in the world where they are found.

Table 4a shows Thailand's "potential" REOs per broad product category. Machinery represents the largest share of the REOs, both weighted (27.7 %) or unweighted (19.7%), followed by transportation equipment (13.4% when weighted by average export values) and chemicals (10.4%). It is also interesting to notice that agro-business products (HS 01-24) make up hardly 5.4% of Thailand's REOs in value terms, but 11.5% in number of opportunities, which is a striking result taking into account Thailand's image as agro-business center.

Table 4a: Thailand's "potential" REOs per broad product category

	Potential export value (thousand US$)	% of total potential export value	Number of opportunities	% of total number of opportunities
01 - 05 Animal and animal products	$8.411.778	1,0%	1393	2,5%
06 - 15 Vegetable products	$17.965.520	2,1%	2642	4,8%
16-24 Foodstuffs	$19.809.776	2,3%	2295	4,2%
25 - 27 Mineral products	$58.778.477	6,9%	718	1,3%
28 - 38 Chemicals and allied industries	$88.258.383	10,4%	6388	11,6%
41 - 43 Raw hides, skins, leather, and furs	$32.742.956	3,9%	3974	7,2%
44 - 49 Wood and wood products	$19.147.772	2,3%	2525	4,6%
50 - 63 Textiles	$35.009.370	4,1%	8874	16,1%
64 - 71 Stone / Glass	$40.477.597	4,8%	2866	5,2%
72 - 83 Metals	$66.353.791	7,8%	6079	11,0%
84 - 85 Machinery / Electrical	$234.861.628	27,7%	10880	19,7%
86 - 89 Transportation	$113.483.336	13,4%	1482	2,7%
90 - 97 Miscellaneous	$113.636.863	13,4%	5143	9,3%
Grand Total	**$848.937.247**	**100,0%**	**55259**	**100,0%**

Table 4b shows the distribution of Thailand's "actual" REOs according to broad product categories. In terms of total potential export value, HS 84-85 Machinery and electrical equipment, now even represents 34.9 %, and HS 86-89 Transportation equipment 16.6 %, but HS 28-38 Chemicals, hardly 2.6 %. If

Thailand's export promotion policies aim at relatively quick export results, these should evidently be targeting the products for which the country has already a sufficiently high comparative advantage. This implies that most attention should go to the promotion of the exports of Thailand's machinery and electrical equipment manufacturing sector. As the transport equipment manufacturing is often the "playground" of large multinational enterprises, rather the promotion of the "Thai made" exports of products of the HS 86-89 category should be considered as worth the while. Much evidently depends on the import markets of destination and it remains to be seen whether product categories that seem to be less interesting as prime export promotion targets, nevertheless offer opportunities in specific import markets, such as ASEAN+3 countries (e.g., chemicals) (for an analysis of these opportunities in ASEAN+3, we refer to Cuyvers, Steenkamp and Viviers, 2012b).

Appendix 1 lists the Top 30 of the "potential" REOs at HS 6-digit level according to potential export value. It can be seen that 12 products belong to the category of machinery and equipment (HS 84-85) and another six to transport equipment (HS 86-87). HS 870324 - Automobiles, spark ignition engine of >3000 cc, ranks second in the list, but relates to 35 countries, whereas HS 870323 - Automobiles, spark ignition engine of 1500-3000 cc, ranks fourth with potential exports in 39 countries. None are in the agro-business products category.[10] When only the number of REOs are considered, eight products in the Top 30 belong to the machinery and equipment category, and only one to transport equipment and among the agro-business products, HS 210690 - Food preparations n.e.s., ranks fourth according to number of opportunities (although 140th in the list according to potential export value). The difference between the ranking according to number of opportunities and their potential export value represents a major challenge for export promotion, in terms of how to prioritize, especially when we also take into account that much of the exports or potential exports in the category "transport equipment", and to lesser extent "machines and electrical equipment" is largely decided by the multinational enterprises which are active in these activities in Thailand. Of course, also the number of countries in which the REO is found has to be taken into account, as the larger this number, the more the scarce export promotion resources will be diluted over a large number of import markets.

Table 4b: Thailand's "actual" REOs per broad product category (RCA ≥ 0.7)

	Total potential export value (thousand US$)	% of total potential export value	Total number of opportunities	% of total number of opp
01 - 05 Animal and animal products	$2.762.011,00	0,95%	510	2,36%
06 - 15 Vegetable products	$3.106.189,00	1,07%	758	3,51%
16-24 Foodstuffs	$6.971.821,00	2,41%	1160	5,37%
25 - 27 Mineral products	$21.604.238,00	7,46%	196	0,91%
28 - 38 Chemicals and allied industries	$7.467.827,00	2,58%	1418	6,56%
41 - 43 Raw hides, skins, leather, and furs	$17.905.468,00	6,18%	2283	10,56%
44 - 49 Wood and wood products	$4.879.555,00	1,69%	826	3,82%
50 - 63 Textiles	$14.393.272,00	4,97%	4229	19,57%
64 - 71 Stone / Glass	$25.115.242,00	8,67%	1348	6,24%
72 - 83 Metals	$20.841.513,00	7,20%	2415	11,17%
84 - 85 Machinery / Electrical	$100.907.866,00	34,85%	4274	19,78%
86 - 89 Transportation	$48.083.551,00	16,61%	587	2,72%
90 - 97 Miscellaneous	$15.479.491,00	5,35%	1608	7,44%
Grand Total	**$289.518.044,00**	**100,00%**	**21612**	**100,00%**

The regional distribution of Thailand's "potential" and "actual" REOs is shown in Table 5a and 5b respectively, from which it can be seen that the EU-15 alone, with 39 % of all "potential" and "actual" REOs, accounts for more than half of Thailand's total potential export value. The Central and East European Countries (CEEC) in turn, a number of which also became EU member countries in the rather recent past, are good for 26.7% of the "potential" REOs, which, however, are only good for 7.3% of the total potential export value of Thailand's REOs. The figures are 28.6 % and 10.1 % when we consider Thailand's "actual" REOs.

Surprisingly, the number of REOs of Thailand in ASEAN and Central Asia together, represents only 5.4 % of all REOs and 11.3% of the potential export value of both Thailand's "potential" and "actual" REOs. This is in sharp contrast to the 1997 results of the DSM, when 8 Asia-Pacific countries were among the 44 countries which came out of the filtering process, representing some 42% of "potential" Thailand's REOs (Cuyvers, 2004). Inspection of our new results as compared to the 1997 REOs, reveals that the low share of Asia-Pacific is attributable to the increased share of the EU-15 and the CEEC. Taking into account the rapid development of the CEEC, of which many have joined the European Union in the last

[10] The first in this category is HS 230400 - Soya-bean oil-cake and other solid residues and found at the 87th place.

couple of years, this should not be too surprising. Yet, the relatively low share of Asia-Pacific in Thailand's list of REOs in 2007 needs further analysis (see Cuyvers, Steenkamp and Viviers, 2012b).

Table 5a: Regional distribution of Thailand's "potential" REOs

	Potential export value (thousand US$)	% of total potential export value	Number of opportunities	% of total number of opportunities
Africa	$6,738,238	0.8%	2384	4.3%
ASEAN	$18,902,762	2.2%	1029	1.9%
CEEC	$61,837,697	7.3%	14765	26.7%
Central America and Caribbean	$8,139,306	1.0%	741	1.3%
Central Asia	$77,666,045	9.1%	2008	3.6%
EU 15	$451,728,306	53.2%	21586	39.1%
Middle East	$20,196,643	2.4%	3216	5.8%
North America	$156,857,500	18.5%	1976	3.6%
North Europe (non-EU)	$4,766,575	0.6%	1543	2.8%
Oceania	$8,174,816	1.0%	921	1.7%
South America	$9,079,254	1.1%	2370	4.3%
South Asia	$6,274,544	0.7%	900	1.6%
South Europe (non-EU)	$18,575,561	2.2%	1820	3.3%
Grand Total	**$848,937,247**	**100.0%**	**55259**	**100.0%**

Table 5b: Regional distribution of Thailand's "actual" REOs

	Potential export value (thousand US$)	% of total potential export value	Number of opportunities	% of total number of opportunities
Africa	$3,200,778	1.1%	976	4.5%
ASEAN	$10,992,617	3.8%	305	1.4%
CEEC	$29,092,766	10.0%	6178	28.6%
Central America and Caribbean	$5,388,721	1.9%	291	1.3%
Central Asia	$21,619,978	7.5%	624	2.9%
EU 15	$44,969,830	50.1%	8262	38.2%
Middle East	$8,975,706	3.1%	1279	5.9%
North America	$46,862,008	16.2%	527	2.4%
North Europe (non-EU)	$2,092,068	0.7%	727	3.4%
Oceania	$3,850,420	1.3%	437	2.0%
South America	$4,304,301	1.5%	892	4.1%
South Asia	$2,268,155	0.8%	278	1.3%
South Europe (non-EU)	$5,900,696	2.0%	836	3.9%
Grand Total	**$289,518,044**	**100.0%**	**21612**	**100.0%**

North America represents 18.5 % and 16.2 % of the potential export value of Thailand's "potential" and "actual" REOs respectively, and 3.6 % and 2.4 % of the respective number of REOs. In 1997, the United States and Canada together stood for 11.1 % of the REOs (Cuyvers, 2004: 269, Table III). This apparent

sharp drop in the importance of Thailand's REOs in North America is equally related to the dramatic rise in importance of the EU-15 and the CEEC.

Nevertheless, the United States ranks first in the Top 30 of countries according to potential export value associated with Thailand's "potential" REOs, followed by Germany, the Netherlands, the United Kingdom and France (see Appendix 2). All this implies that public export promotion resources of Thailand, should very much aim at further penetrating the markets of the United States and the European Union. In the top 30 list of "potential" REOs in the United States, 16 belong to the Cells 11-20, i.e. are REOs for which Thailand has already a high or moderately high market share. In the case of e.g., Germany this is somewhat less (11), mostly offering scope at product level for offensive export promotion strategies of market expansion (Cuyvers et al., 1995: 183; Cuyvers, Viviers, Sithole-Pisa and Kühn, 2012: 194-195). However, one should be aware of the limitations of export promotion when many among the most import REOs are related to products which are produced and marketed by multinational enterprises (automobiles, medicaments, chemicals, etc.). It remains to be seen what Thailand's export opportunities in ASEAN+3, the country's "hinterland", have to offer, which we investigate in a separate paper (Cuyvers, Steenkamp, Viviers, 2012).

6. Conclusions

The DSM methodology is rooted in the international marketing research literature. It allows to identify an exporting country's realistic export opportunities (REOs) in the world at large, which is instrumental in bringing about a more efficient use of scarce public resources devoted to export promotion. The DSM output is per import market and at detailed product level, and can immediately be translated into export promotion strategies, as was outlined in Cuyvers, Viviers, Sithole-Pisa and Kühn, 2012.

It was found that the present DSM results for Thailand show that a surprisingly high share of the REOs (both in terms of potential export value as in sheer number) is in the EU-15 and the Central and Eastern European Countries, which dramatically brings down the share of the REOs in Southeast and East Asia which was found in previous studies (Cuyvers, 1996; Cuyvers, 2004). This high European share evidently reflects the impact of increased European economic integration, particularly in 2003-2007. At the same time, however, it points to a serious fallacy if Thailand's export promotion policies would be based on the REOs detected by the latest run of the DSM only. These policies should rather be based on the REOs that show sufficient stability over a time period of, say, five years, both in terms of presence, as in terms of major import market characteristics. The identification of these stable REOs can only be achieved by subsequent yearly "runs" of the DSM.

It was found that Thailand's REOs in the world are much concentrated in the broad product categories of machinery and electrical apparatus, and in transport equipment. This is particularly true of we consider the "actual" REOs, i.e. the REOs for which Thailand has already achieved some comparative advantage (as evidenced by a Revealed Comparative Advantage (RCA) Index of at least 0.7). Transport equipment production and marketing in the world being one of the major "playgrounds" of multinational enterprises, the REOs of this product group can hardly be considered as "true" REOs, which can be tapped using

appropriate public export promotion strategies and activities. The same argument holds for major chemicals and even for machinery and electrical apparatus, although in the latter case probably to a lesser extent. It is evidently pointless to waste scarce public resources to the promotion of products in markets that the relevant multinational enterprises are either already catering to, or are outside of reach of their producing and assembling affiliates in Thailand. Therefore, before translating the REOs identified into action, additional circumstances have to be investigated, such as the exposure of the relevant exporting sectors to multinational business.

An additional warning is appropriate. The present results are based on international statistical data up to 2007, which means that the REOs identified are according to data which are four years old. This drawback is unavoidable and implies that if Thailand's export promotion agency were to use them, they should be supported by additional evidence, such as the opinions of e.g., key experts.

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APPENDICES

APPENDIX 1: TOP 30 OF THAILAND'S "POTENTIAL" REALISTIC EXPORT OPPORTUNITIES IN POTENTIAL EXPORT VALUE.

HS 6-digit product category	Product ranking by potential export values (US$ thousands)	Potential export value (US$ thousands)	Number of opportunities (import countries)
999999 - Commodities not specified according to kind	1	$49.429.568	9
870324 - Automobiles, spark ignition engine of >3000 cc	2	$28.571.453	35
270900 - Petroleum oils, oils from bituminous minerals, crude	3	$23.953.977	6
870323 - Automobiles, spark ignition engine of 1500-3000 cc	4	$21.629.189	39
300490 - Medicaments nes, in dosage	5	$16.485.619	14
854221 - Monolithic integrated circuits, digital	6	$11.781.480	27
847330 - Parts and accessories of data processing equipment ne	7	$11.537.874	38
271019 - Light petroleum distillates nes	8	$9.550.020	16
710239 - Diamonds (jewellery) worked but not mounted or set	9	$9.340.624	14
852520 - Transmit-receive apparatus for radio, TV, etc.	10	$9.146.056	22
271011 - Aviation spirit	11	$8.382.268	13
841191 - Parts of turbo-jet or turbo-propeller engines	12	$8.053.734	10
880240 - Fixed wing aircraft, unladen weight > 15,000 kg	13	$8.027.382	7
300210 - Antisera and other blood fractions	14	$6.872.947	7
870332 - Automobiles, diesel engine of 1500-2500 cc	15	$6.859.250	24
880330 - Aircraft parts nes	16	$6.801.208	27
852990 - Parts for radio/tv transmit/receive equipment, nes	17	$6.513.624	28
870333 - Automobiles, diesel engine of >2500 cc	18	$6.454.018	14
847130 - Portable digital data pr	19	$6.336.269	18
950390 - Toys nes	20	$5.058.420	26
847989 - Machines and mechanical appliances nes	21	$4.837.144	6
841112 - Turbo-jet engines of a thrust > 25 KN	22	$4.418.697	10
293499 - Nucleic acids & their salts, whether or not chemically defined, n.e.s.; het ...	23	$3.965.690	15
851790 - Parts of line telephone/telegraph equipment, nes	24	$3.902.687	10
852540 - Still image video camara	25	$3.895.556	37
870840 - Transmissions for motor vehicles	26	$3.878.078	28
740311 - Copper cathodes and sections of cathodes unwrought	27	$3.704.436	8
847150 - Digital process units wh	28	$3.691.288	35
870899 - Motor vehicle parts nes	29	$3.659.387	43
847160 - I/O units w/n storage u	30	$3.355.615	31

APPENDIX 2: TOP 30 OF COUNTRIES ACCORDING TO THAILAND'S "POTENTIAL" REALISTIC EXPORT OPPORTUNITIES IN POTENTIAL EXPORT VALUE.

Country	Country ranking by potential export values (US$ thousands)	Potential export value (US$ thousands)	Number of opportunities (import countries)
United States	1	$150,445,410	1690
Germany	2	$127,640,753	3132
Netherlands	3	$74,263,938	1620
United Kingdom	4	$69,883,268	2589
France	5	$61,548,453	2760
China	6	$51,076,118	1025
Italy	7	$42,525,237	2405
Spain	8	$29,451,474	2090
Russia	9	$24,998,725	1757
Belgium	10	$21,223,652	1068
Japan	11	$19,213,557	551
Switzerland	12	$17,972,735	1124
Singapore	13	$13,919,637	409
Poland	14	$11,072,525	1630
Mexico	15	$7,729,966	247
Australia	16	$7,625,314	394
Hong Kong	17	$7,185,864	251
Czech Republic	18	$6,886,515	1265
Turkey	19	$6,831,933	534
Canada	20	$6,412,090	286
Saudi Arabia	21	$6,410,014	688
India	22	$6,224,749	755
Austria	23	$5,148,690	1054
Brazil	24	$5,147,558	659
Sweden	25	$5,111,673	916
Norway	26	$4,405,617	895
Denmark	27	$4,380,282	948
Finland	28	$4,130,986	706
Hungary	29	$4,098,244	614
Slovakia	30	$3,876,326	884