MANUALES

Module for the analysis of growth in international commerce (MAGIC Plus)

User guide (updated)

René A. Hernández
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Summary

The Module for the analysis of growth in international commerce (MAGIC) is a computer program created by the ECLAC subregional headquarters in Mexico for post-trade analysis of the competitiveness of countries' exports to the United States market. The new version, MAGIC Plus, handles multiple windows or reports simultaneously, includes exports and imports up to 2010, generates different types of interactive graphics, allows easy administration of user profile options, enables the user to include, modify and eliminate groups of countries and features options to print, create graphics, generate Excel spreadsheets and request context-sensitive help in all reports. The program also includes a portal with forums, product demos, help and news, all available on the website http://www.eclac.org/magic.

I.   Introduction

The first version of the Module for the analysis of growth in international commerce (MAGIC) was designed in 1995 by experts and analysts from the ECLAC subregional headquarters in Mexico. It is a relatively simple, user-friendly computer program designed to facilitate access to foreign trade databases and provide a series of automated analytical calculations and indicators which are useful for preparing studies and analyses of trade policies and post-trade competitiveness of exports.

Since the program was created, ECLAC has continually sought to enhance it both analytically and technologically, introducing various modifications and improvements. These include the creation of new consultation indicators and changing the platform from CD-ROM to online consultation using personalized passwords.

The module is one of a range of database analysis programs developed by ECLAC (others include BADECEL, TradeCAN and PADI).[1] In recent years, it has become one of the most popular, most used and most in-demand ECLAC database for analysing competitiveness in the United States market.

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[1]   For further information, see http://www.cepal.org/software and http://www.eclac.cl/badecel/login.asp.

1.　Background

The original idea of creating this analytical tool resulted from the interest expressed by many countries in the Central American and Caribbean subregions in evaluating possible trade distortions which might result from the North American Free Trade Agreement (NAFTA) between Mexico, Canada and the United States. For that reason, the original version included only the imports of the United States and was called the Module for United States import consultation (MUSIC).

However, it was recognized from the outset that the scope of the system was much broader. Using MUSIC, any country could look at its market share in the imports of the United States, analyse in great detail the contribution of different products, determine which countries were its main competitors for any product or group of products and compare its own performance with that of others. MUSIC also established the classification of a country's exports in accordance with the criteria developed by the Competitive Analysis of Nations (CAN) system.[2]

At the second stage, MUSIC was expanded to include other importing countries in addition to the United States; this brought about a series of modifications. Owing to classification differences in international trade, the categorization of products and product aggregates was significantly simplified. MAGIC, which is the result of successive modifications to MUSIC, could in fact accept any product classification, such as the Harmonized Commodity Description and Coding System (HS) or the Standard International Trade Classification (SITC), and any level of aggregation. At present it includes only the database of the United States Department of Commerce.

At the third stage, the system was again modified to include export statistics. At the fourth and fifth stages, new indicators such as relative unit value and share by volume were included. The sixth stage was a major step forward, with the migration of MAGIC from the DOS operating system to the Windows system, in which the program could be used simultaneously with spreadsheet and word processing applications. Also at this stage, two new indicators were added for the United States database, in order to make use of data provided by that country's Department of Commerce: actual tariff receipts and implicit tariff.

The seventh stage involved a series of modifications in both form and substance. First, the Windows version was improved so that MAGIC could be used entirely via screen icons. Second, thanks to users' suggestions and the needs detected through constant use, new indicators and consultation options were added, which will be detailed below. Of particular note are the calculation of trade balances, the selection of the order in which lists are displayed and the disaggregation of specific categories.

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[2]　The purpose of the CAN system (the current version is TradeCAN 2009) is to provide tools to analyse countries' international competitiveness by evaluating the competitive situation in certain international markets. This can be done from a global viewpoint or with detailed analysis of international trade sectors. A country's competitive situation, taken over a particular period, in selected international markets and in chosen sectors of international trade, is determined by relative international market share and by the country's capacity to detect the highest growth sectors and specialize in them. In the CAN system, also designed and developed by ECLAC, a country's exports are classified on the basis of changes over a particular period in its market share (competitiveness) and product share (growth). This gives rise to four categories: the "rising star" (competitive and dynamic sector), the "declining star" (competitive but stagnant sector), the "missed opportunity" (dynamic but uncompetitive sector) and the "retreat product" (sector which is neither competitive nor dynamic). See Fajnzylber (1988), Mandeng (1991) and http://www.eclac.cl/software/.

2.   The new MAGIC Plus

The new MAGIC Plus is the latest and current stage in the system's development. It is based on a new platform developed using a Rich Internet Application (RIA) version, whose structure in layers and levels incorporates state-of-the-art technology and architecture. On the one hand the user interface or "front end" has been developed with Flash ActionScript 2, obtaining high levels of interactivity, ease of use and speed, characteristic of Web 2.0. On the server, or "back end" side, ASP.NET and SQL Server have been used. Communication between the two modules is via Web services, making intensive use of Extensible Markup Language (XML), a standard for data exchange and dissemination, optimizing response times and minimizing bandwidth consumption.

The analytical and practical application of MAGIC has evolved so that it has now become a valuable analytical tool for businesses, governments and academics in the countries of Latin America, especially those which negotiate trade agreements. Besides being used as an analytical tool in numerous empirical studies,[3] it has recently been widely used by several analysts of the free trade agreement between the Dominican Republic, Central America and the United States (DR-CAFTA) and continues to be used as a valuable tool in other trade negotiations currently under way in the hemisphere.

MAGIC Plus uses import data based on customs value and export data from the Foreign Agricultural Service (FAS) of the United States, whose source is the Department of Commerce, which considers all trade figures, including the maquila export industry (ECLAC, 2007). On the basis of this information, MAGIC Plus performs a set of automated calculations to analyse the competitiveness of products and countries in international trade. The data use the trade classification of the Harmonized Commodity Description and Coding System with four different aggregation levels: two, four, six and ten digits. The data are updated annually and the time ranges available currently cover the period from 1990 to 2010.

The system shows the variation in the market share of specific products, identifies the main competitors in the market, classifies products by their levels of competitiveness and growth and provides for comparison of the tariff conditions in which the product enters the United States market from different countries, in addition to other analytically useful calculations and indicators.

The characteristics of the new version of MAGIC Plus include the option to open several windows or reports at the same time; calculate exports and imports of the United States to and from all its trade partners from 1990 to 2010; generate various kinds of interactive graphics; select user profile options such as language, punctuation of decimals and thousands, and scale (units, thousands and millions); create, modify and eliminate user country groups; and generate reports with print, graphic, Excel spreadsheet and context-sensitive help options (see figure 1).

Work is under way on designing the portal and website for MAGIC Plus. (See http://www.cepal.org/magic/) In addition to providing system access, it will contain value added content with features including user discussion forums, access to important publications, trade glossaries and dictionaries, support and technical help options, frequently asked questions, news, training activities, organization of events, search engines and this user guide.[4]

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[3]   See Dussel (2001 and 2004), Martínez and Cortés (2004) and Hernández and others (2006).
[4]   For further information, write to magic@cepal.org.

FIGURE 1
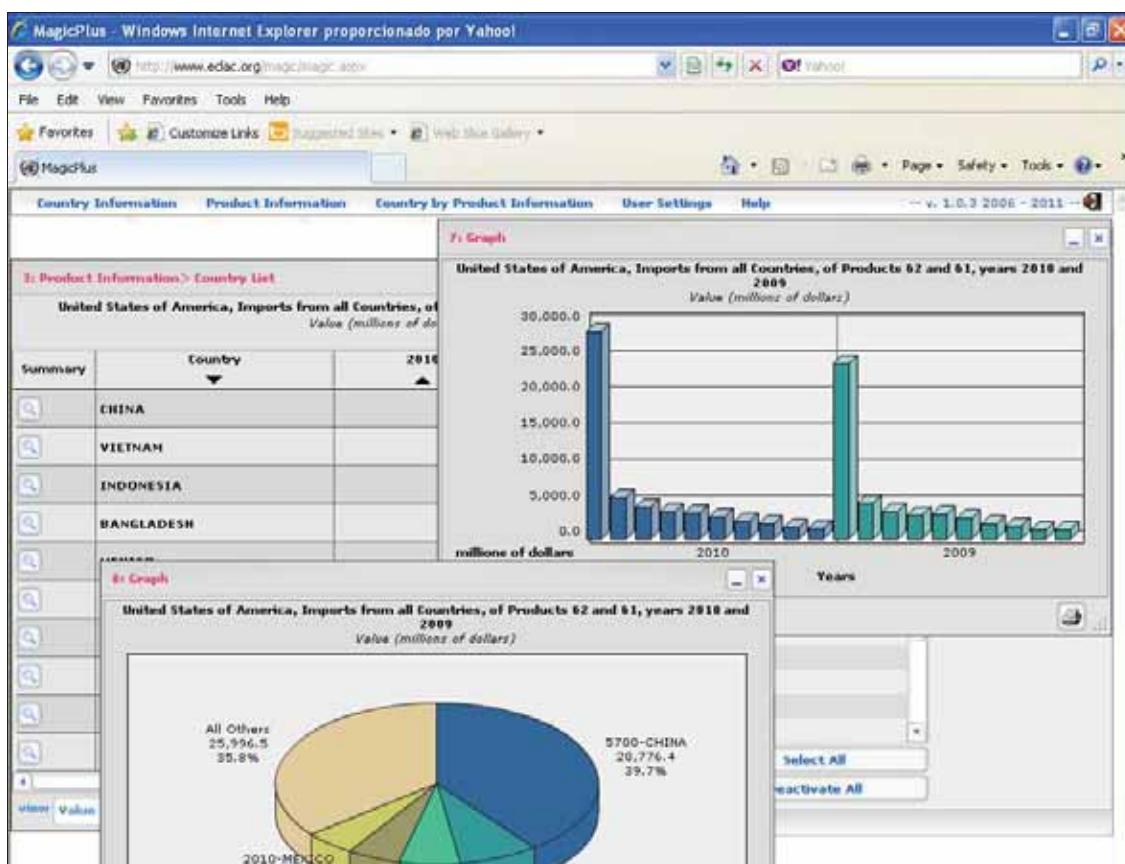
Source: Compiled from MAGIC Plus.

3.   **Access**

The system requires a PC with Pentium 4 processor or higher, or equivalent; minimum memory of 512 MB; Windows XP operating system or Mac OS X, or higher; and broadband Internet access.

MAGIC Plus can be accessed at the following URL address: http://www.cepal.org/magic/.

To access the database click on "MAGIC Plus Demo". Restrictions apply to the download of information to .xls Excel files. Full access to the database is available on a subscription-only basis. To purchase a subscription click on the link "Subscriptions to MAGIC Plus". Special prices apply for universities and government bodies. Once a subscription has been purchased, enter the user name and password in the box in the top right of the page to access the different units of MAGIC Plus.

FIGURE 2

Source: Compiled from MAGIC Plus.

4.   Disclaimer

ECLAC cannot be held responsible for any errors contained in the database or software program. Nor can it assume any liability for the consequences of any use or interpretation of MAGIC Plus. The source of the database is the United States Department of Commerce and ECLAC maintains its integrity. Country names and other terminology used in MAGIC Plus do not imply a value judgement by ECLAC or formal recognition of the legal situation of countries, regions or authorities, or of their borders or limits.

II. Methodology

The methodology applied in MAGIC Plus is consistent with the analytical and methodological basis developed in the Competitive Analysis of Nations (CAN) program. MAGIC Plus is designed to measure countries' shares in a specific area of trade, which in this case is the United States market. The analysis therefore focuses on changes in market-share and share-change ratios using adapted business management tools (Gluck, 1985). In particular, the methodology combines changes in the trade structure of one or more countries with changes in the pattern of the United States market. The basic hypothesis is that, together, both changes determine trade and competitiveness models. The concepts of competitiveness, specialization and market growth are covered by Mandeng (1991). This guide briefly presents the constant market share (CMS) analysis together with issues directly related to the software program.[5]

In the methodology used it is assumed that, regardless of its export specialization pattern, every country seeks to penetrate the United States market.

Moreover, it is postulated that countries will seek to maximize their total share and their success in doing so will reflect their capacity for international competition. A competitiveness analysis is therefore associated with the post-trade export situation. As a result, it does not take into account structural factors (technological capacity building, learning patterns and

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[5]   The literature on competitiveness and specialization is too extensive to mention in this guide and is not the purpose of this document. Examples include Balassa (1965, 1977, 1979 and 1986); Fagerberg (1988, 1996 and 2007); Krugman (1979, 1994 and 1996); Porter (1990, 1998 and 2000); Porter, Sachs and Warner (2000); Lall (1995, 2000 and 2001); McFetridge (1995); Bender and Li (2002); and Fontagné, Gaulier and Zignago (2007). For discussion of systemic competitiveness, see Esser, Hillebrand, Messner and Meyer-Stamer (1999); Meyer-Stamer (2000 and 2001); Schimtz (1997); Messner and Meyer-Stamer (1994); Messner (2002). For Latin America, see Fajnzylber (1981 and 1988); Dussel, Piore and Ruiz (1997); Hernández (2001 and 2003); Katz and Stumpo (2001); Cimoli (ed.). (2005); Dini and Stumpo (2004) (coord.); Peres (1997) (coord.); Peres and Stumpo (2002) (coord.); and others.

technical change, production structure, labour productivity and factor endowment) related to the development of international specialization and should not be used for the purposes of explanation or forecasting (ECLAC, 2007).[6]

According to Mandeng (1991), the nature of competition and pricing are exogenous variables. MAGIC Plus therefore assumes that overall competitive efficiency depends on the interaction between market share and market attractiveness. Thus, competitiveness is seen not as a goal in itself but as a push towards selected markets. In MAGIC Plus the focus is on the United States market. This approach is explained by Condliffe (1958, p.71) in his comment on Baldwin (1958): "Those countries which cling too long to declining trades lose out in world markets. Those which are flexible enough to move with the times and keep abreast of the developing new demands maintain or improve their share of world trade".

Market attractiveness is related to the concept of portfolio planning[7] used by McKinsey and the Boston Consulting Group and developed in the 1960s and 1970s to evaluate the strategic position of a company. This tool combines market attractiveness with the competitive strength of each company, in order to guide and improve the investment process (Gluck, 1985). The power of market attractiveness adapted to MAGIC Plus refers in this context to the structural variations triggered by supply or demand in the total import structure of the United States. For that reason, differences in the development of sectors offer different growth prospects for a given sector, category or product. Market growth is a key criterion for classifying products, analysing the distribution of resources and devising valid competitiveness strategies.

The advantages associated with specialization can be rationalized from at least five angles. First, from the point of view of neoclassical growth theory, which emphasizes that factor endowment is a key element in a country's comparative advantage; second, on the basis of new trade theory, which attributes comparative advantage and economies of scale equal importance as explanations of why countries trade; third, on the basis of post-Keynesian literature, which argues that specialization in certain segments of international demand provides better growth prospects because of higher income elasticity, which may be interpreted as reflecting differences in technological intensity and quality (Fagerberg, 1988; Dalum and others, 1999); fourth, from the point of view of Latin American structuralism and the Prebisch-Singer hypothesis that specialization in a small group of export products can increase the volatility of export revenue when the latter is affected by a long-term deterioration of the terms of trade; and lastly, from the evolutionary, neo-Schumpeterian perspective, which views technological capacities as a reflection of a country's specialization and a factor influencing the export competitiveness of its companies. An analysis of trade patterns over time based on the latter perspective shows a country's technological specialization and changes in specialization. Neo-Schumpeterian thought regards specialization in international trade and its link with technological capacities as a measure of competitiveness and the result of learning processes in a given sector or country.[8]

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[6]   Bender and Li (2000) used various indicators of diversification and buoyancy of demand. The simulations conducted by MAGIC Plus are comparative statics exercises comparing two different equilibrium states, before and after a change in a parameter or variable. The program does not study the movement towards equilibrium or the process of change in itself. Consequently, the results should be interpreted in a specific context taking into account underlying structural factors. The analyses carried out on the basis of MAGIC Plus simulations are sensitive to the years selected and are complemented by other analytical tools in order to verify the sign and magnitude of trends identified.

[7]   Portfolio analyses are subject to major limitations and have been criticised in the past, for example, because they are post-trade analyses that do not take into account other determinants of market share such as market structure, economies of scale, competition conditions and barriers to entry. Nonetheless, the portfolio approach allows the use of empirical data that complement the analysis and works best when conditions are stable, when the alternatives are known and relatively constrained and when the future is a confirmation of the past. For that reason, portfolio analysis should be used with caution and should never be used as an isolated tool to identify investment or business opportunities, given that it does not cover the dynamics and complexity of markets in which companies compete (Gluck, 1985).

[8]   In accordance with new trade theory, comparative advantage is still the main theoretical explanation for the prediction of trade flows between countries with similar or different factors of production or technology (Davies, 1997). Pérez Caldentey and Ali (2007) present an approach based on a leader-follower model that shows that free trade can accentuate growth disparities and differences between countries. Lastly, in evolutionary and neo-Schumpeterian thought, stochastic technological changes play a key role in growth (see Verspagen, 1993, or Dosi and others, 1994). The technological competitiveness of a country determines the growth in the market share of its exports and comparative advantages include explanatory analytical categories such as product cycle, technological gaps and diversification of the production structure as determinants of trade flows between countries (see Amable,

In order to simplify the analysis, we can assume —according to the basic principles of free trade— that countries will specialize in goods in which they have a comparative advantage (Davies, 1997; Deardoff, 1980). From the purely theoretical point of view, taking into account static supply and demand effects, the proposition of Deardoff (1980) for identifying the product or industry in which a country has a comparative advantage is clear and general, given that one needs only to observe the sign of the difference between relative autarkic and free-trade prices. If the sign is positive the country has a comparative advantage in the production and export of a particular product; if it is negative the country has a comparative disadvantage.

Given that autarkic prices are not directly observable variables and that this hampers the identification of true comparative advantages, Balassa's revealed comparative advantage (RCA) index has been used widely in the profession and in empirical literature as a substitute variable or measure of countries' specialization patterns. The revealed comparative advantage (Balassa, 1965) is defined as follows:

$$RCA_i^j = \frac{x_i^j / x_i^o}{X_o^j / X_o^o} \equiv \frac{x_i^j / X_o^j}{x_i^o / X_o^o}$$

The RCA index compares the share of exports of a product or sector in a given country with the share of exports of the same product or sector in world trade or in the reference market, which in the case of MAGIC Plus is the United States. x_i^j denotes the exports of product or sector i from country j; x_i^o represents the exports of product or sector i from the reference country or market; X_o^j represents the total exports from country j; and X_o^o represents the total exports from the reference country or market. The denominator represents the share of exports of a sector or product in the exports of the United States. The RCA index compares the structure of exports from one country (numerator) with the structure of exports from a market (denominator). When the RCA index is equal to 1 for a sector or commodity in a given product, the change in that sector or product is identical to the average for the reference market. When the RCA index is higher than 1, the country is said to specialize in that sector or product and vice versa when the RCA index is below 1 (Benedictis and Tamberis, 2001; and Laursen, 1998 on alternative normalizations of the RCA index).

In short, the definition of specialization used in the MAGIC Plus model is based on the general principles of comparative advantage described above and compares changes in the composition of a country's exports with the market structure.[9] For each country, specialization refers to the share of a sector or individual product in relation to its global competitiveness position or in relation to market structure, which reflects its revealed comparative advantage. Relative export performance is used as an indicator of comparative advantage instead of terms of trade or net exports, owing to differences in the patterns of goods imports between countries, which are strongly influenced by the protection systems applied —especially in the case of developing countries— which maintain (although much less than before) high barriers to imports and large variations between products (Balassa, 1965, 1977 and 1986).[10]

1993; Dosi and Soete, 1983; Dosi, Pavitt and Soete, 1990; Metcalfe, 1989; Metcalfe and Soete, 1984; Posner, 1961; Silverberg and Verspagen, 1995; Vernon, 1966, Verspagen, 1991).

[9] Another reason for applying the principles of comparative advantage is related to the availability of more and better databases on international trade with information on products and sectors under both the Standard International Trade Classification and Harmonized Commodity Description and Coding System (Harmonized System), thus facilitating comparisons between countries, the construction of panel models and the development of comparative statics analyses.

[10] See the annex for a brief description of the advantages of the Lafay index compared with the Balassa index and other indicators of specialization.

With regard to imports, specialization in one product or sector with a specific trade partner is also defined by two ratios. The numerator represents the share of a product or sector in the total imports of a country j. The denominator is the share of product or sector i in the total imports of that country or reference market, and the ratio is equivalent to the revealed comparative advantage or Balassa index (see the annex for a more detailed explanation). In this case, the country has a comparative advantage when the revealed comparative advantage index is less than 1, that is, when imports of its products in the reference market are lower than expected on the basis of its share in the total imports of the reference country. Thus:

$$RCA_i^j = \frac{m_i^j / m_i^o}{M_0^j / M_0^o} \equiv \frac{m_i^j / M_0^j}{m_i^o / M_0^o}$$

It should be noted that in the case of MAGIC Plus, the concept of competitiveness is closely associated with external trade performance and especially with export performance. Broader definitions of the concept of competitiveness exist for companies, industries or countries, and analytically original definitions of systemic and spurious competitiveness were put forward by Fajnzylber at ECLAC (1990) and then applied at ECLAC (2008). According to Porter's (1985) particularly relevant definition, competitive advantage is a function of either providing comparable buyer value more efficiently than competitors (low cost), or performing activities at comparable cost but in unique ways that create more buyer value than competitors and, hence, command a premium price (differentiation).

Market share and trade balance are frequently used as indicators to measure competitiveness at the industry level. Markusen (1992), cited in McFetridge (1995), suggests the following "positive, trade-based" definition of industry competitiveness: "In a free-trade environment: (1) An industry loses competitiveness if it has a declining share of total domestic exports or a rising share of total domestic imports deflated by the share of that good in total domestic production or consumption. (2) An industry loses competitiveness if it has a declining share of total world exports or [a] rising share of total world imports of that good deflated (divided by) the country's share of world trade." It should be noted that Porter (1990, 1991) also uses the Balassa index of revealed comparative advantage as a measure of competitiveness.

1.   The model

The methodological and analytical components of MAGIC Plus are based on the basic CAN model, which is a single equation model derived from constant market share analysis (CMSA), simplified to a two-dimensional focus to examine the growth of export trade flows during a specific period and break down that variation into two effects: the first associated with demand, the second with supply.

Below is a simplified expression of the model:

$$\Delta X_0^j = X_{it_f}^j - X_{it_b}^j = \left(SM_{tb}^j\right)\left(\Delta X_0^o + X_{0t_f}^o\right)\left(\Delta SM_{tb}^j\right)$$

X_o^j are the total exports of the country j, X_o^o are the global exports or those of the reference market and SM^j, the share in world exports of country j. The superscript j represents the country and the subscript i, the product in the export basket; t_b and t_f represent the base year and the final year, respectively. The expanded version of the model more commonly used in economic literature is as follows:

$$\Delta X_0^j = (SM_{t_b}^j)\Delta X_0^o + \left[\Sigma(SM_{tb}^j)(\Delta X_i^o - SM_{tb}^j)\Delta X_0^o\right] + \left[\Sigma\Sigma\ (SM_{tb}^j)\ \Delta X_i^j - \Sigma\ (SM_{tb}^j)\ (\Delta X_i^o)\right] + \Sigma\Sigma\ X_{it_f}^{ij}\ (\Delta SM_i^j)$$

CMSA is an alternative term for the widely used "shift-share analysis", coined by Creamer (1943) in a study on industrial location, not on foreign trade.[11] CMSA is first and foremost a descriptive tool that indicates whether the comparative export performance of a country reflects changes in market share or total market growth. This section gives an overview of CMSA while greater detail on CMSA can be found in the annex.[12]

CMSA can be broken down into four components that affect growth in global market share: growth in world trade; differential growth by product; differential growth in the market; and a residual or competitiveness effect. The first three components represent the growth in exports that would take place if a country maintained a constant market share in each market. Together these three are referred to as the "structural effect". The fourth component (competitiveness or residual effect) captures the effect of changes in market share. The CMSA methodology measures the contribution of each of these factors in variations in total market share (Magee, 1975, Milana, 1988, Ahmadi-Esfahani, 2006, Mandeng, 1991, Merkies and van der Meer, 1988).

The CAN and MAGIC Plus models look only at differential product growth in relation to market growth and the residual effect, or competitiveness (with both factors treated as independent vectors). The models do not explain the structural effects and underlying non-structural effects of total market share and describe rather how the competitiveness and specialization modalities are changing as the market evolves.

The limitations of CMSA are associated with sectoral disaggregation, the base year and the reference market. The first is a common aggregation problem and should be dealt with accordingly; the second is related to indices, despite the basic model being particularly sensitive in that regard; the third limitation is in relation to the reference markets: in the case of MAGIC Plus the United States is the selected reference market and for TradeCAN the markets of the industrialized and developing countries were chosen, in both cases because of their significance in international trade (Mandeng, 1991). It should be noted, however, that while any evaluation or analysis based on market share makes it possible to examine ex post the nature of competitiveness —in the same way that structural analyses are conducted on national accounts and input-output frameworks— it does not offer any explanation of the structural or underlying determinants of competitiveness. Milana (1988) cites Magee (1975) in a phrase that sums up this discussion: "even if a country maintains its share of every product in every geographical destination, it can still have a decrease in its aggregate market share if it exports to individual markets that grow more slowly than the world average".

According to Mandeng (1991), the model is based on the assumption that all of the sectors under consideration are in differentiated markets in which none of the sectors have a large enough share to determine the overall import structure. The analysis measures a country's overall share in either the imports of the United States or the OECD countries and as a function of structural and competitive factors. These can be described in terms of sectoral competitiveness, capacity to adapt to market conditions and comparative advantages. To simplify the evaluation, comparative advantages are considered a factor of competitiveness.[13] A country's total share S^j at any given time is determined by the shares s_i^j of a country and s_i of a group and that is also equal to the weighted product of a country's share in the total imports of the United States (or the OECD countries) (M):

$$S^j = \sum_{i=1}^{n} \frac{M_i^j M_i}{M_i M} = \sum_{i=1}^{n} s_i^j s_i \qquad (1)$$

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[11]   Shift-share analysis was first applied to international trade in a pioneering study by Tyszynski (1951).

[12]   For more information on CMSA, see Milana (1988), Ahmadi-Esfahani (2006), Merkies and van der Meer (1988), and Oldersma and Van Bergeijk (1993).

[13]   The concepts of comparative advantage and competitiveness are often confused when in fact they are quite distinct. According to Lafay (1987) there are two essential differences: (a) while competitiveness is usually measured between countries for a given product, comparative advantage is measured between products for a given country; (b) while competitiveness is subject to changes resulting from macroeconomic factors (especially variations in the real exchange rate), comparative advantage is, by its very nature, structural.

where i is a product or sector and j is a country. Constant market share is defined by ΔS^j and the differential evolution of the groups by the variations in s_i. From equation (1) it can be derived that variations in s_i have a direct impact on S^j. The evaluation is conducted using a 2x2 competitiveness matrix (see box 1), which is obtained using equation (1). The horizontal axis is for the change in the share of a product or group of products $(\Delta S_i \geq 0)$ or $(\Delta S_i < 0)$ and the vertical axis is the change in market share by country $(\Delta s_i^j \geq 0)$ or $(\Delta s_i^j < 0)$. For example, $(\Delta s_i \geq 0)$ would represent a dynamic group of products and $(\Delta s_i^j \geq 0)$ a group of products where the country is competitive. Each square of the matrix represents one of four specific combinations representing a country's market competitiveness and attractiveness.

BOX 1
COMPETITIVENESS MATRIX

The "retreats" represent product groups or sectors that are losing market share in stagnant markets.

The "declining stars" represent product groups or sectors that are gaining market share in stagnant markets.

The "missed opportunities" represent product groups or sectors that are losing market share in dynamic markets.

The "rising stars" represent product groups or sectors that are gaining market share in dynamic markets.

The relative share of each competitive position in the matrix depends on the country's trade structure, that is, the contribution of each group $c_i^j = \dfrac{M_i^j}{M^j}$

The diversification of the structure is therefore represented by $\Delta c_i^j \geq 0$ or by $\Delta c_i^j < 0$

Market specialization is the change in the relative share of a group of products for one country in the overall structure of imports into the United States (or OECD). The relationship between a country's trade structure and the market structure is expressed by k

where $k_i^j = \dfrac{c_i^j}{s_i}$ and $k_i^j \geq 1$ for the groups in which a country specializes and where k_i^j is also derived from $\dfrac{s_i^j}{S^j}$ Variations in the changes to c_i^j and s_i represent either similarities with the structure of the market $\Delta k_i^j \geq 0$ or differences $\Delta k_i^j < 0$. Δk represents the interaction between the changes in a country's trade structure and the competitiveness of sectors in relation to the country's overall results.
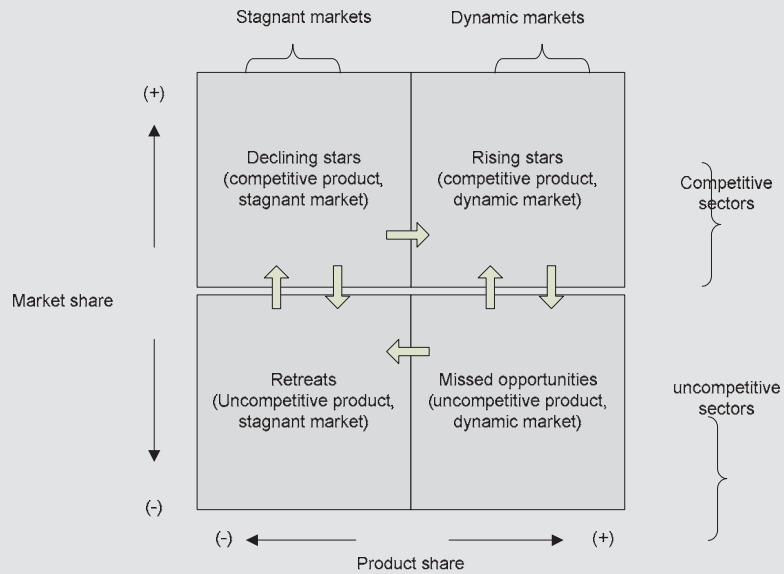
Source: Prepared by the author.

III. Features of the system

Once signed in to the system as either a subscriber or visitor, the user will see the welcome screen and main menu.

At that stage, the user has access to three search modules, which are described below. However, before explaining how those modules work, it is necessary to introduce some key concepts and indicators that are used and applied in each of the modules.

The statistics on imports and exports are provided by the United States Department of Commerce. Annual data from 1990 to 2010 are available, disaggregated at the two-, four-, six- and 10-digit levels[14] using the Harmonized Commodity Description and Coding System (Harmonized System).

The main features of the system are integrated and provide information on the indicators described in box 2 (see also the glossary in the annex).

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[14]   The United States Department of Commerce does not have information disaggregated at the 8-digit level.

FIGURE 3
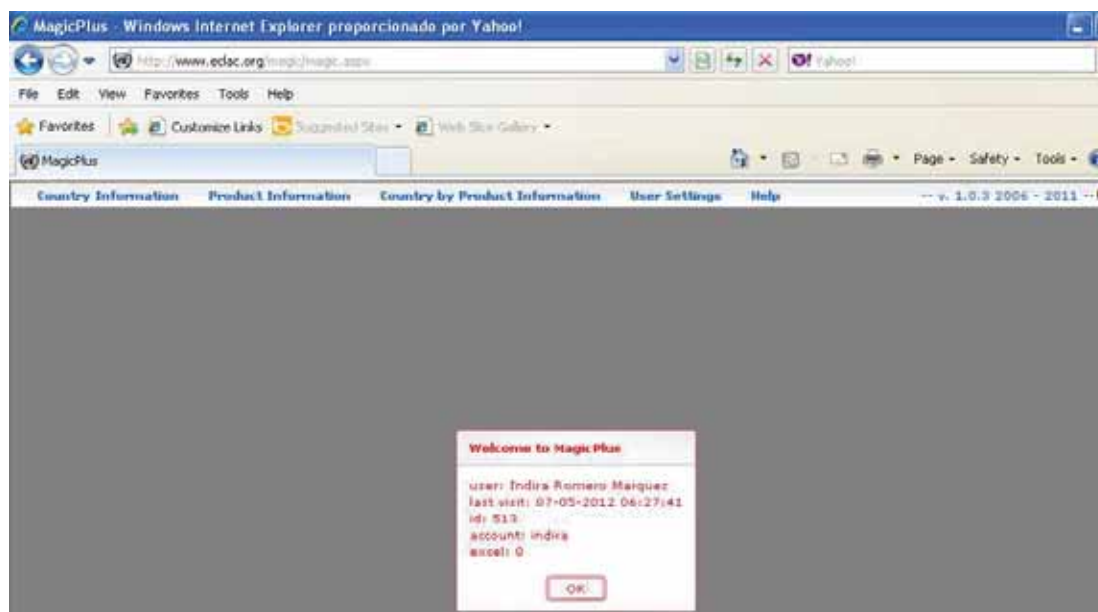
Source: Compiled from MAGIC Plus.

BOX 2
MAIN MAGIC PLUS INDICATORS

Value: Monetary value of trade.

Volume: Volume of goods traded. The unit of measurement depends on the product in question. This information is available only at the 10-digit level of disaggregation.

Country share: A trade partner's share in total trade.

Product share: A specific product's value as a share of the value of total trade, that is, all products traded between the reporting country and its trade partner(s).

Market share: One country's trade in a specific product as a proportion of all trade in that product.

Unit value: Price per unit, obtained by dividing the value traded of a specific product by the volume traded. In MAGIC Plus this information is available only at the 10-digit level of disaggregation.

Relative unit value: The unit value of the product at the bilateral level, that is, between the reporting country and its trade partner, as a proportion of the unit value of the product at the global level (all countries). If the relative unit value is greater than one, the product has a higher unit value when traded between the two countries than when traded internationally.

Specialization: The market share of a specific product in bilateral trade as a proportion of the market share of the same product in relation to total world trade, that is, all countries and all products. In the case of import statistics, product specialization is the revealed comparative advantage, or Balassa index (1965), of the trade partner in the reporting country's import market for the product.

Actual duty: The monetary value paid in the form of a duty by the importer.

Duty rate: The duty collected on a product as a percentage of the total value traded in the product.

Decomposition of change: A breakdown of the different components of changes in the value of the trade flow between the reporting country and its trade partner during a selected period, distinguishing between the dynamism of the market, its structure and the level of competitiveness.

Product qualification: A classification derived from an analysis of competitiveness based on the methodology of the CAN system. Broadly speaking, the methodology involves classifying the products imported by the reporting country from its trade partners according to its product share and market share. The classifications are: rising star, declining star, missed opportunity and retreat.

Source: Prepared by the author.

On the basis of the indicators, MAGIC Plus gives an overview of how the market share of specific products is changing, it identifies the main competitors in the market, it classifies products according to

their level of competitiveness and dynamism and allows users to compare the tariff schedules applied to the same products or sectors coming from different countries into the United States market, among other functions or options.

1. Search modules

MAGIC Plus has three search modules for consulting import statistics for the United States and its trade partners:

(a) Country information: Searches information on the products traded between the reporting country and one or more of its trade partners.

(b) Product information: Searches information on specific products or groups of products traded with the reporting country.

(c) Country by product information: Searches information on specific products traded between the reporting country and one or more of its trade partners.

One noteworthy characteristic of MAGIC Plus is that different paths can be taken to the same information. Once the search module has been chosen, the user must select the database and reporting country. At present, the database is made up solely of import and export statistics for the United States, making that the default reporting country. All search results can be exported to an Excel file or printed directly, as preferred. The following elements can be changed by clicking on "User settings": e-mail address, language (English or Spanish), thousands separator, number of decimal places (up to five) and units. To save the new settings, click on "Save". The password can be changed by going to "User settings", selecting "password", entering the old password and the new password and saving the changes.

(a) Country information (trade partner or groups of countries)

Searching for country information will retrieve information on the imports of the reporting country from one of its trade partners or from a group of trade partners, which should be selected from a list that appears on the screen. The following searches can be conducted under this module (see figure 4):

(i) Country summary. Calculates the country's trade share by comparing total imports of its products with the global imports of the United States during a specified period.

(ii) Product list. Searches information on individual products traded between the reporting country and its trade partner(s).

(iii) Product qualification. Classifies products according to product share and market share.

(iv) Decomposition of change. Provides information on the different components of changes in the value of the trade flow between the reporting country and its trade partner or partners during a selected period, distinguishing between the dynamism of the market, its structure and the level of competitiveness.
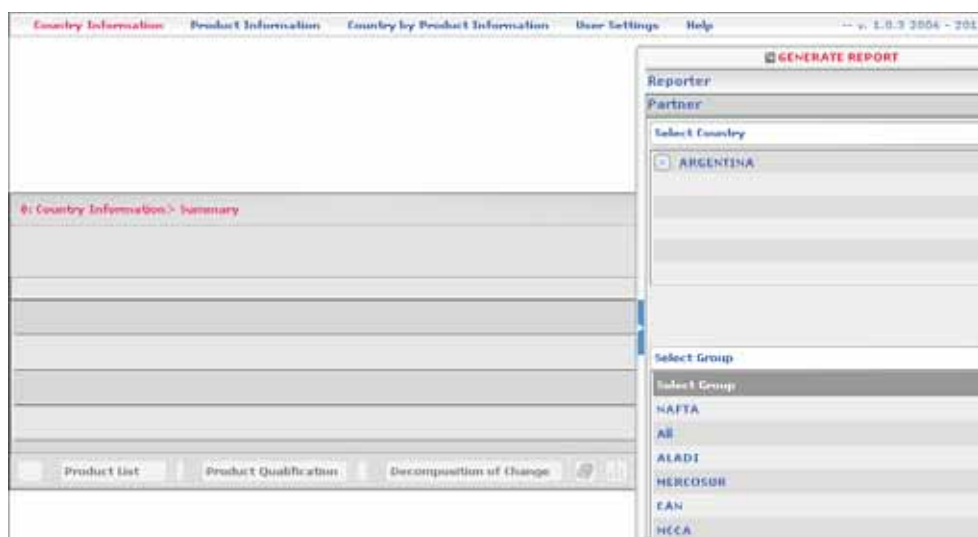
FIGURE 4

Source: Compiled from MAGIC Plus.

The following steps must be taken to carry out any search in MAGIC Plus:

Step 1:   Select the reporting country. As the only reporting country in this database is the United States, the selection is made by default and does not have to be repeated for each search. Indeed, it is not possible to select a country other than the United States as the reporting country.

Step 2:   Select the trade partner. The trade partner can be a country or one of the groups of countries that has been predefined in the programme. It is possible to select a country and a group of countries at the same time, if the user wishes to carry out the same search for both (see figure 5).
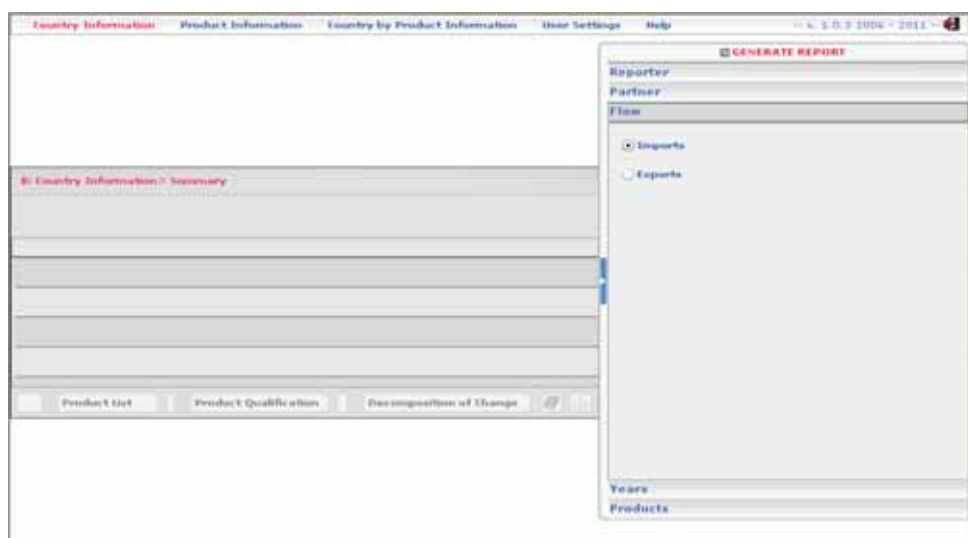

FIGURE 5

Source: Compiled from MAGIC Plus.

Step 3:   Select the direction of trade flow. Once the trade partner or group of trade partners has been selected, the user must specify the direction of trade flow (exports or imports) (see figure 6).

Step 4:   Select the years. The user then selects the base year and the final year of the search. By default, MAGIC Plus will pre-select the most recent two years of data available in the database. Please note that for all searches a base year and final year must be selected. All years can be selected or deselected rapidly by clicking on the corresponding buttons (see figure 7).

FIGURE 6

Source: Compiled from MAGIC Plus.

FIGURE 7
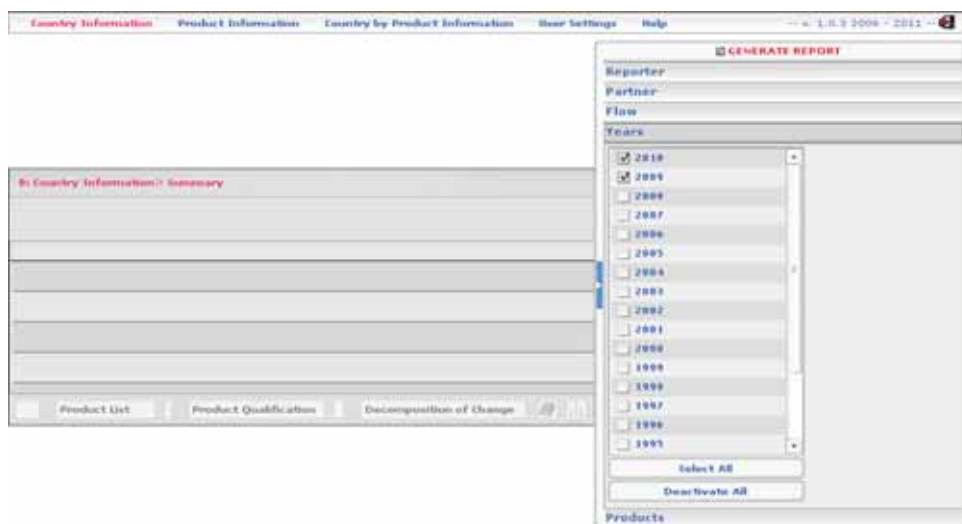
Source: Compiled from MAGIC Plus.

Step 5: <u>Select the products</u>. Lastly, the user selects the level of disaggregation for the search: chapters (two digits), headings (four digits), subheadings (six digits) or products (10 digits).[15] Products can also be searched by code or using keywords.

Step 6: <u>Generate report</u>. When a search for import statistics has been performed, a table is subsequently generated with the following headings: "total global imports[16]", "total imports" and "country share". By way of example, figure 8 shows the "Country summary" generated by searching for data on Argentina for the years 2009 and 2010 using the first search module "Country information". The summary gives the figures for total global imports to the United States (all countries and all products) and for imports of all Argentine products. Under this option it is not possible to show data broken down by chapter, heading, subheading or product. The example shows that Argentina's share of total imports into the United States remained unchanged at 0.2% over the period 2009-2010.

FIGURE 8

Source: Compiled from MAGIC Plus.

From the information available, the user can obtain data on bilateral trade between the United States and its trade partners and also access a series of features, including a help function to assist in interpreting the results, generating figures, printing the report or downloading and saving the report in Excel format (see figures 9 to 12).

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[15] Under the "Country information" search module, it is not possible to search by specific products.
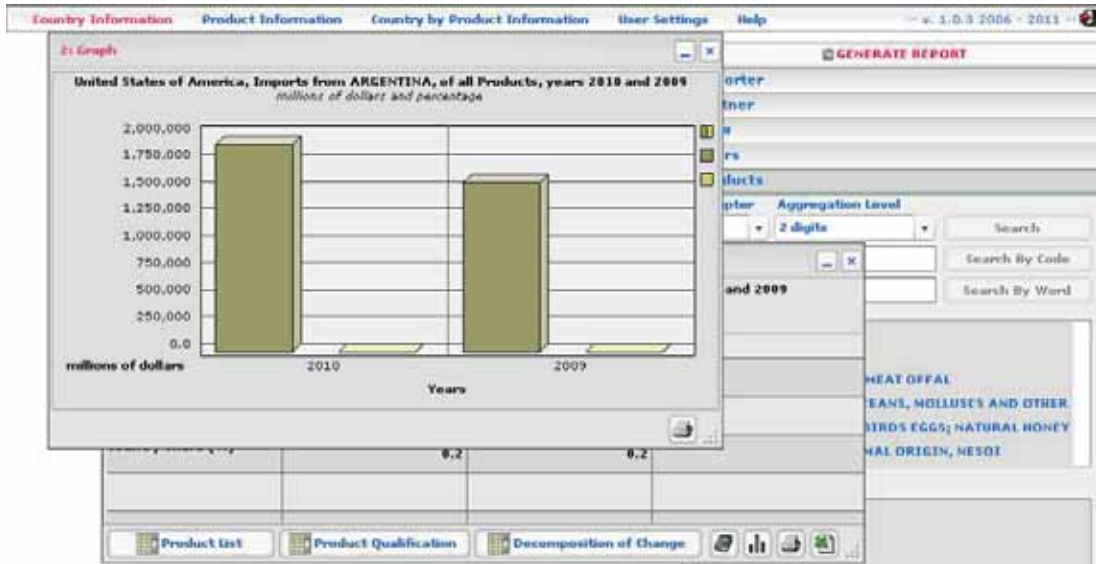[16] In MAGIC Plus the adjective "total" is used to indicate the sum of all products, and the adjective "global" to indicate the sum of all countries.
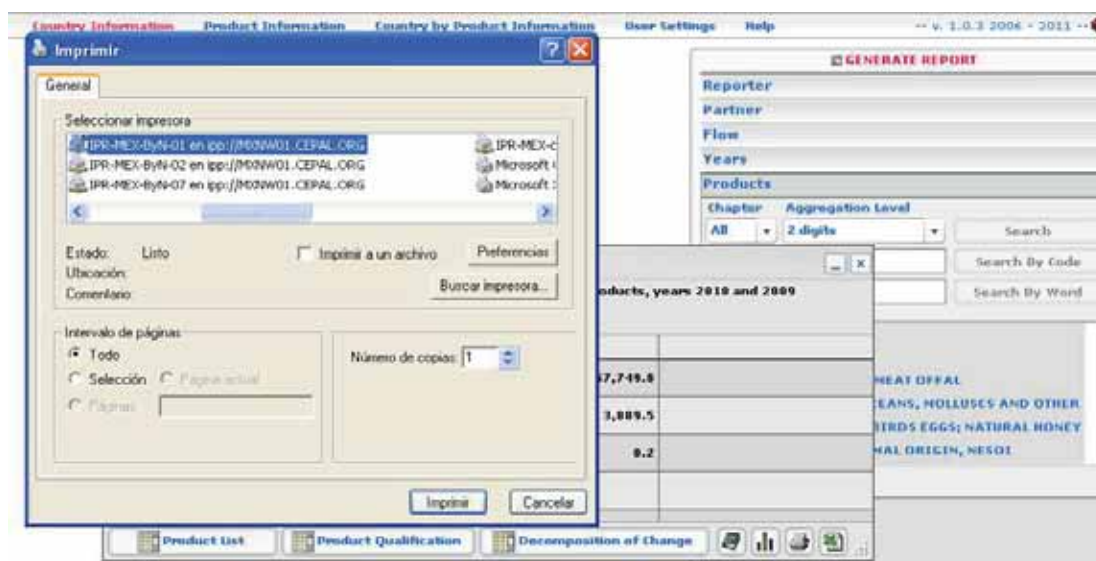
FIGURE 9

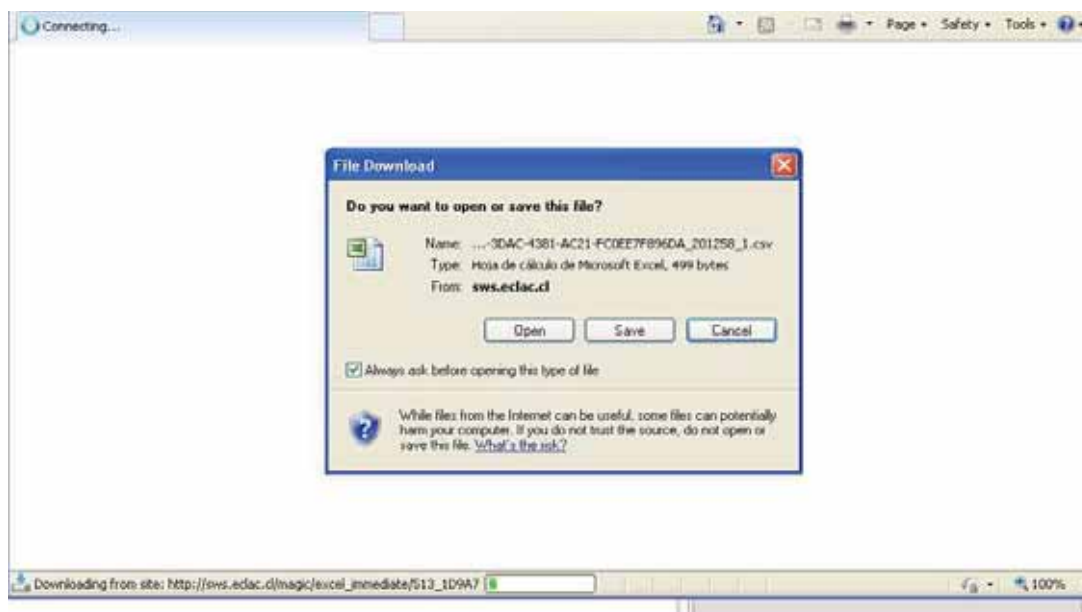Source: Compiled from MAGIC Plus.

FIGURE 10

Source: Compiled from MAGIC Plus.

FIGURE 11

Source: Compiled from MAGIC Plus.

FIGURE 12

Source: Compiled from MAGIC Plus.

Searches can be broadened in several ways. As mentioned above, with MAGIC Plus the same data can be obtained using different search options. The analyst selects the options that best coincide with the focus of his or her research. The country information module has four different sub-modules: "Country summary"; "Product list"; "Product qualification", and "Decomposition of change" (see the glossary in the annex).

(i)   Product list. Using Argentina as an example, if the user selects the product list, a list of all of the Argentine products imported by the United States will be given in numerical order according to their Harmonized System codes at the two-digit level (see figure 13). This information can also be obtained using the second search module, as will be shown below. Using the first search module, the data on all products will be shown upon selecting the country (the starting point for all searches under this module) by default, unless the user selects another option. By contrast, using the second search module, the starting point is the product and once that has been selected, the user can go on to access information on individual or multiple countries (see diagram 1, which shows the relationship between the search modules and sub-modules and the five main indicators in MAGIC Plus).

As shown in figure 8, when searching the product list, the user can click on icons to access the help function, to generate figures, to print or to download the information in Excel format. Also, at this stage of searching the list of products, the user can select the indicators of value, product contribution, specialization, actual duty and duty rate (for an explanation of these terms, see the beginning of this chapter and the glossary in the annex).
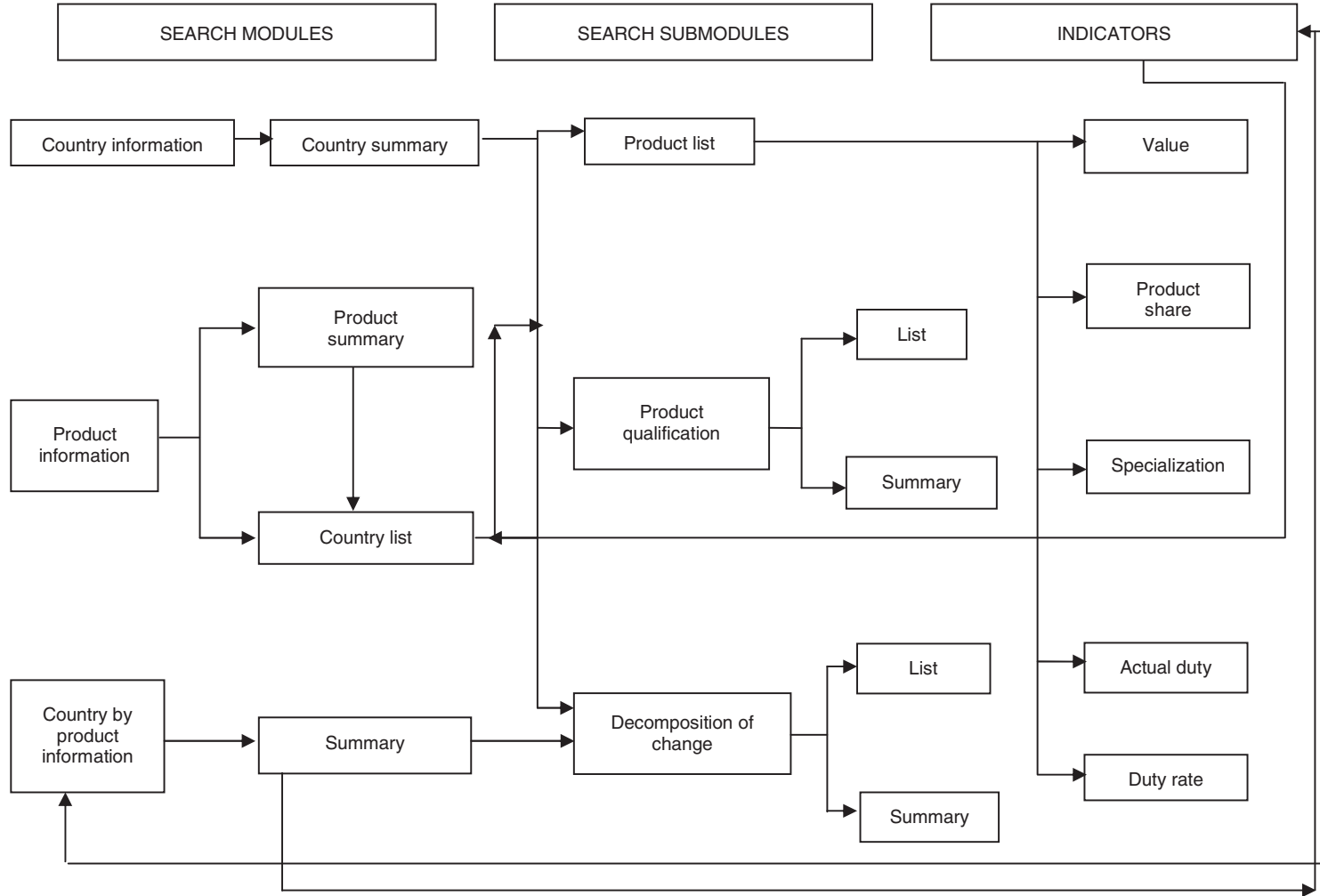
In summary, if the user searches using this feature, the programme will display a list of products traded between the reporting country and the selected trade partner, the value of trade flows in different years, product contributions, specializations, the actual duty paid and the duty rate. This information is obtained by selecting an option from the drop-down menu on the lower left part of the screen (see figure 13).

FIGURE 13

Source: Compiled from MAGIC Plus.

DIAGRAM 1
MAGIC PLUS FLOWCHART WITH MODULES AND SUB-MODULES OF CONSULTATION

| SEARCH MODULES | SEARCH SUBMODULES | INDICATORS |

Country information → Country summary → Product list → Value

Product information → Product summary → Country list

Product information → Country list

Product qualification → List → Product share

Product qualification → Summary → Specialization

Country by product information → Summary → Decomposition of change → List → Actual duty

Decomposition of change → Summary

Decomposition of change → Duty rate

Source: Prepared by the author.

To the left of each chapter number, there is a magnifying glass icon. Clicking on it will reveal the product share for each of the 99 entries in the harmonized system. For example, selecting chapter 2 (meat and edible meat offal) brings up the product share for all chapter 2 products, which fell from 0.3% to 0.2% over the period 2009-2010 (see figure 14). Here again, the Help options are available to interpret the results, generate graphics, print the report, or download and save it as an Excel file.

Further searches may be performed at this point. For example, clicking on the "Country list" button at the bottom of the window in figure 14 brings up an alphabetical list of the countries from which the United States imports chapter 2 products. Use the arrow below the most recent year (2010 in this instance) to sort the countries in descending order of value, from the highest (Canada) to the lowest (see figure 15). If you click on a particular country, such as Canada, the programme will display a country summary for all products – the same country summary that is available from the first module (see figure 16).
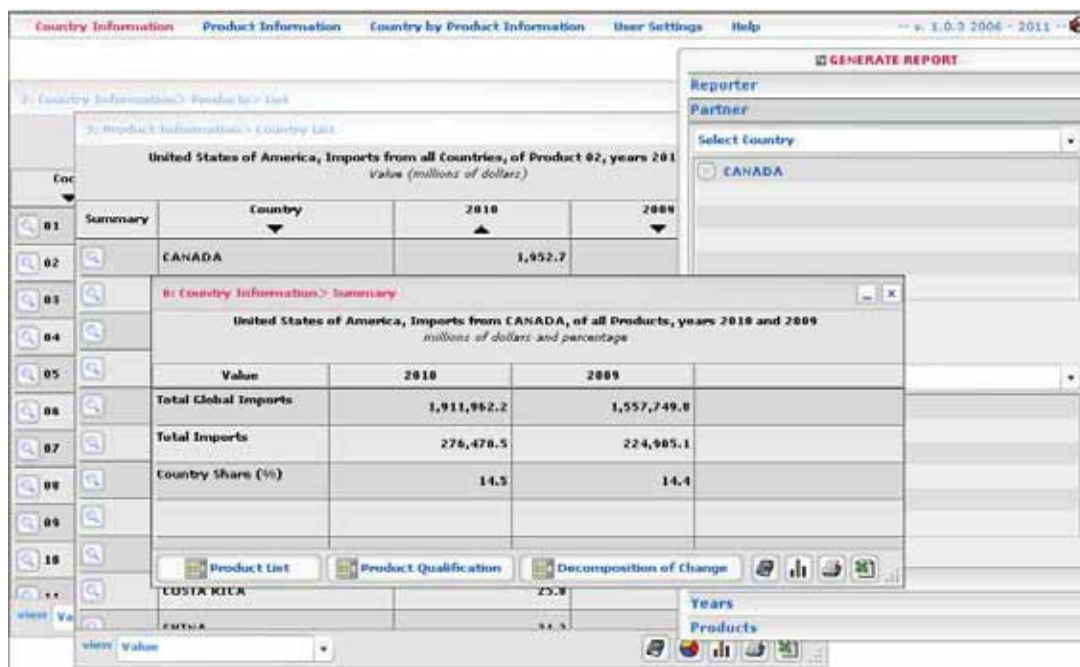
FIGURE 14
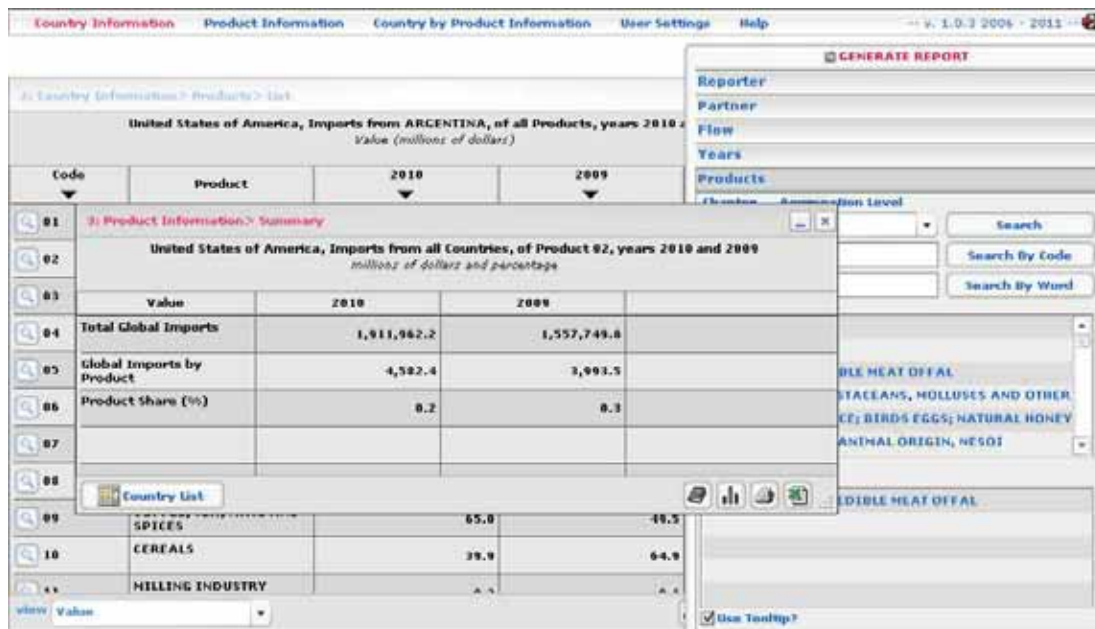
Source: Compiled from MAGIC Plus.

FIGURE 15
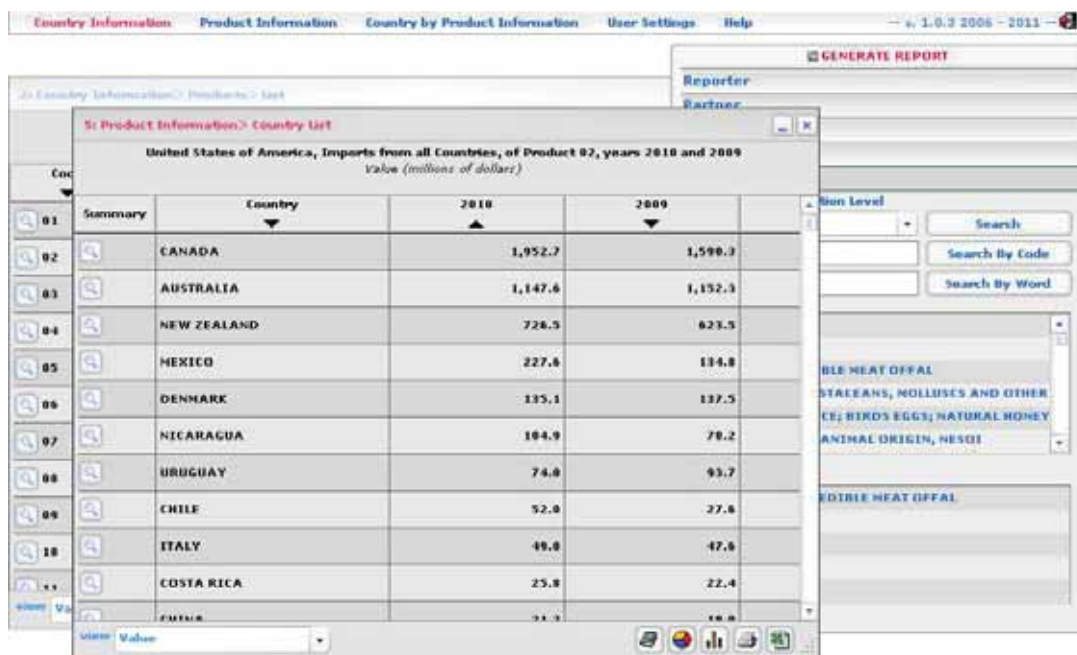
Source: Compiled from MAGIC Plus.

FIGURE 16

Source: Compiled from MAGIC Plus.

MAGIC has been designed to be flexible and the search in progress may be modified. For example, in the product list in figure 13, the value of United States imports from Argentina is displayed in millions of dollars, for all products and for the period 2009-2010. However, the other four MAGIC Plus indicators may also be consulted, as illustrated in figure 17.
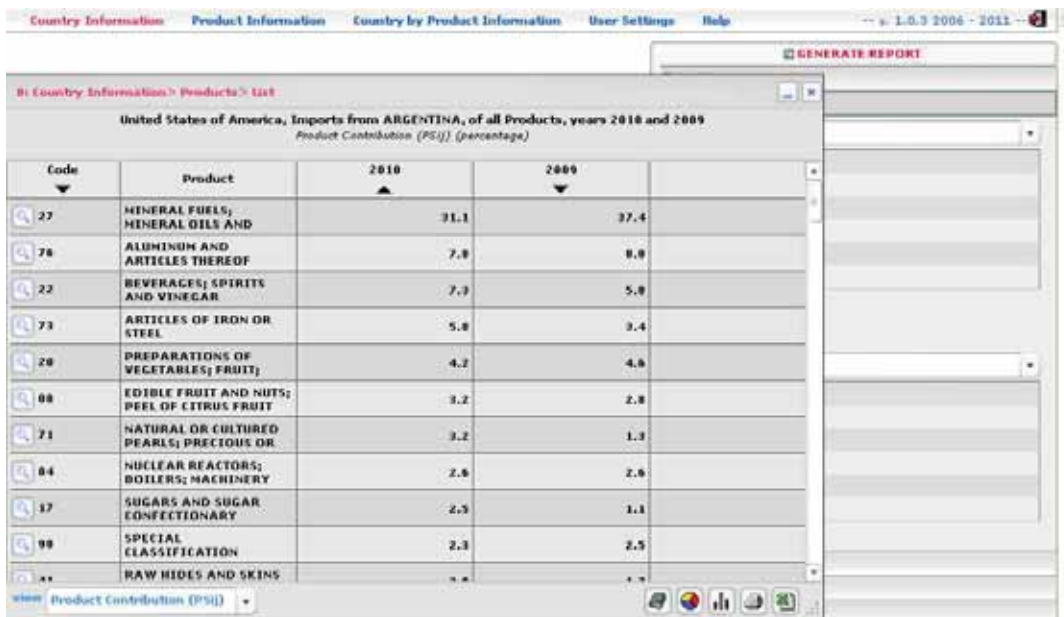
FIGURE 17

Source: Compiled from MAGIC Plus.

With regard to product contribution,[17] in the Argentina example, the programme displays the contribution of all Argentine products by tariff code for the period 2009-2010. If the list is displayed in descending order for 2010, the products contained in chapters 27 (mineral fuels and mineral oils) and 76 (aluminum) are the most important, with shares of 31.1% and 7.8%, respectively (see figure 18). Further searches on individual products may be performed from the "Country information" module. Returning to our example, selecting chapter 27 would bring up the product contribution for all chapter 27 products together with United States imports from all countries over the period 2009-2010. The "Country list" button is also available (see figures 19 and 20); when the countries are placed in descending order, Canada, Mexico and Venezuela are the main competitors in the United States market for chapter 27 products. If required, the five indicators can be displayed again for the country or countries of interest.

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[17]   Please note that in this manual the terms "product share" and "product contribution" are used interchangeably.
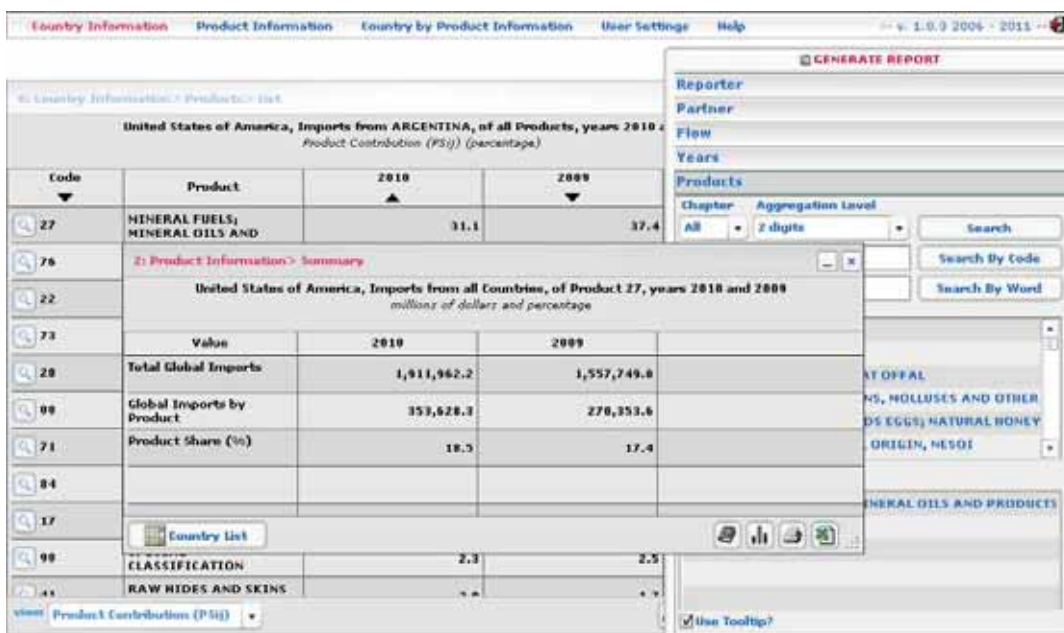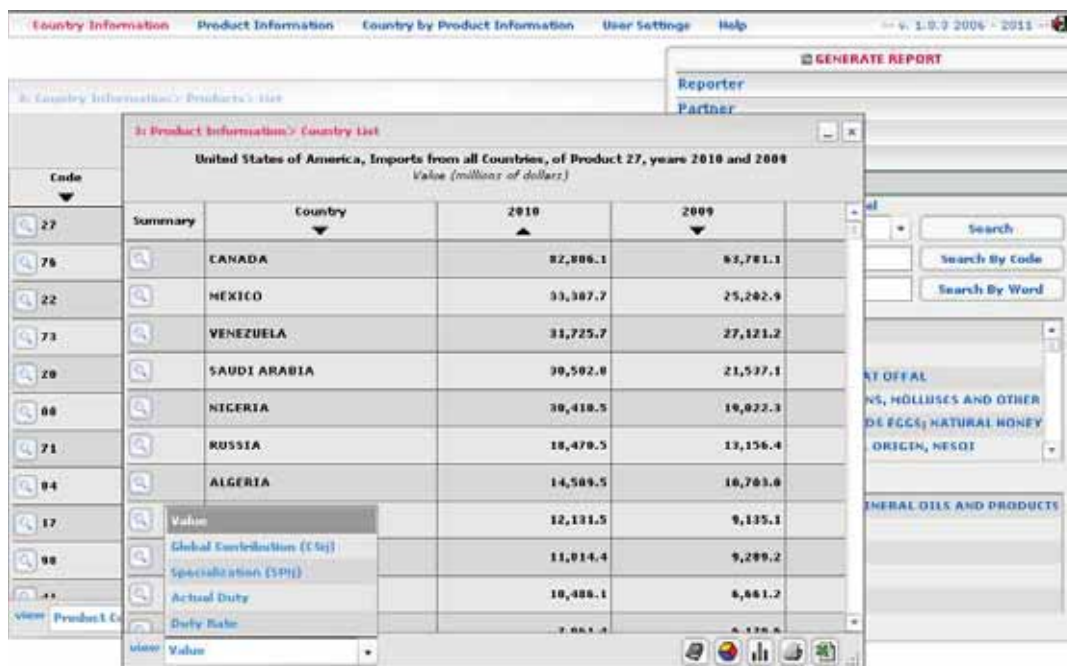
FIGURE 18

Source: Compiled from MAGIC Plus.

FIGURE 19

Source: Compiled from MAGIC Plus.

FIGURE 20

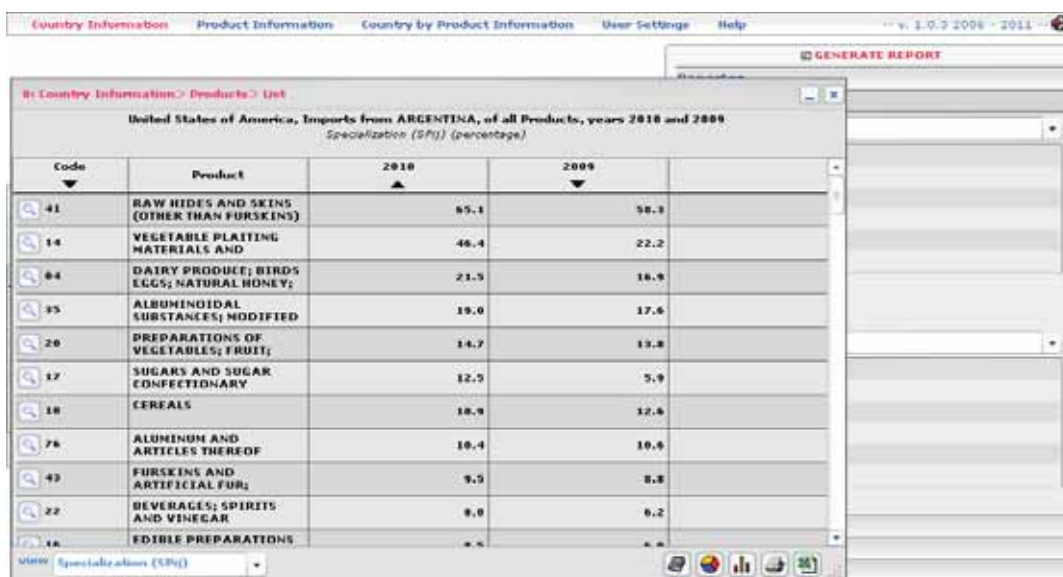Source: Compiled from MAGIC Plus.

In figure 20, the product contribution indicator was analysed using the figures for United States imports of all Argentine products over the period 2009-2010. The third indicator, specialization, will now be discussed.

Specialization refers to the market share of a specific product in bilateral trade as a proportion of the total global market share of the product internationally – that is, all countries and all products. In import statistics, product specialization means the "revealed comparative advantage" (RCA) the trade partner has in the market for that product imported by the reporting country.

In the example, we find that Argentina specializes (RCA >1)[18] in a wide range of animal and vegetable products (chapters 41, 14, 4, 35, 20, 17, 10, 76, 43 and 22). Note that the percentage of specialization has risen. The analyst must consider whether the increase in specialization has been accompanied by a corresponding expansion in market share in these products, or whether an increase in unit value greater than the market average is a sign of increased export value resulting from better quality goods (see figure 21). In general, the goal should be to improve product quality in order to be able to raise the price vis-à-vis competitors' average price and, simultaneously, gain market share. Boosting competitiveness in this way is consistent with a process of upgrading exports, while lowering relative price and market share downgrades the products exported (ECLAC, 2008).

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[18]   According to the general definition, the Balassa index of revealed comparative advantage (RCA) is a measure of export performance, with a range of between 0 and $+\infty$, where the upper limit is given by X_o^o / X_o^j ; j is the trade partner, o the reference country or market , and subscript o represents total exports (all products). The upper limit of the RCA index tends to ∞ when X_o^j tends to zero, or in other words, when the economic weight of the trade partner's exports in the reference country or market is irrelevant. X_o^o / X_o^j is equal to 1 when $X_i^j / X_i^o = X_o^j / X_o^o$. Therefore, the RCA index reveals that a country does not have a comparative advantage in a particular product or sector if $0 < IB < 1$; it does, however, have a comparative advantage when $1 \prec IB \prec X_o^o / X_o^j$.

FIGURE 21

Source: Compiled from MAGIC Plus.

As previously mentioned, the search may be extended to one or more specific groups of products, leading to the country list, following which a new query may be initiated.

Lastly, MAGIC Plus calculates the actual duty, which is simply the monetary value of the duties paid by the importer of the product from the trade partner.

The duty rate is the duty collected for the product as a percentage of the total value traded in this product. Figure 23 shows the duty rate for the specialized products imported from Argentina.

(ii) Product qualification. MAGIC Plus classifies products based on changes in market and product share. By default, the products are listed in order of their code in the harmonized system. They can however be ranked according to market share, product share, or both, in ascending or descending order.

One of the noteworthy features of MAGIC Plus is that a product qualification summary can be requested at this stage for an overview of how all products have been classified. It is also possible to request a graphical representation of the competitiveness matrix, print the results or download them as an Excel file.

Figure 22 shows the duty paid in millions of dollars for the specialized products imported from Argentina.

FIGURE 22

Source: Compiled from MAGIC Plus.

FIGURE 23

Source: Compiled from MAGIC Plus

Broadly speaking, the methodology used consists of classifying products imported by the reporting country from a trade partner according to two factors: (1) changes in imports of the product; and (2) changes in the trade partner's market share (for more details, see section 1, chapter II of this Manual). The results are used to construct a matrix with four possible categories: rising star, declining star, missed opportunity and retreat (see box 1).

It is important to note that monetary values are used to create the competitiveness matrix. Substantial changes in the relative prices of tradable goods have an impact on estimates of the competitiveness of different sectors. Oil is an example of this: its price has followed a downward trend over the past 20 years, which has contributed to its decreasing market share in relation to other products; according to this methodology, it would be classified as a product in retreat, even at times when the export volume increases.

Product qualification has a different meaning for export statistics. Rising stars are products for which both the trade partner's share of the reporting country's exports and its importance in the reporting country's worldwide exports have grown. Similarly, missed opportunities are products whose share of exports to the trade partner has declined, while their weight in total exports has increased. Declining stars are characterized by an increase in the trade partner's share, but a smaller weight overall among total products. In the case of retreats, both are negative.

Figure 24 shows the qualification of Argentine products, ordered by default by their code in the harmonized system.

As previously mentioned, these results can be sorted by change in market share (see figure 25), or by change in product share (see figure 26).

FIGURE 24

Source: Compiled from MAGIC Plus.

FIGURE 25

Source: Compiled from MAGIC Plus.

FIGURE 26

Source: Compiled from MAGIC Plus.

A product qualification summary is also available (see figure 27). The category "Not defined" is used in cases where some of the changes in market or product share are equal or close to zero, or where there is no information available.

FIGURE 27

Source: Compiled from MAGIC Plus.

Lastly, a graphical representation of the competitiveness matrix can be generated showing all four product categories (see figure 28).

FIGURE 28
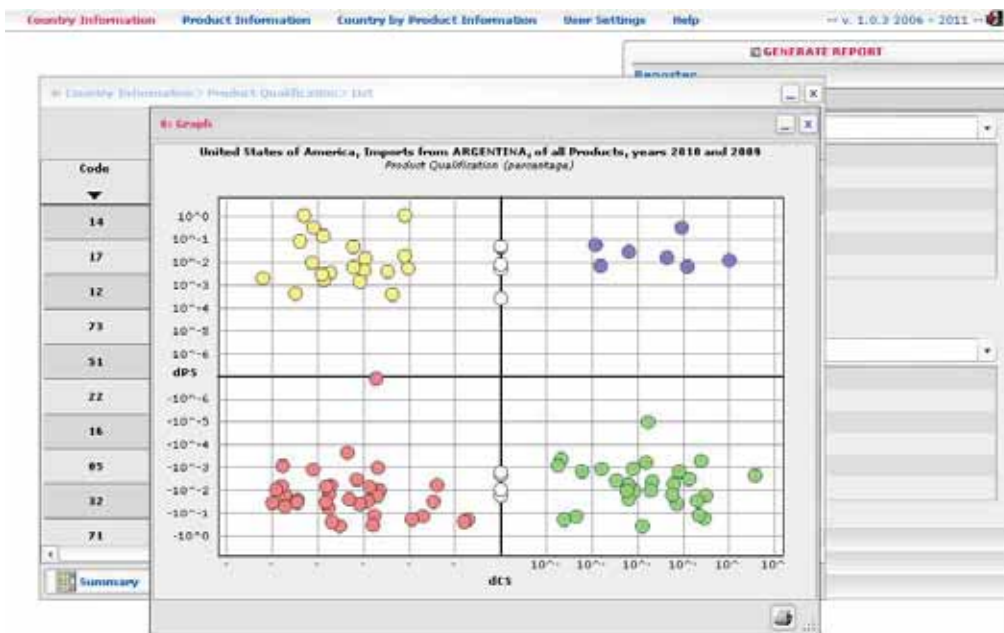
As before, the Help options may be used to interpret the results, print the report, or download and save the report as an Excel file.

(iii)   Decomposition of change. This option provides information on various components of the change in the value of trade flows between the reporting country and the trade partner over the selected period. Go to the "Country information" menu and select the fifth option: "Decomposition of change: list". Then follow the steps for selecting the desired trade partner, trade flow and years. The last year must of course be different from the first year. All the formulas and the interpretation for each of their effects are contained in the appendix to this document, but a short summary is presented below.

Changes in the import value may be split into three effects: the demand effect (DE), the share effect (SE) and the interaction effect (IE). The demand effect is the change in the value of imports that would have happened had the trade partner's share remained constant since the base year. The share effect reflects the change in the value of imports that would have occurred if the overall (or global) share of the product imports had remained constant. The interaction effect is a combination of the two. Both the demand effect and the interaction effect may be broken down into a structural effect and an overall (or global) effect (see diagram 2).

Figure 29 illustrates the decomposition of change between 2009 and 2010, with the United States as the reporting country and Argentina as the trade partner. As an example, imports of mineral fuels and mineral oils (chapter 27 of the harmonized system) from Argentina fell by US$ 270 million over this period (Change column). This variation can be broken down into the three effects previously described. If changes in chapter 27 alone are considered, imports would have grown US$ 447.6 million (DE). On the other hand, if changes related to a smaller market share by Argentina are isolated, imports would have decreased by US$ 548.6 million (SE). These two changes, coupled with the interaction effect, determine the overall change.

DIAGRAM 2
DECOMPOSITION OF CHANGE EFFECTS
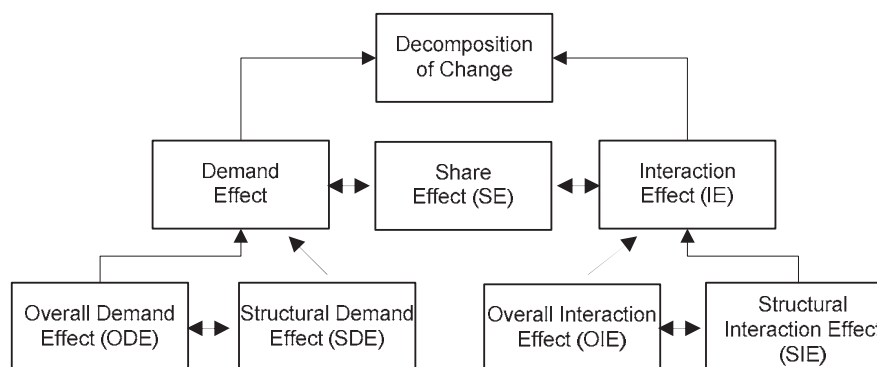
Source: Prepared by the author.

FIGURE 29

Source: Compiled from MAGIC Plus.

Decomposition of change is calculated based on the previously specified aggregation level, and an overview is provided by selecting the option "Decomposition of change: summary" from the "Country information" module (see figure 30). Please note that decomposition of change and product aggregation are not interchangeable operations, therefore the summary results depend on the aggregation level selected.

FIGURE 30

Source: Compiled from MAGIC Plus.

(b) Product information

In the second search module, "Product information", data may be obtained on individual products traded between the reporting country and its trade partners. A product may be selected from the list, or a group of products created. You can also use the tariff code or product name to search for a product. Once a product or group of products has been selected, the system displays information on United States imports from all its trade partners; clicking on "Country list" will bring up an alphabetical list of countries. A specific country can then be chosen and first module consultations carried out – product list, product qualification and decomposition of change.

FIGURE 31

Source: Compiled from MAGIC Plus.

In this example, if the first option "Product summary" is selected from the "Product information" menu, data on a specific product or group of products may be consulted. For example, in the case of Argentina, we know from the searches carried out in the first module that Argentina specializes in raw hides and skins (chapter 41 of the harmonized system). If the harmonized system code is known, it can be entered, or the tariff code or name can be used to search for a product. Here, the intention is to run searches on chapter 41 and this is carried out using the established steps. A report is generated that shows total global imports, global imports of the product, and the product share (see figure 32). In order to find out which countries participate or compete in this market, click on the "Country list" button. An alternative, more direct route for arriving at the country list is to go to the "Product information" menu, select "Country list" and then the product code, in this case chapter 41 of the harmonized system, and request a report. Placing this in descending order of value produces exactly the same list of countries.

Sorting these results in descending order also reveals that Argentina is one of the top three competitors in leather products in the United States market, after Italy and Brazil (see figure 33). As demonstrated in the first module, one of the characteristics of MAGIC Plus is that product information may be consulted via country information and vice versa. In addition to value, the programme calculates global contribution, specialization, actual duty and the duty rate.

FIGURE 32
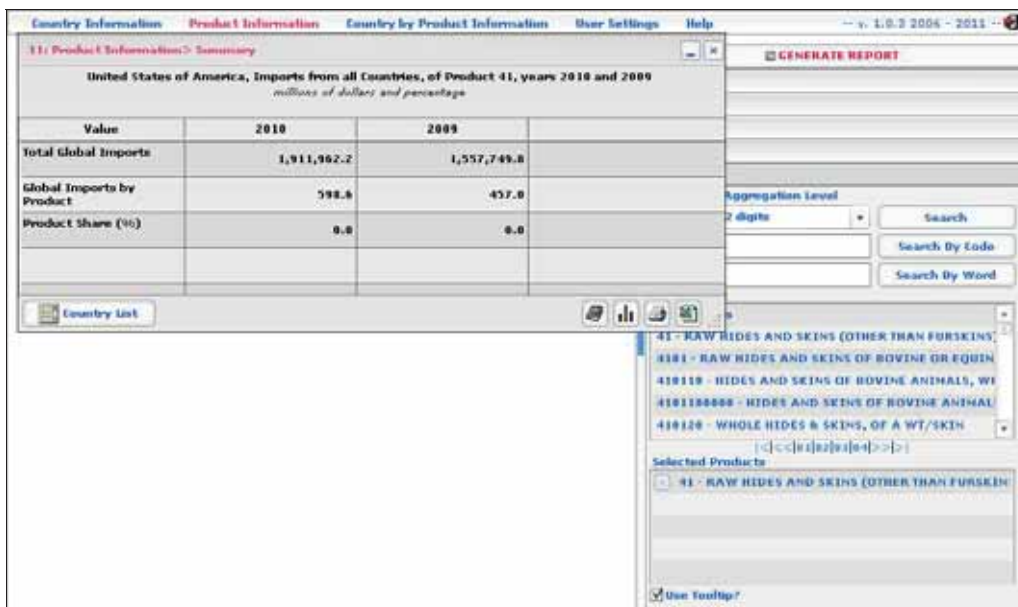
Source: Compiled from MAGIC Plus.

FIGURE 33
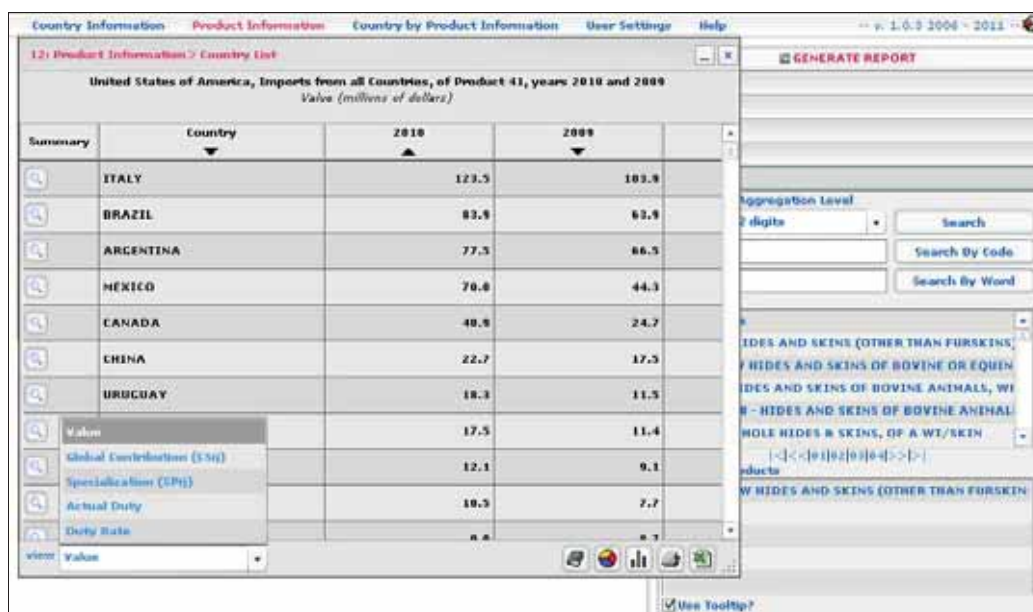
Source: Compiled from MAGIC Plus.

Here, the Help options can be used to automatically generate bar or pie charts to illustrate the results (see figures 34 and 35). Note that in figure 35, MAGIC Plus depicts the top five competitors by default, showing the value of their imports and their global contribution to the selected product.

FIGURE 34
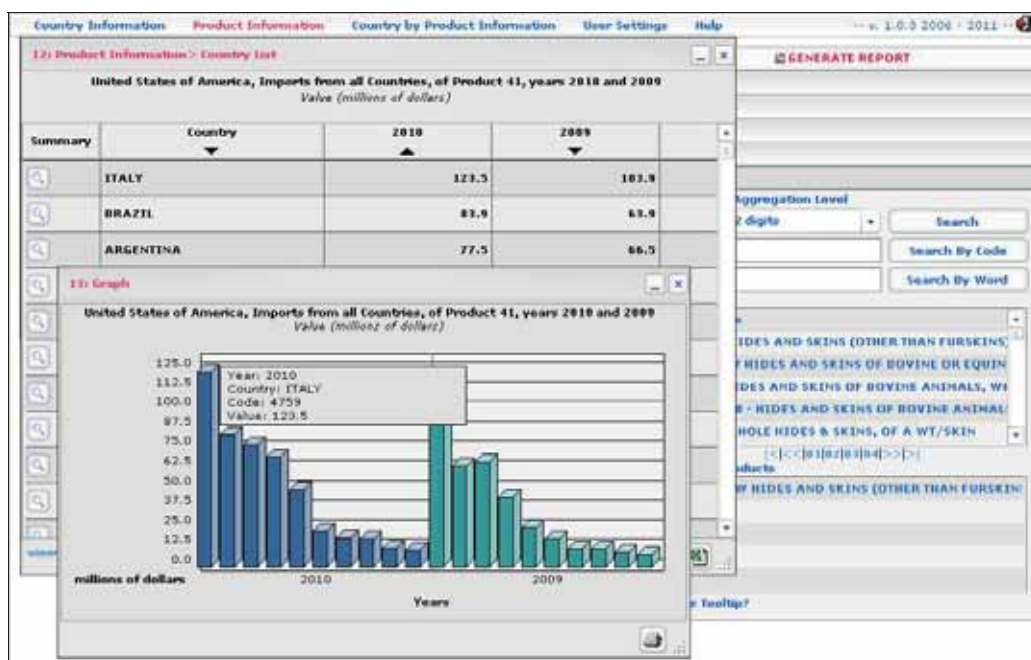
Source: Compiled from MAGIC Plus.

FIGURE 35
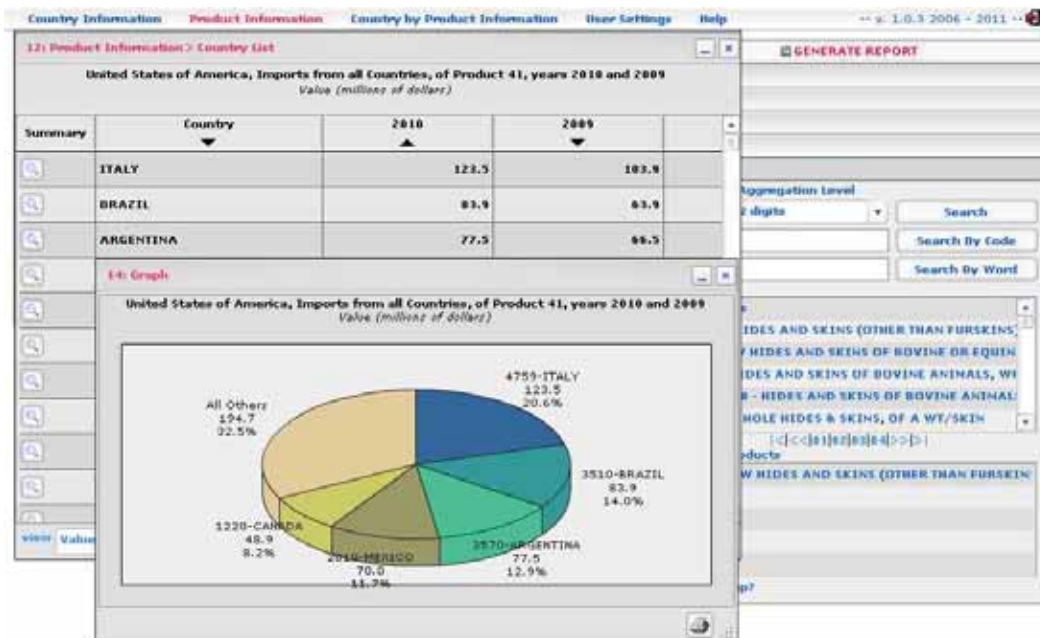
Source: Compiled from MAGIC Plus.

(c) Country by product information

In the third and final module, information is available on trade in a specific product between the reporting country and a trade partner or a group of trade partners. Select the desired trade partner and product; a window then appears with basic information on value, volume, unit value, product contribution, market share, actual duty and duty rate. It is also possible to analyse the decomposition of change using the "Summary" icon, as in the "Country information" module. As in the earlier examples, a base year and final year must be selected.

Data is available on imports by the reporting country from just one of its trade partners, or from a group of trade partners, which must be selected from the country list that appears on-screen.

A country must be selected from the alphabetical country list. Groups of countries have also been created based on existing trade agreements, and these can be chosen from the list "Select group of countries". Once the trade partner or group has been selected, you must specify the type of trade flow (exports or imports), the base and final year, and the chapters (two digits), headings (four digits), subheadings (six digits) or products (10 digits) you wish to view. For products, you can also search by code or keyword. A report will then be generated.

As an example, we have selected Argentina as the trade partner and the chapter 41 products. Remember that searches can be carried out at a higher level of disaggregation: at the maximum 10-digit level, the system can calculate unit values. At other levels of disaggregation, however, unit value calculation and the report on volume data are not available. The results are presented in figure 36 and include data on value, product contribution, market share, actual duty and duty rate. In the example, United States imports of chapter 41 products from Argentina rose from US$ 66.5 million in 2009 to US$ 77.5 million in 2010. In this case, the product contribution rose from 1.7% to 2% from one year to the next, and the market share dropped slightly from 14.6% to 12.9%; the actual duty and the duty rate varied little over this period.

FIGURE 36

Source: Compiled from MAGIC Plus.

Click on "Summary" for immediate access to decomposition of change data for chapter 41 products (see figure 37). Again, the interpretation is exactly the same as when the search is performed from the "Country information" module.

FIGURE 37
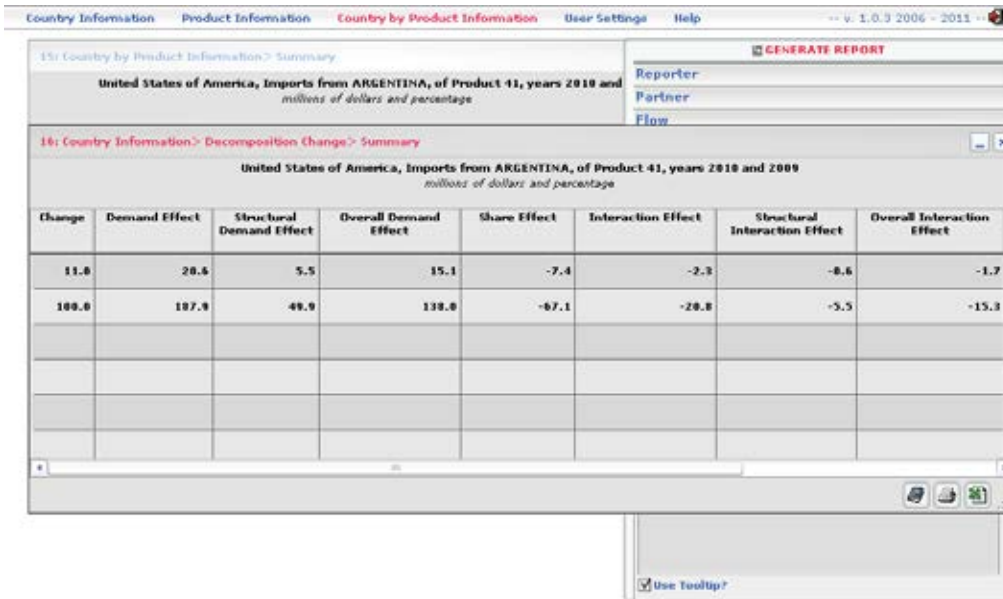
Source: Compiled from MAGIC Plus.

A search for country information with Argentina as the trade partner, but for "all products" rather than one specific product, would yield the results shown in figure 38. Note that, in this particular instance only, the product contribution has to be 100% because all Argentine products imported to the United States are included, further proof that the same information may be accessed via different routes in MAGIC Plus.

FIGURE 38
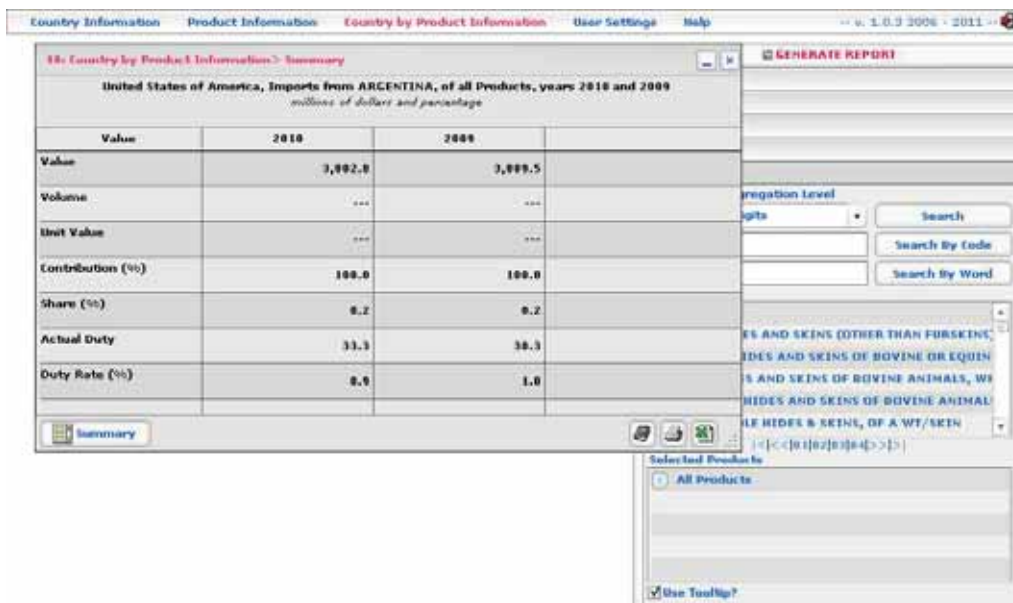
Source: Compiled from MAGIC Plus.

Lastly, a decomposition of change summary may be requested. The change will again be 100% because all products are included, as shown in figure 39.

FIGURE 39
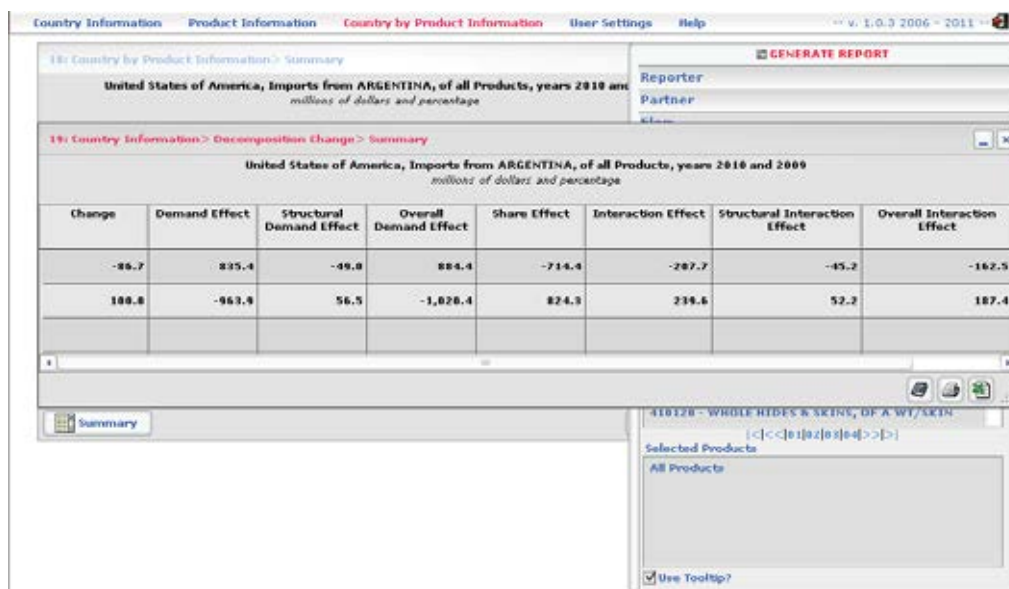
Source: Compiled from MAGIC Plus.

IV. Exercises

Exercise 1

Obtain the principal products imported by the United States from China in 2005 and 2006, to four digits of the harmonized system (HS), and rank them in descending order of each product's contribution in 2006.

Since the aim is to obtain a list of *all* products imported by the United States from China, the "Country information" module has to be used for the search and the "Product list" option selected.

After this, it is just a matter of selecting the trade partner (China), the years (2005-2006) and the level of disaggregation (four digits) by clicking through the three options.

In the case of flow selection, the default option (imports) is left because this is the information required for the exercise.

Lastly, selecting the "generate report" option brings up the following list.

| Country Information | Product Information | Country by Product Information | User Settings | Help |

0: Country Information > Products > List

United States of America, Imports from CHINA, of all Products, years 2006 and 2005
Value (millions of dollars)

Code ▼	Product	2006 ▼	2005 ▼
🔍 0101	HORSES; ASSES; MULES AND HINNIES; LIVE	0.1	0.0
🔍 0102	BOVINE ANIMALS; LIVE	0.0	0.0
🔍 0103	SWINE; LIVE	0.0	0.0
🔍 0104	SHEEP AND GOATS; LIVE	0.0	0.0
🔍 0105	POULTRY; LIVE; CHICKENS; DUCKS; GEESE; TURKEYS AND GUINEAS	0.0	0.0
🔍 0106	ANIMALS; LIVE; NESOI	28.9	23.6
🔍 0201	MEAT OF BOVINE ANIMALS; FRESH OR CHILLED	0.0	0.0
🔍 0202	MEAT OF BOVINE ANIMALS; FROZEN	0.0	0.0
🔍 0203	MEAT OF SWINE (PORK); FRESH; CHILLED OR FROZEN	0.0	0.0
🔍 0204	MEAT OF SHEEP OR GOATS; FRESH; CHILLED OR FROZEN	0.0	0.0
🔍 0205	MEAT OF HORSES; ASSES; MULES OR HINNIES; FRESH; CHILLED OR FROZEN	0.0	0.0

view Value |< < |01|02|03|04|05|06|07|>>|>|

The exercise calls for the results to be ranked in descending order of each product's contribution in 2006. To view the desired information, there is a "view" menu at the bottom left-hand corner of the screen above that can be used to display the information in terms of value, product contribution, specialization, actual duty and tariff rate. The indicator required is the second of these; thus, this option is selected, the report refreshes and, lastly, the ▼ symbol under the year 2006 is clicked to rank the information in descending order. The table below presents the results.

It can be seen that the main products imported by the United States include automatic data processing machines and units thereof (code 8471), transmission apparatus for radiotelephony, radiotelegraphy, radio broadcasting and television (code 8525) and parts and accessories (other than covers, carrying cases and the like) (code 8473); these three products account for 21.4% of all United States imports from China.

Exercise 2

Analyse changes in the competitiveness of United States imports of electrical machinery and equipment and parts thereof (chapter 85) from Mexico in the periods 1990-1995 and 1996-2006, on the basis of the product qualification.

The module for carrying out this search is "Country information". Click this option and select "Product qualification: list"; to complete the information needed for the report, select the trade partner and the period to be consulted. Note that two reports have to be generated for this exercise, one for the period 1990-1995 and another one for the period 1996-2006, so that the comparisons can be made. If all four years are selected, the program will generate a report for the first and last years.

Lastly, click the "generate report" option at the upper right. The report displayed looks like this:

The first screen displayed only shows products with codes from 1 to 10. Because code 85 is required, it has to be found by scrolling down with the arrows on the right-hand side of the report or, for faster searching, the bar. The report indicates that "electrical machinery and equipment and parts thereof", chapter 85, was classified in the rising star category in the period 1990-1995, i.e., the changes in both its market share and its product share were positive. This category increased its share of total exports from Mexico to the United States and its share of all products imported by the United States, i.e., it was a dynamic product in a dynamic market.

Now the same exercise has to be carried out again, but this time for the period 1996-2006.

The result shows code 85 falling into the declining star category, since while it continued to be competitive, with Mexico gaining share in global exports of this product, at the international level it lost share relative to other products imported by the United States. MAGIC Plus can show how the product behaved in this period in terms of its contribution; according to the MAGIC report, it was the product with the third-largest contribution, behind only "mineral fuels, mineral oils and products of their distillation" (code 27) and "nuclear reactors, boilers, machinery and mechanical appliances" (code 84), while in 1996 it was the product with the second-largest contribution.

4: Country Information > Products > List   _ ☒

United States of America, Imports from all Countries, of all Products, years 2006 and 1996
Product Contribution (PSij) (percentage)

Code ▼	Product	2006 ▲	1996 ▼	
🔍 27	MINERAL FUELS; MINERAL OILS AND PRODUCTS OF THEIR DISTILLATION;	18.0	9.1	
🔍 84	NUCLEAR REACTORS; BOILERS; MACHINERY AND MECHANICAL APPLIANCES; PARTS	13.1	16.4	
🔍 85	ELECTRICAL MACHINERY AND EQUIPMENT AND PARTS THEREOF; SOUND RECORDERS	12.4	14.5	
🔍 87	VEHICLES; OTHER THAN RAILWAY OR TRAMWAY ROLLING STOCK; AND PARTS AND	11.6	13.3	
🔍 90	OPTICAL; PHOTOGRAPHIC; CINEMATOGRAPHIC; MEASURING; CHECKING;	2.7	3.0	
🔍 71	NATURAL OR CULTURED PEARLS; PRECIOUS OR SEMIPRECIOUS STONES; PRECIOUS	2.4	2.2	
🔍 29	ORGANIC CHEMICALS	2.4	2.1	
🔍 30	PHARMACEUTICAL PRODUCTS	2.3	0.6	
🔍 94	FURNITURE; BEDDING; CUSHIONS ETC.; LAMPS AND LIGHTING FITTINGS NESOI; ILLUMINATED	2.1	1.5	
🔍 98	SPECIAL CLASSIFICATION PROVISIONS; NESOI	2.1	2.6	
🔍 62	ARTICLES OF APPAREL AND CLOTHING ACCESSORIES; NOT KNITTED OR CROCHETED	2.0	2.9	

view **Product Contribution (PSij)** ▼

Exercise 3

Analyse the decomposition of change in total United States imports from the countries of the Central American Common Market (CACM) in the period 1996-2006.

The first module, "Country information", will be used to obtain a decomposition of the change in total imports from the CACM countries. Thus, we select the "Decomposition of change: summary" option in module 1, together with the desired options for the trade partner and years to be consulted.

Note that for the "select country" option, the trade partner has to be chosen from the "select group" menu this time, as this is where CACM is listed.

Lastly, we select the period to be consulted (1996-2006) and click on "generate report".

10: Country Information> Summary

United States of America, Imports from MCCA, of all Products, years 2006 and 1996
millions of dollars and percentage

Value	2006	1996
Total Global Imports	1,854,997.2569	791,314.6646
Total Imports	14,043.8967	6,867.0021
Country Share (%)	0.7571	0.8678

[Product List] [Product Qualification] [Decomposition of Change]

What immediately stands out is that United States imports from CACM increased by over US$ 7 billion in the period 1996-2006; thus, the information from MAGIC Plus indicates that whereas in 1996 the United States took US$ 6.867 billion worth of imports from CACM, in 2006 the figure was just over US$ 14 billion. However, note that the structural demand effect is negative, indicating that while United States imports from CACM increased, they did so by less than the country's other product imports from around the world.

9: Country Information> Decomposition Change> Summary

United States of America, Imports from MCCA, of all Products, years 2006 and 1996
millions of dollars and percentage

Change	Demand Effect	Structural Demand Effect	Overall Demand Effect	Share Effect	Interaction Effect	Structural Interaction Effect	Overall Interaction Effect
7,176.8946	6,707.4730	-2,523.1289	9,230.6019	16.1288	453.2928	431.6126	21.6802
100.0000	93.4593	-35.1563	128.6155	0.2247	6.3160	6.0139	0.3021

This is reflected in the share effect which, while positive, is very small in comparison with the demand effect; in fact, it accounts for just 0.22% of the total change in the volume exported by CACM. The combined effect of greater demand and a higher share yields a positive interaction effect which contributes 6.3% of the total change. The overall demand effect is what explains the rise in imports from CACM, and this was due to the expansion of the total import market.

Exercise 4

Obtain the list of trade partners from which the United States imports knitted or crocheted and non-knitted or crocheted articles of apparel and clothing accessories (codes 61 and 62, respectively, of the HS) for the period 1996-2006, and identify the country with the largest market share in the last year.

Because the products involved are clearly identified and a list of all trade partners is asked for, the appropriate module for generating the report is the second one ("Product information"). This module and the "Country list" option are used. In this case, only the period and products to be consulted are selected.

At this product selection stage, enter the number 61 to the left of the "search by code" button and then click on that button. The "product list" window will display a series of products belonging to the different subcategories of code 61. Select the product or category of interest and it will appear in the last window, "selected products". Repeat the same steps to make the selection for code 62.

The object of the exercise is to identify the countries with the largest market shares in 2006. There is a "view" menu at the bottom left-hand corner of the report above. Select the "global contribution" option here and the information displayed will change to percentages. Lastly, select the ▼ symbol under the year 2006 to rank the information in descending order. The table below shows the results of the exercise.

0: Product Information> Country List

United States of America, Imports from all Countries, of Products 61 and 62, years 2006 and 1996
Global Contribution (CSij) (percentage)

Summary	Country ▼	2006 ▲	1996 ▼	
🔍	CHINA	27.0702	13.2496	
🔍	MEXICO	7.4234	9.8680	
🔍	INDONESIA	5.0068	3.5122	
🔍	INDIA	4.4176	3.2955	
🔍	VIETNAM	4.3031	0.0622	
🔍	HONG KONG	3.8376	10.3551	
🔍	BANGLADESH	3.8278	2.6912	
🔍	HONDURAS	3.4303	3.2687	
🔍	CAMBODIA	2.9041	0.0063	
🔍	PHILIPPINES	2.7231	3.8459	
🔍	THAILAND	2.5327	2.7918	

view **Global Contribution (CSij)** ▼ |<|<<|01|02|>>|>|

China has far and away the largest market share (27%); 10 years earlier, its share was barely half this. Mexico is in second place, but with a market share barely exceeding a quarter of China's.

Exercise 5

Obtain the main indicators for United States imports from Brazil of turbofan powered airplanes with HS tariff code 8802300040 for the period 1997-2006.

The third module is used for this exercise, as it provides information on both the product and the trade partner of interest. After that, the steps are the same as for any search: select the reporting country, trade partner, period and product, and then generate the report.

0: Country by Product Information> Summary

United States of America, Imports from BRAZIL, of Product 8802300040, years 2006 and 1997
millions of dollars and percentage

Value	2006	1997	
Value	391.4999	233.0321	
Volume	18.0000	16.0000	
Unit Value	21.7500	14.5645	
Contribution (%)	1.4838	2.4199	
Share (%)	11.1987	12.9806	
Actual Duty	0.0000	0.0000	
Duty Rate (%)	0.0000	0.0000	

Summary

Although both the import volume and unit value of the product have increased, its contribution and market share have fallen. In these circumstances, and given the evolution of its share of the United States import total, it would fall into the category of "retreats" or "missed opportunities". The analysis is done to confirm the product qualification.

2: Product Information> Summary

United States of America, Imports from all Countries, of Product 8802300040, years 2006 and 1997
millions of dollars and percentage

Value	2006	1997	
Total Global Imports	1,854,997.2569	869,873.8568	
Global Imports by Product	3,495.9506	1,795.2281	
Product Share (%)	0.1885	0.2064	

Country List

The product share in the United States import total has declined, and likewise the market and product shares. Code 8802300040 would be considered a retreat for Brazil in the period 1997-2006.

If the "Summary" option at the bottom left-hand corner of the report is selected, we get the decomposition of change for this product.

4: Country Information> Decomposition Change> Summary

United States of America, Imports from BRAZIL, of Product 8802300040, years 2006 and 1997
millions of dollars and percentage

Change	Demand Effect	Structural Demand Effect	Overall Demand Effect	Share Effect	Interaction Effect	Structural Interaction Effect	Overall Interaction Effect	
158.4678	220.7646	-43.1418	263.9065	-31.9904	-30.3064	5.9225	-36.2288	
100.0000	139.3120	-27.2244	166.5363	-20.1873	-19.1246	3.7373	-22.8620	

These results provide a broader overview of what has happened with this product in the United States market; as might be expected, the demand effect is positive; however, we can see that the structural demand effect, which compares a product's export performance with the performance of all products (if a given country's exports of the product are kept unchanged in the start year), is negative. The negative share effect is unsurprising as well, but it does reveal that if exports of this product are kept unchanged in the start year, then its share of Brazilian exports in 2006 relative to all countries exporting it is lower than in 1997.

Exercise 6

Obtain the main exporters of ignition wiring sets and other wiring sets of a kind used in vehicles, aircraft and ships (tariff code 8544300000), comparing 2006 to 2000. Also obtain the decomposition of change for the two main exporters, using the results of the search already done for 2006.

In the "Product information" module, select "Country list" and then choose the start (or base) year and the final year (2000 and 2006, respectively) and enter the product of interest. Then select the "generate report" option and rank first the 2006 and then the 2000 findings to obtain the main exporting countries in each period.

Once the list has been obtained, the procedure is to ascertain which countries were the two leading exporters in 2006, use the "Country by product information" module to select the appropriate country, years and product, and generate the report. Lastly, select the "Summary" option, which generates the table showing the decomposition of change, and repeat the same steps for the second-largest exporter.
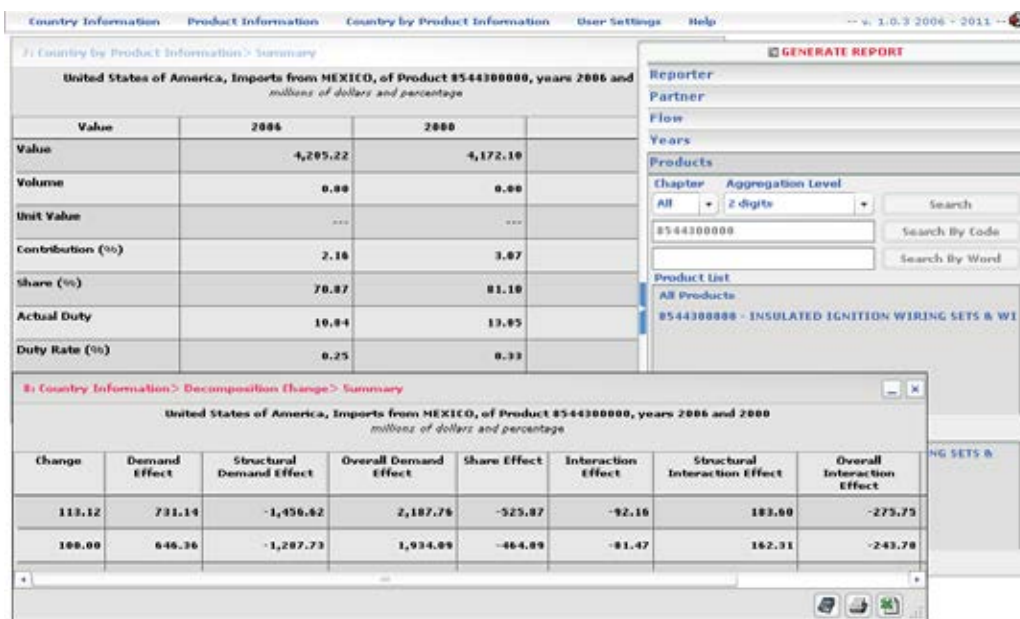
The results of this search indicate that while Mexico continued to be the main supplier of ignition wiring sets to the United States between 2000 and 2006, its share fell by just over 10% in the period, something that is reflected in the share effect by a loss of US$ 525.9 million. Honduras, having not ranked among the top five exporters in 2000, had risen to second place by 2006 (see charts below); thus, both the demand effect and the share and interaction effects are positive, with the share effect being much the larger (US$ 249.9 million), which seems obvious given that Honduras now has 6% of the market.
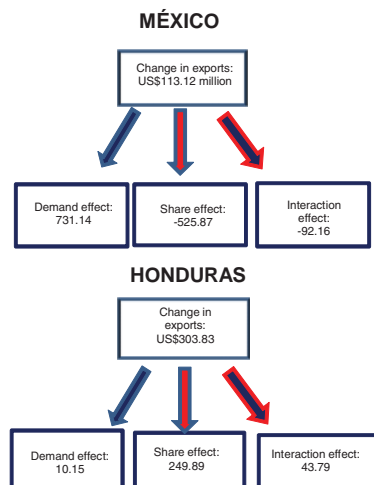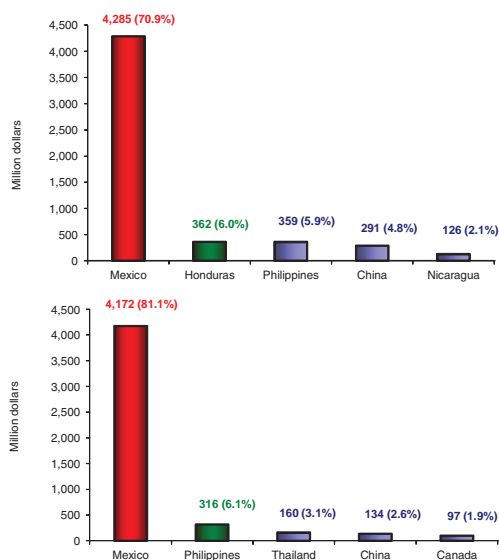
Exercise 7

Combined analysis of product qualification and decomposition of change

The idea with this exercise is to show the advantages of conducting a combined analysis using the competitiveness matrix and the decomposition of change. The example used for this is exports of mineral fuels and oils and products of their distillation (chapter 27) from Mexico to the United States. Figure 1 shows the evolution of exports of this product to the United States market, and this can be used to divide the information into three periods, namely 1990-1997, 1998-2000 and 2001-2007, as well as considering the whole period (1990-2007).

FIGURE 40
MEXICO: EXPORTS OF MINERAL FUELS AND OILS TO THE UNITED STATES, 1990-2007
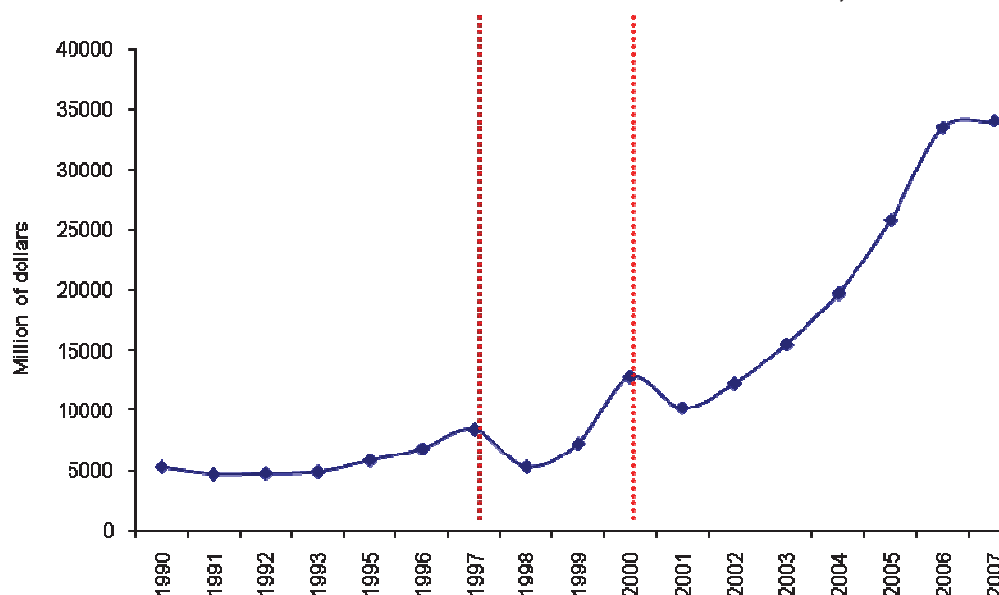
Source: Prepared by the author.

The results of the product qualification in the different periods are presented in table 1. Thus, other than in the period 1990-1997, when they fell into the declining star category, these products qualified as rising stars throughout.

TABLE 1
MEXICO: PRODUCT QUALIFICATION BY PERIOD

	1990-1997	1998-2000	2001-2007	1990-2007
Δ market share	2.7072	0.3908	0.9441	1.2027
Δ product share	-4.1284	4.5624	7.9444	5.5017
Qualification	Declining star	Rising star	Rising star	Rising star

Source: Prepared by the author.

The change in market share is positive in all periods except 1990-1997, when it is negative. At this point, it is interesting to look a little further into this result using the decomposition of change tool; table 2 shows the results yielded by MAGIC Plus in the different periods considered.

65

It can be seen that in the 1990-1997 period, when the product is qualified as a declining star, the structural demand effect and the interaction effect are negative; the negative structural demand effect (amounting to almost US$ 3 million) reflects the fact that demand for mineral fuels and oils is less dynamic than overall demand in the United States. Meanwhile, the negative structural interaction effect (US$ 972 million) shows that the product is less dynamic than the market, i.e., is growing more slowly than the market overall. For this particular period, therefore, the recommendation might be to concentrate on supporting other sectors or products, since United States demand in this category has stagnated or even declined. It should be noted, however, that Mexico has not lost market share, since the share effect, like the total demand effect, is positive.

In this situation, other countries would be expected to have lost share, given that overall demand has dropped. A rapid search on MAGIC Plus indicates that whereas 49 countries exported mineral fuels and oils to the United States in 1990, just 44 did in 1997. One of the countries that stopped exporting was India. The results for the decomposition of change obtained using MAGIC Plus reflect this development; table 3 shows a negative change of US$ 246 million and an unfavourable trend in the share and interaction effects.

TABLE 2
DECOMPOSITION OF CHANGE BY PERIOD

15: Country Information> Decomposition Change> Summary

United States of America, Imports from MEXICO, of Product 27, years 1997 and 1990
millions of dollars and percentage

Change	Demand Effect	Structural Demand Effect	Overall Demand Effect	Share Effect	Interaction Effect	Structural Interaction Effect	Overall Interaction Effect
3,131.56	1,047.69	-2,955.89	4,003.58	1,739.28	344.59	-972.20	1,316.79
100.00	33.46	-94.39	127.85	55.54	11.00	-31.05	42.05

United States of America, Imports from MEXICO, of Product 27, years 2000 and 1998
millions of dollars and percentage

Change	Demand Effect	Structural Demand Effect	Overall Demand Effect	Share Effect	Interaction Effect	Structural Interaction Effect	Overall Interaction Effect
7,470.55	6,958.46	5,198.27	1,760.19	221.62	290.47	217.00	73.48
100.00	93.15	69.58	23.56	2.97	3.89	2.90	0.98

United States of America, Imports from MEXICO, of Product 27, years 2007 and 2001
millions of dollars and percentage

Change	Demand Effect	Structural Demand Effect	Overall Demand Effect	Share Effect	Interaction Effect	Structural Interaction Effect	Overall Interaction Effect
23,842.29	20,433.96	13,175.57	7,258.39	1,135.82	2,272.51	1,465.28	807.22
100.00	85.70	55.26	30.44	4.76	9.53	6.15	3.39

United States of America, Imports from MEXICO, of Product 27, years 2007 and 1990
millions of dollars and percentage

Change	Demand Effect	Structural Demand Effect	Overall Demand Effect	Share Effect	Interaction Effect	Structural Interaction Effect	Overall Interaction Effect
28,767.29	24,425.42	8,846.48	15,578.94	772.72	3,569.15	1,292.69	2,276.46
100.00	84.91	30.75	54.16	2.69	12.41	4.49	7.91

Source: Prepared by the author.

TABLE 3
INDIA: DECOMPOSITION OF CHANGE

| United States of America, Imports from INDIA, of Product 27, years 1997 and 1990 | | | | | | | |
| millions of dollars and percentage | | | | | | | |
Change	Demand Effect	Structural Demand Effect	Overall Demand Effect	Share Effect	Interaction Effect	Structural Interaction Effect	Overall Interaction Effect
-245.85	52.79	-148.95	201.74	-249.26	-49.38	139.33	-188.71
100.00	-21.47	60.58	-82.06	101.39	20.09	-56.67	76.76

Source: Prepared by the author.

Glossary

- Actual duty: This is the monetary value of the duty paid by the importer of the product from the trade partner.

- Aggregation level: These are the product groupings used in international statistical classifications. In MAGIC Plus, information is presented at the 2-, 4-, 6- and 10-digit aggregation levels of the Harmonized Commodity Description and Coding System (HS).

- Balassa index (see Revealed comparative advantage)

- CAN system methodology: This consists in classifying the products imported by the reporting country from a trade partner by the product's import dynamic and the dynamic of the trade partner's market share. The sign of these two effects allows a competitiveness matrix to be constructed with four categories: rising star, declining star, missed opportunity and retreat.

- Competitive sector: A sector whose market share, contribution or specialization increases between a base year and a final year.

- Country share: This is the proportion of total global trade represented by the trade partner's total trade.

- Declining star: This denotes a competitive but stagnant product which is increasing its market share even as overall demand for that product declines.

- Decomposition of change: This is the mechanism used to obtain information on the different components of the change in value of the trade flow between the reporting country and the trade partner in the selected period, by distinguishing between market dynamism, market structure and the competitiveness factor.

- Demand effect (DE): This is the change in the value of imports that would have occurred if the product share by country at the global level had remained unchanged since the base year; consequently, the change is explained by a rise in overall demand for the product.

- Duty rate: This is the tariff levied on the product as a percentage of the total value of trade in that product.

- Dynamic sector: A sector whose share of trade flows increases between a base year and a final year.

- Global trade: This is the trade of all countries.

- HS: Harmonized Commodity Description and Coding System, with a classification level of from 2 to 10 digits.

- Information modules: MAGIC has three information modules for calling up statistics on the imports (M) and exports (X) of the United States and all its trade partners. These modules are: (1) Country information, (2) Product information and (3) Country by product information.

- Country information module: This provides information on products traded between the reporting country and one or more trade partners.

- Product information module: This provides information on the specific product or group of products a country trades with the reporting country.

- Country by product information: This provides information on the reporting country's trade by trade partner (or group of countries) and by product (at any level of disaggregation).

- Interaction effect (IE): This is an effect combining the change in the product's share by country at the global level with a change in global trade in the product. According to the formula used, its value is zero when the product's share does not change or global demand does not change. The IE is positive if the country's share and the change in global demand have the same sign, i.e., if both are positive or negative. Conversely, when one is positive and the other negative, the rule of signs holds and the effect is negative.

- Lafay index (LFI): This is an index of international specialization proposed by Lafay (1992) to supplement the analysis of specialization patterns carried out using the Balassa index of revealed comparative advantages. The LFI is defined as follows:

$$LFI_i^j = 100 \left[\frac{X_i^j - M_i^j}{X_i^j + M_i^j} - \frac{\sum_{i=1}^{n} X_i^j - M_i^j}{\sum_{i=1}^{n} X_i^j + M_i^j} \right] \frac{X_i^j + M_i^j}{\sum_{i=1}^{n} X_i^j + M_i^j}$$

  where X_i^j and M_i^j are exports and imports of product or product group i from country j to and from the rest of the world, respectively, and n is the number of groups or products traded. According to this index, the comparative advantage of a country j in the production of a good i is measured by the deviation of the normalized trade balance for good i from the total normalized trade balance, multiplied by the trade share (imports plus exports) of good i in the trade total. Positive values for the Lafay index indicate the existence of comparative advantages; the higher the value, the greater the degree of specialization in a product. Negative values indicate non-specialization and an absence of comparative advantages.

- Market share: This is the proportion of global trade in a specific product represented by the trade in that product from a specific country.

- Missed opportunity: This denotes an uncompetitive, undynamic product that is losing market share even as overall demand for that product increases.

- Old need met: Refers to products which have lost ground as a share of the total, but for which the trade partner's share has risen.

- Old need left unmet: Refers to products for which both the trade partner's and the products' share of total trade have fallen.

- Overall demand effect (ODE): This is the component of change accounted for by growth in total global imports.

- Overall interaction effect (OIE): This is the change identified by combining the change in a product's share by country at the global level with the change in total global trade.

- Product contribution: See product share.

- Product qualification: This is a classification derived from an analysis of competitiveness based on the CAN system methodology. Broadly speaking, the methodology consists in classifying products imported by the reporting country from a trade partner by the dynamic of the product's contribution and the dynamic of its market share. The categories are: rising star, declining star, missed opportunity and retreat.

- Product list: This is a listing of the products traded between the reporting country and the trade partner selected.

- Product share: This is the proportion of total global trade represented by a product's global trade.

- Recognized new need: This refers to products for which both the trade partner's share of exports from the reporting country and their share of the reporting country's overall exports are increasing.

- Relative unit value: Indicates the unit value of the product at the bilateral level, i.e., between the reporting country and the trade partner, as a proportion of the product's unit value at the global level, i.e., at the level of all countries. If the relative unit value is over 1, the product has a higher unit value in bilateral than in global trade.

- Reporting country: The country providing the basic reference database.

- Retreats: These are uncompetitive, undynamic products experiencing a decline in both market share and overall demand.

- Revealed comparative advantage (RCA): The Balassa index of revealed comparative advantage compares the export share of a product or sector in a country with that product or sector's export share in world trade or in the reference market. The denominator represents the sector or product's share of exports to the United States. The RCA index compares a country's export structure (numerator) with a market's export structure (denominator). When the RCA index is 1 for a particular country's sector or product, the percentage change for that sector or product is identical to the average for the reference market. When the RCA index is greater than 1, the country is said to have specialized in that sector or product, while the opposite holds when the RCA index is less than 1.

$$RCA_i^j = \frac{x_i^j / x_i^o}{X_o^j / X_o^o} \equiv \frac{x_i^j / X_o^j}{x_i^o / X_o^o}$$

x_i^j are the exports of sector or product i from country j; x_i^o are exports of product i from the country or market of reference; X_o^j are total exports from country j; X_o^o are total exports from the country or market of reference. Where import statistics are concerned, revealed comparative advantage is equivalent to product specialization (see Specialization).

- Rising star: This denotes a competitive and dynamic product which is increasing its market share even as overall demand for that product rises.

- Share effect (SE): This is the change in the value of trade that is accounted for exclusively by a change in the share of product i from country j at the global level.

- Specialization: This is the market share of a specific product in bilateral trade or the reference market as a proportion of the product's market share at the total global level, i.e., all countries and all products. Where import statistics are concerned, the product's specialization is the "revealed comparative advantage" the trade partner has in the market for that product which the reporting country imports.

- Stagnant sector: A sector whose share of trade flows decreases between a base year and a final year.

- Statistics or trade flows: These are data on the reporting country's imports and exports relative to its trade partners'.

- Structural demand effect (SDE): This is an effect reflecting the difference between the dynamic of global trade in a specific product and the dynamic of total global trade.

- Structural interaction effect (SIE): This is an effect that combines any change in the product's share by country at the global level with the difference between a specific product's global trade dynamic and the dynamic of total global trade. The SIE is positive when the product is more dynamic than the overall market.

- Total trade: This is trade in all products.

- Trade balance: This calculates the dollar trade balance (X, exports, minus M, imports) of the bilateral trade between the reporting country and the trade partner.

- Trade bloc: This is a trade agreement between countries formalized in a treaty.

- Trade partner: The country or countries with which the reporting country trades.

- Uncompetitive sector: A sector whose market share, contribution or specialization decreases between a base year and a final year.

- Unit value: This is the price per unit and is obtained by dividing the value of trade in a specific product by its volume. In MAGIC, this information is only available at the 10-digit aggregation level.

- Unrecognized new need: This refers to products whose share of exports to the trade partner is declining even as their share of total exports increases.

- Value: Monetary value of trade according to the statistics selected.

- Volume: Trade volume. This information is only available at the 10-digit aggregation level.

- Volume share: This is the proportion of the total volume of trade between the reporting country and its trade partner(s) accounted for by the volume of trade in a specific product. This information is only available at the 10-digit aggregation level.

Annexes

Annex 1   Constant market share (CMS) analysis

Revised formulation of constant market share (CMS) analysis

In accordance with the formulation revised by Milana (1988), the percentage change in the market share of a country's exports – the "total effect" defined by the ratio between a country's total exports and total world exports – has been disaggregated into two effects: the competitiveness effect and the structural effect. The competitiveness effect reflects changes in price competitiveness (measured by the real effective exchange rate). Thus:

Total effect ≡ competitiveness effect + market effect + product effect + residual effect.[19]

Total effect

$$\left[\frac{\displaystyle\sum_{j} \sum_{i} X_{it_f}^{j}}{\displaystyle\sum_{j} \sum_{i} XW_{it_f}^{j}} - \frac{\displaystyle\sum_{j} \sum_{i} X_{it_b}^{j}}{\displaystyle\sum_{j} \sum_{i} XW_{it_b}^{j}} \right] * 100$$

where:

X_{it}^{j} = element (j, i) of the reporting country's export matrix in period t

XW_{it}^{j} = element (j, i) of the world export matrix in period t

j = market index

i = product index

t_b = base period, t_f = final period

Competitiveness effect

$$\sum_{j} \sum_{i} 0.5 * \left[\frac{XW_{it_b}^{j}}{\displaystyle\sum_{j} \sum_{i} XW_{it_b}^{j}} + \frac{XW_{it_f}^{j}}{\displaystyle\sum_{j} \sum_{i} XW_{it_f}^{j}} \right] * \left[\frac{X_{it_f}^{j}}{XW_{it_f}^{j}} - \frac{X_{it_b}^{j}}{XW_{it_b}^{j}} \right] * 100$$

The "competitiveness" effect reveals a country's capacity to increase its market share through competitiveness factors alone, irrespective of structural changes in the market or product's trade pattern. It is calculated by adding changes in a country's export share for each market and each product, weighted by the relative import shares of trade partners in world trade.

Market composition effect

$$\sum_{j} \sum_{i} 0.5 * \left[\frac{X_{it_b}^{j}}{\displaystyle\sum_{i} XW_{it_b}^{j}} + \frac{X_{it_f}^{j}}{\displaystyle\sum_{i} XW_{it_f}^{j}} \right] * \left[\frac{\displaystyle\sum_{i} XW_{it_f}^{j}}{\displaystyle\sum_{j} \sum_{i} XW_{it_f}^{j}} - \frac{\displaystyle\sum_{i} XW_{it_b}^{j}}{\displaystyle\sum_{j} \sum_{i} XW_{it_b}^{j}} \right] * 100$$

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[19]   In Milana (1988), the competitiveness effect is not equivalent to the residual effect but only to the price effect.

The "market" effect measures the effect of a geographical decomposition of exports and is calculated by adding changes in the individual product share of total world trade, weighted by the country's export share in geographical markets.

Product composition effect

$$\sum_j \sum_i 0.5 * \left[\frac{X_{it_b}^j}{\sum_j XW_{it_b}^j} + \frac{X_{it_f}^j}{\sum_j XW_{it_f}^j} \right] * \left[\frac{\sum_j XW_{it_f}^j}{\sum_j \sum_i XW_{it_f}^j} - \frac{\sum_j XW_{it_b}^j}{\sum_j \sum_i XW_{it_b}^j} \right] * 100$$

The "product" effect defines the influence of a product's composition on the country's exports. It is calculated by adding changes in the individual product share of world trade, weighted by a country's export share in the markets for the products concerned.

Residual effect

$$\sum_j \sum_i 0.5 * \left[\frac{X_{it_b}^j}{XW_{it_b}^j} * \frac{\sum_j XW_{it_b}^j * \sum_i XW_{it_b}^j}{\left(\sum_j \sum_i XW_{it_b}^j \right)} + \frac{X_{it_f}^j}{XW_{it_f}^j} * \frac{\sum_j XW_{it_f}^j * \sum_i XW_{it_f}^j}{\left(\sum_j \sum_i XW_{it_f}^j \right)} \right] *$$

$$\left[\frac{XW_{it_f}^j * \sum_j \sum_i XW_{it_f}^j}{\sum_j XW_{it_f}^j * \sum_i XW_{it_f}^j} - \frac{XW_{it_b}^j * \sum_j \sum_i XW_{it_b}^j}{\sum_j XW_{it_b}^j * \sum_i XW_{it_b}^j} \right] * 100$$

The "residual" effect encompasses all second-order effects. It represents the positive or negative impact of a particular product-market combination by comparison with the mean product-market distribution of a country's exports.

Annex 2   Decomposition of change

Case 1

There are no missing data

Notation:

M = imports

j = country imported from

i = product imported

t = year of importation

M_{it}^{o} represents imports of product i from *all* countries in year t.

M_{ot}^{j} represents imports of *all* products from country j in year t.

M_{ot}^{o} represents imports of *all* products from *all* countries in year t.

There are two years:

The base year, or start year, symbolized by a *b*. For example, $M_{it_b}^{o}$ represent imports of product i from all countries in the base year (year *b*).

The final year, symbolized by an *f*. For example, $M_{it_f}^{o}$ represents imports of product i from all countries in the final year (year *f*).

Decomposition of change:

The change in imports is expressed as follows:

(2) $M_{it_f}^{j} - M_{it_b}^{j}$

$M_{it_b}^{j}$ are imports of product i from country j in the base year.

$M_{it_f}^{j}$ are imports of the same product from the same country in a later year, which can be the final year.

The change in imports is simply the difference between the two figures. If imports are greater in the final year than in the base year, the change will be positive; if they are lower in the final year than in the base year, it will be negative.

To obtain the decomposition of the change in imports, the procedure is as follows:

First, we start with the following identity, where the change in imports is equal to itself:

(3) $M_{it_f}^{j} - M_{it_b}^{j} = M_{it_f}^{j} - M_{it_b}^{j}$

Both terms on the right-hand side of the identity are multiplied by 1 without altering it:

$$(4)\ M_{it_f}^j - M_{it_b}^j = \frac{M_{it_f}^o}{M_{it_f}^o} * M_{it_f}^j - \frac{M_{it_b}^o}{M_{it_b}^o} * M_{it_b}^j$$

Similarly, the order of the two terms on the left-hand side of equation (3) can be reversed:

$$(5)\ M_{it_b}^j - M_{it_f}^j = \frac{M_{it_b}^o}{M_{it_b}^o} * M_{it_b}^j - \frac{M_{it_f}^o}{M_{it_f}^o} * M_{it_f}^j$$

Lastly, we can add terms whose sum is zero:

$$(6)\ M_{it_f}^j - M_{it_b}^j =$$

$$\frac{M_{it_b}^j}{M_{it_b}^o} * M_{it_f}^o - \frac{M_{it_b}^j}{M_{it_b}^o} * M_{it_b}^o + \frac{M_{it_f}^j}{M_{it_f}^o} * M_{it_b}^o - \frac{M_{it_b}^j}{M_{it_b}^o} * M_{it_b}^o$$

$$+\frac{M_{it_f}^j}{M_{it_f}^o} * M_{it_f}^o - \frac{M_{it_f}^j}{M_{it_f}^o} * M_{it_b}^o + \frac{M_{it_b}^j}{M_{it_b}^o} * M_{it_b}^o - \frac{M_{it_b}^j}{M_{it_b}^o} * M_{it_f}^o$$

Note that the clearest terms are those in equation (4) and that the other terms cancel one another out.

Note too that:

$M_{it}^j = $ imports of product i from country j in year t

$M_{it}^o = $ imports of product i from all countries in year t

Therefore,

$\dfrac{M_{it}^j}{M_{it}^o}$ is equal to the country j share of total world imports of product i in year t.

In abbreviated form:

$$\frac{M_{it}^j}{M_{it}^o} = SM_{it}^j\ , \qquad \frac{M_{it_f}^j}{M_{it_f}^o} = SM_{it_f}^j \quad \text{y} \quad \frac{M_{it_b}^j}{M_{it_b}^o} = SM_{it_b}^j$$

Substituting these expressions into (6), we get:

$$(7)\ M_{it_f}^j - M_{it_b}^j =$$

$$SM_{it_b}^j * M_{it_f}^o - SM_{it_b}^j * M_{it_b}^o + SM_{it_f}^j * M_{it_b}^o - SM_{it_b}^j * M_{it_b}^o + SM_{it_f}^j * M_{it_f}^o - SM_{it_f}^j * M_{it_b}^o - SM_{it_b}^j * M_{it_b}^o + SM_{it_b}^j * M_{it_b}^o$$

$$-SM_{it_b}^j * M_{it_f}^o + SM_{it_b}^j * M_{it_b}^o$$

We can regroup similar terms:

$$(8) \quad SM_{it_b}^{j} * M_{it_f}^{o} - SM_{it_b}^{j} * M_{it_b}^{o}$$

$$+ SM_{it_f}^{j} * M_{it_b}^{o} - SM_{it_b}^{j} * M_{it_b}^{o}$$

$$+ SM_{it_f}^{j} * M_{it_f}^{o} - SM_{it_f}^{j} * M_{it_b}^{o} - SM_{it_b}^{j} * M_{it_f}^{o} + SM_{it_b}^{j} * M_{it_b}^{o}$$

and factorize:

$$(9) \quad SM_{it_b}^{j} * \left[M_{it_f}^{o} - M_{it_b}^{o} \right] \qquad\qquad \text{Demand effect}$$

$$+ \left[SM_{it_f}^{j} - SM_{it_b}^{j} \right] * M_{it_b}^{o} \qquad\qquad \text{Share effect}$$

$$+ \left[SM_{it_f}^{j} - SM_{it_b}^{j} \right] * \left[M_{it_f}^{o} - M_{it_b}^{o} \right] \qquad\qquad \text{Interaction effect}$$

Thus, the change in the value of imports of product i from country j can be decomposed into a demand effect, a share effect and an interaction effect. Both the demand effect and the interaction effect can be divided into global effects and structural effects.

The *demand effect* is interpreted as the change in the value of imports that would have occurred if the country's share had held steady since the base year. With this condition, the change in the value of imports would have derived exclusively from the increase in the value of total imports of product i. Thus, the change is the result of the change in overall imports of the product.

The *share effect* is the change in the value of imports that would have occurred if the value of imports had held steady since the base year. In this case, the change in the country's share of imports of product i is what generates the change.

The *interaction effect* is a combination of the two effects described above. It is equal to zero when the country's share remains unaltered or when overall imports of the product do not change. Again, it shows a positive sign when country j gains share in a dynamic product or when it loses share in a stagnant product.

(a) Structural and overall changes in demand

According to equation (9), the demand effect is given by:

$$SM_{it_b}^{j} * \left[M_{it_f}^{o} - M_{it_b}^{o} \right]$$

Recall that

$$SM_{it_b}^{j} = \frac{M_{it_b}^{j}}{M_{it_b}^{o}}$$

so that

$$(10) \quad \frac{M_{it_b}^{j}}{M_{it_b}^{o}} * \left[M_{it_f}^{o} - M_{it_b}^{o} \right]$$

which is equal to:

$$(11) \quad \frac{M_{it_b}^{j}}{M_{it_b}^{o}} * M_{it_f}^{o} - \frac{M_{it_b}^{j}}{M_{it_b}^{o}} * M_{it_b}^{o}$$

One of the terms in the equation above cancels out:

$$(12) \quad \frac{M_{it_b}^{j}}{M_{it_b}^{o}} * M_{it_f}^{o} - \frac{M_{it_b}^{j}}{\cancel{M_{it_b}^{o}}} * \cancel{M_{it_b}^{o}} = \frac{M_{it_b}^{j}}{M_{it_b}^{o}} * M_{it_f}^{o} - M_{it_b}^{j}$$

Similarly, the order of the terms can be reversed:

$$(13) \quad -M_{it_b}^{j} + \frac{M_{it_b}^{j}}{M_{it_b}^{o}} * M_{it_f}^{o}$$

Lastly, we can add two terms whose sum is zero:

$$(14) \quad \frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} * M_{it_b}^{j} - M_{it_b}^{j} + \frac{M_{it_b}^{j}}{M_{it_b}^{o}} * M_{it_f}^{o} - \frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} * M_{it_b}^{j}$$

The first and last term in equation (14) cancel out:

$$\cancel{\frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} * M_{it_b}^{j}} - M_{it_b}^{j} + \frac{M_{it_b}^{j}}{M_{it_b}^{o}} * M_{it_f}^{o} - \cancel{\frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} * M_{it_b}^{j}}$$

If we solve to derive the demand effect in (14), we get:

$$(15) \quad M_{it_b}^{j} * \left[\frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} - 1 \right] + M_{it_b}^{j} * \left[\frac{M_{it_f}^{o}}{M_{it_b}^{o}} - \frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} \right]$$

where:

$$M_{it_b}^{j} * \left[\frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} - 1 \right]$$

is the overall demand component (or effect) (ODE) and

$$M_{it_b}^{j} * \left[\frac{M_{it_f}^{o}}{M_{it_b}^{o}} - \frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} \right]$$

is the structural demand component (or effect) (SDE).

The overall demand component is the result of the change in demand for product i in country j multiplied by the overall change in the market (total imports in the market of reference). Thus, the base year value remains constant and is multiplied by the change in total market size.

The structural demand component, for its part, is the product dynamic minus the dynamic of the total import market, i.e., the upward or downward change in the product's share is isolated. Thus, the structural component reflects the extent to which the dynamic of demand for product i differs from that of overall demand.

(b) Structural and overall changes in interaction

In accordance with equation (9), the interaction effect is given by:

$$\left[SM_{it_f}^{j} - SM_{it_b}^{j} \right] * \left[M_{it_f}^{o} - M_{it_b}^{o} \right]$$

Recall that:

$$SM_{it_b}^{j} = \frac{M_{it_b}^{j}}{M_{it_b}^{o}} \quad \text{and} \quad SM_{it_f}^{j} = \frac{M_{it_f}^{j}}{M_{it_f}^{o}}$$

Therefore, the interaction effect is equal to:

$$(16) \quad \left[\frac{M_{it_f}^{j}}{M_{it_f}^{o}} - \frac{M_{it_b}^{j}}{M_{it_b}^{o}} \right] * \left[M_{it_f}^{o} - M_{it_b}^{o} \right]$$

The above equation is equal to:

$$(17) \quad \left[\frac{M_{it_f}^{j}}{M_{it_f}^{o}} - \frac{M_{it_b}^{j}}{M_{it_b}^{o}} \right] * M_{it_b}^{o} * \left[\frac{M_{it_f}^{o}}{M_{it_b}^{o}} - 1 \right]$$

We can add terms whose sum is equal to zero to the last term of equation (17):

$$\left[\frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} - \frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} + \frac{M_{it_f}^{o}}{M_{it_b}^{o}} - 1 \right]$$

and then regroup terms:

$$\left[\frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} - 1 \right] + \left[\frac{M_{it_f}^{o}}{M_{it_b}^{o}} - \frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} \right]$$

Reintroducing this last equation into the last term of equation (17) gives:

$$(17.1) \quad \left[\frac{M_{it_f}^j}{M_{it_f}^o} - \frac{M_{it_b}^j}{M_{it_b}^o}\right] * M_{it_b}^o * \left\{\left[\frac{M_{ot_f}^o}{M_{ot_b}^o} - 1\right] + \left[\frac{M_{it_f}^o}{M_{it_b}^o} - \frac{M_{ot_f}^o}{M_{ot_b}^o}\right]\right\}$$

whence we get:

$$(17.2) \quad \left[\frac{M_{it_f}^j}{M_{it_f}^o} - \frac{M_{it_b}^j}{M_{it_b}^o}\right] * M_{it_b}^o * \left[\frac{M_{ot_f}^o}{M_{ot_b}^o} - 1\right]$$

which is the overall interaction effect (OIE), and

$$(17.3) \quad \left[\frac{M_{it_f}^j}{M_{it_f}^o} - \frac{M_{it_b}^j}{M_{it_b}^o}\right] * M_{it_b}^o * \left[\frac{M_{it_f}^o}{M_{it_b}^o} - \frac{M_{ot_f}^o}{M_{ot_b}^o}\right]$$

which is the structural interaction effect (SIE).

The sum of the two effects yields the interaction effect.

The overall interaction effect (OIE) is obtained by multiplying the share effect by the overall growth rate, while the structural interaction effect (SIE) is the share effect multiplied by the change in the sectoral structure of demand. The SIE has a positive sign when the product is more dynamic than the market, i.e., when the growth rate of product i is greater than that of the overall market, and vice versa.

Case 2

Information on imports in the start year (base year) is lacking

Equation (9) indicates that, where the data are complete, the demand effect is equal to:

$$SM_{it_b}^j * \left[M_{it_f}^o - M_{it_b}^o\right]$$

When the base or start year is lacking, the first term of equation (9) is equal to zero, so that in this case there is no demand effect (DE).

Again, according to the same equation, the share effect with no missing data is:

$$\left[SM_{it_f}^j - SM_{it_b}^j\right] * M_{it_b}^o$$

But since the second term becomes zero ($PM_{it_b}^j$) because the start year is lacking, the share effect (SE) is modified as follows:

$$(9.1) \quad SE_{it_f,t_b}^j = SM_{it_f}^j * M_{it_b}^o$$

Likewise, the interaction effect (IE), according to equation (9), is equal to:

$$\left[SM_{it_f}^{j} - SM_{it_b}^{j} \right] * \left[M_{it_f}^{o} - M_{it_b}^{o} \right]$$

But since the start year is missing, this effect is reduced to:

$$(9.2) \quad IE_{it_f,t_b}^{j} = SM_{it_f}^{j} * \left[M_{it_f}^{o} - M_{it_b}^{o} \right]$$

In summary, the decomposition of change (or total effect) when no information is available for the start year is equal to the sum of equations (9.1) and (9.2), where the demand effect is equal to zero, i.e.:

$$DE_{it_f,t_b}^{j} + SE_{it_f,t_b}^{j} + IE_{it_f,t_b}^{j} = SM_{it_f}^{j} * M_{it_b}^{o} + SM_{it_f}^{j} * \left[M_{it_f}^{o} - M_{it_b}^{o} \right]$$

Factorizing, we get:

$$DE_{it_f,t_b}^{j} + SE_{it_f,t_b}^{j} + IE_{it_f,t_b}^{j} = SM_{it_f}^{j} * \left\{ M_{it_b}^{o} + \left[M_{it_f}^{o} - M_{it_b}^{o} \right] \right\}$$

Finally, by cancelling out equivalent terms, we get:

$$(9.3) \quad DE_{it_f,t_b}^{j} + SE_{it_f,t_b}^{j} + IE_{it_f,t_b}^{j} = SM_{it_f}^{j} * M_{it_f}^{o}$$

However, this expression, $SM_{it_f}^{j} * M_{it_f}^{o}$, is equal to $M_{it_f}^{j}$, i.e., equal to imports of product i from country j in the final year.

Therefore:

$$(9.4) \quad DE_{it_f,t_b}^{j} + SE_{it_f,t_b}^{j} + IE_{it_f,t_b}^{j} = M_{it_f}^{j}$$

this equation being the total effect of the change in imports.

Demonstration

We know that $SM_{it}^{j} = \dfrac{M_{it}^{j}}{M_{it}^{o}}$, so for $t = t_f$ we get $SM_{it_f}^{j} = \dfrac{M_{it_f}^{j}}{M_{it_f}^{o}}$

So, substituting this last expression into (9.3), we get:

$$DE_{it_f,t_b}^{j} + SE_{it_f,t_b}^{j} + IE_{it_f,t_b}^{j} = \dfrac{M_{it_f}^{j}}{M_{it_f}^{o}} * M_{it_f}^{o}$$

By cancelling out equivalent terms, we end up with:

$$DE_{it_f,t_b}^{j} + SE_{it_f,t_b}^{j} + IE_{it_f,t_b}^{j} = M_{it_f}^{j} \quad \text{QED}$$

(a)   Structural and overall changes in demand

Earlier, we found that when the start figure is unavailable or is zero, the demand effect is zero; for this reason, the structural and overall changes in demand are also zero, as these two components are the sum of the demand effect. This result is also easy to see if we recall equation (15):

$$(15) \quad M_{it_b}^{j} * \left[\frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} - 1 \right] + M_{it_b}^{j} * \left[\frac{M_{it_f}^{o}}{M_{it_b}^{o}} - \frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} \right]$$

where:

$$(15.1) \quad M_{it_b}^{j} * \left[\frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} - 1 \right] \text{ is the overall component or effect, and}$$

$$(15.2) \quad M_{it_b}^{j} * \left[\frac{M_{it_f}^{o}}{M_{it_b}^{o}} - \frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} \right] \text{ is the structural component or effect}$$

With both effects, the first term multiplies the rest of the components. Since the figure $M_{it_b}^{j}$ is unavailable or equal to zero,[20] both components (or effects) are equal to zero.

(b)   Structural and overall changes in interaction

When there is missing information, equal to zero, the structural interaction effect is reduced to the following expression:

$$(16) \quad SIE_{it_f,t_b}^{j} = \frac{M_{it_f}^{j}}{M_{it_f}^{o}} * M_{it_b}^{o} * \left[\frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} - 1 \right]$$

The overall interaction effect, meanwhile, is equal to:

$$(17) \quad OIE_{it_f,t_b}^{j} = \frac{M_{it_f}^{j}}{M_{it_f}^{o}} * M_{it_b}^{o} * \left[\frac{M_{it_f}^{o}}{M_{it_b}^{o}} - \frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} \right]$$

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[20]   This information may be lacking for two reasons. First, because the information is simply not to hand or not available, and second, because imports or exports (these being the concepts used when information was defined) are equal to zero (nil imports or exports) that year. In either case, it is necessary to assume that this value is zero when the calculations are carried out. Otherwise, the calculations of the three effects and the structural and global components of the demand and interaction effects for each product will not match the sum of the effects of these products. It should be recalled that MAGIC allows the user to retrieve data on the decomposition of change by product and also to obtain a summary table for all products combined; if this assumption is not used, the two results will not be compatible.

Case 3

Information on imports in the final year is lacking

In this case, the demand effect is obtained in the same way as when there is full information:

$$(18) \quad DE_{it_f,t_b}^{j} = SM_{it_b}^{j} * \left[M_{it_f}^{o} - M_{it_b}^{o} \right]$$

The share effect is modified because one of the terms becomes zero:

$$(19) \quad SE_{it_f,t_b}^{j} = \left[\cancel{SM_{it_f}^{j}} - SM_{it_b}^{j} \right] * M_{it_b}^{o} = -SM_{it_b}^{j} * M_{it_b}^{o} = -M_{it_b}^{j}$$

That is, the share effect is equal to imports from country j of product i in the base or start year with a negative sign.

Demonstration

We know that $SM_{it}^{j} = \dfrac{M_{it}^{j}}{M_{it}^{o}}$, so for $t = t_b$ we get $SM_{it_b}^{j} = \dfrac{M_{it_b}^{j}}{M_{it_b}^{o}}$

Thus, substituting this last expression into (20) gives:

$$SE_{it_f,t_b}^{j} = -\dfrac{M_{it_b}^{j}}{\cancel{M_{it_b}^{o}}} * \cancel{M_{it_b}^{o}}$$

Cancelling out equivalent terms, we finally get:

$$SE_{it_f,t_b}^{j} = -M_{it_b}^{j} \quad \text{QED}$$

As regards the interaction effect when the information for the final year is zero (or is unavailable), we get:

$$(20) \quad IE_{it_f,t_b}^{j} = -SM_{it_b}^{j} * \left[M_{it_f}^{o} - M_{it_b}^{o} \right]$$

It should be recalled that the total effect (TE) of the change in imports for this case is equal to:

$$TE_{it_f,t_b}^{j} = M_{it_f}^{j} - M_{it_b}^{j} = DE_{it_f,t_b}^{j} + SE_{it_f,t_b}^{j} + IE_{it_f,t_b}^{j}$$

Substituting equations (19), (20) and (21) into the above expression gives:

$$(21) \quad TE_{it_f,t_b}^{j} = SM_{it_b}^{j} * \left[M_{it_f}^{o} - M_{it_b}^{o} \right] - M_{it_b}^{j} - SM_{it_b}^{j} * \left[M_{it_f}^{o} - M_{it_b}^{o} \right]$$

Eliminating equivalent terms, we get:

$$TE_{it_f,t_b}^{j} = \cancel{SM_{it_b}^{j} * \left[M_{it_f}^{o} - M_{it_b}^{o} \right]} - M_{it_b}^{j} - \cancel{SM_{it_b}^{j} * \left[M_{it_f}^{o} - M_{it_b}^{o} \right]}$$

$$(22) \quad TE_{it_f,t_b}^{j} = -M_{it_b}^{j}$$

Thus, when the information for the final piece of information (imports) is equal to zero (or lacking), the total effect is equal to the negative value of imports from country j of product i in the start year (base year).

(a)   Structural and overall changes in demand

Recall how the overall and structural demand components or effects are obtained when there is no missing information:

$$(15.1) \quad M_{it_b}^{j} * \left[\frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} - 1 \right] \quad \text{is the overall component or effect, and}$$

$$(15.2) \quad M_{it_b}^{j} * \left[\frac{M_{it_f}^{o}}{M_{it_b}^{o}} - \frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} \right] \quad \text{is the structural component or effect.}$$

In the case of these effects, the calculation does not undergo any change.

(b)   Structural and overall changes in interaction

The structural interaction effect when information is lacking (or the figure is zero) for the final year is reduced to the following expression:

$$SIE_{it_f,t_b}^{j} = -\frac{M_{it_b}^{j}}{\cancel{M_{it_b}^{o}}} * \cancel{M_{it_b}^{o}} * \left[\frac{M_{it_f}^{o}}{M_{it_b}^{o}} - \frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} \right]$$

$$(23) \quad SIE_{it_f,t_b}^{j} = -M_{it_b}^{j} * \left[\frac{M_{it_f}^{o}}{M_{it_b}^{o}} - \frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} \right]$$

The overall interaction effect, meanwhile, is equal to:[21]

$$(26) \quad OIE_{it_f,t_b}^{j} = -\frac{M_{it_b}^{j}}{M_{it_b}^{o}} * M_{it_b}^{o} * \left[\frac{M_{ot_f}^{o}}{M_{ot_b}^{o}} - 1 \right]$$

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[21]   In cases where no information exists for either the start year or the final year, each of the effects will be equal to zero, so the total effect will also be equal to zero.

Numerical example of decomposition of change

To familiarize the user with the concepts explained, a numerical example will now be presented.[22] For simplicity's sake, a hypothetical situation is used with two supplier countries and two products.

Let the situation in the base year be:

	Country 1	Country 2	Product total
Oil	4	5	9
Computers	6	10	16
Country total	10	15	25

Let the situation in the final year be:

	Country 1	Country 2	Product total
Oil	5	5	10
Computers	7	15	22
Country total	12	20	32

It can be seen that the total increase in imports is 7. Country 1 registers an increase of 2 and country 2 an increase of 5.

The overall demand effect (ODE) reflects what would have happened if growth had been spread evenly across the sectors of both countries.

Country 1: $(4+6)*(32/25 - 1) = 2.8$

Country 2: $(5+10)*(32/25 - 1) = 4.2$

The structural demand effect (SDE) reflects the advantage country 2 obtains by being more oriented towards the more dynamic product. When adding by country, we get the multiplication of the value of imports by country and by product with the differential between the actual growth rate of each product and the overall growth rate.

Country 1: $(4*((10/9) - (32/25)) + (6*((22/16) - (32/25)) = -0.1055$

Undynamic product   Dynamic product

(Oil)   (Computers)

SDE<0 SDE>0

Country 2: $(5*((10/9) - (32/25)) + (10*((22/16) - (32/25)) = 0.1055$

Undynamic product   Dynamic product

(Oil)   (Computers)

SDE<0 SDE>0

The share effect reflects the value of the change in each country's share of each market and shows that country 1 lost more in the computer market than it gained in the oil category. Adding by country, we get the change in share in each category with the value of total imports of the product in the base year.

Country 1: $((5/10) - (4/9))*9 + ((7/22) - (6/16))*16 = -0.4090$

Competitive   Uncompetitive

---

[22]   The numerical example is taken from Buitelaar (1997).

(Oil)   (Computers)

SE>0   SE<0

Country 2: $((5/10) - (5/9))*9 + ((15/22) - (10/16))*16 = 0.4090$

Uncompetitive Competitive

SE<0   SE>0

The overall interaction effect (OIE) calculates what the significance of the change in each country's share in each category would have been had each category grown at the average rate. Thus, the OIE supplements the share effect, which is calculated from the base year values. The sum of the SE and the OIE gives the change in share if the final year figures were used in the SE formula.

Country 1: $(((5/10) - (4/9))*9 + ((7/22) - (6/16))*16)*(32/25 - 1) = -0.1145$

Country 2: $(((5/10) - (5/9))*9 + ((15/22) - (10/16))*16)*(32/25 - 1) = 0.1145$

The structural interaction effect (SIE) reflects the value of each country's change in share in each category multiplied by the differential between the actual growth rate in each category and the overall growth rate. This formula yields a positive result when both elements in it have the same sign and a negative result when the signs are opposite.

Country 1: $(((5/10) - (4/9))*9)*(10/9 - 32/25)) + (((7/22) - (6/16))*16)*((22/16) - (32/25))) = -0.1708$

Country 2: $(((5/10) - (5/9))*9)*(10/9 - 32/25)) + ((15/22) - (10/16))*16)*((22/16) - (32/25))) = 0.1708$

The sum of the effects gives the total or actual change that has occurred.

The information presented also serves for the product qualification analysis. In this example, oil is a declining star for country 1 and computers a missed opportunity. For country 2, oil is a retreat and computers are a rising star.

Annex 3   Specialization, relative unit value and volume share

Balassa index of revealed comparative advantage

The following notation is used in this annex:

M_{it}^{j} Value of imports of product i from country j in the reference country or market in year t.

A subscript o instead of i means the sum of all products, and when it replaces j it denotes the sum of all countries. Therefore:

$M_{ot_b}^{j}$ is the value of everything imported by the reference country from country j in the base year.

$M_{it_f}^{o}$ is the value of imports of product i by the reference country from all countries in the final year.

MS_{it}^{j} is the share of overall imports of product i coming from country j in year t.

$$MS_{it}^{j} = \frac{M_{it}^{j}}{M_{it}^{o}}$$

PS_{it}^{j} is the share of product i in total imports from country j in year t.

$$PS_{it}^{j} = \frac{M_{it}^{j}}{M_{ot}^{j}}$$

A specific trade partner's specialization (TPS) in a product or sector is defined by two ratios. The numerator represents the contribution of a product or sector to the reference country's total imports from country j. The denominator symbolizes the product or sector's share of the reference country or market's global imports, and the ratio is equivalent to the revealed comparative advantage or Balassa index. Thus:

$$TPS_{it}^{j} = \frac{PS_{it}^{j}}{PS_{it}^{o}}$$

It is easy to show that specialization can also be written in terms of country share:

$$TPS_{it}^{j} = \frac{MS_{it}^{j}}{MS_{ot}^{j}}$$

For exports, revealed comparative advantage is also defined by a ratio:

$$RCA_{i}^{j} = \frac{X_{i}^{j} / \sum_{j} X_{i}^{j}}{\sum_{i} X_{i}^{j} / \sum_{j} \sum_{i} X_{i}^{j}}$$

The numerator represents the percentage change in a sector or product's share of a country's exports, while x_{i}^{j} symbolizes the exports of sector or product i from country j. The denominator is the percentage change in a sector or product's share of the reference country or market's total exports.

Lastly, in a context of growing intra-industry trade, internationalization of production and hypersegmentation of markets, it is important to consider exports and imports when analysing specialization and comparative advantages. The international specialization index proposed by Lafay

(1992) is a move in this direction and has been widely used to supplement the analysis of specialization patterns carried out with the Balassa index of revealed comparative advantages.[23]

$$LFI_i^j = 100 \left[\frac{X_i^j - M_i^j}{X_i^j + M_i^j} - \frac{\sum\limits_{i=1}^{n} X_i^j - M_i^j}{\sum\limits_{i=1}^{n} X_i^j + M_i^j} \right] \frac{X_i^j + M_i^j}{\sum\limits_{i=1}^{n} X_i^j + M_i^j}$$

where X_i^j and M_i^j are exports and imports of product or product group i by country j to and from the rest of the world, respectively, and n is the number of groups or products traded. According to this index, the comparative advantage of a country j in the production of a good i is measured by the deviation of the normalized trade balance for good i from the total normalized trade balance, multiplied by the share (imports plus exports) of good i in total trade. Positive values of the Lafay index indicate the existence of comparative advantages; the higher the value, the greater the degree of specialization in a product. Negative values indicate an absence of specialization and a lack of comparative advantages.

Relative unit value and volume share

Empirical analyses of vertical differentiation in external trade have used unit export values (value/volume exported) as a measure of quality for goods exports. Unit value is the price per unit and is obtained by dividing the value of trade in a specific product by its volume. In MAGIC Plus, this information is only available at the 10-digit aggregation level.

One of the advantages of using unit value as a quality indicator is that all activities that enhance the quality of a product are reflected in a higher value per unit of measurement, and the result is that unit value provides a broad measure of quality because it groups a number of quality aspects in a single indicator (Aiginger, 2001).

Another consideration in using unit export value instead of unit import value is the reliability of the information supplied by importing countries, as the idea is for the measure to contain the smallest possible number of non-quality-related elements that might distort it. With a few exceptions, like the United States, the value of imports is reported in databases in c.i.f. terms, including the cost of transporting and insuring the goods, and this can distort the measure considerably.

Besides the advantages of reliability, unit value information is available at several levels of disaggregation for almost all countries and goods. However, unit value as a quality indicator presents a number of drawbacks which should be mentioned. The first problem is that, in certain cases, unit values may be simply a reflection of market structure, corporate strategies (higher or lower profit margins) or variations in exchange rates and costs, rather than of product quality. Consequently, in some cases low unit value may be an indicator of high production efficiency and low costs (or low profit margins), while in others it may be an indicator of low quality (Machinea and Vera, 2007).

In an analysis of several periods (comparative statics), this ought not to be a problem, as in cases where high unit value is synonymous with higher costs or greater inefficiency, or both, the product will eventually be driven out of the market. The consequence of higher quality is precisely the ability to charge a higher price without losing market presence; if a product's market share declines over time as its unit value rises, then we are dealing with a case of lower product competitiveness and not higher quality. For this reason, some studies that analyse unit value as an indicator of a product's vertical differentiation and its quality use this measure in combination with data on the evolution of its market share. The MAGIC Plus analytical model makes use of the simplifying assumption that a product's

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[23]   The current version of MAGIC Plus does not calculate the Lafay index, but this is an indicator that will be incorporated into forthcoming versions. A number of analysts consider it superior to the Balassa, beneficial or Michaely indices, as it can be used to control for intra-industry trade and re-export flows. Considering that comparative advantages are structural by definition, the Lafay index controls for the cyclical factors that can affect trade flows in the short term.

presence in the market on any significant scale is indicative of its competitiveness, reducing the likelihood that higher unit values are necessarily a reflection of higher costs and inefficiencies. Even if this assumption is not valid in specific cases (when a product or sector and a country or group of countries is analysed), this problem should not in principle mean a bias in the results, as it is not related to countries' development level.[24]

Relative unit value indicates the unit value of the product in the bilateral trade between the reporting country and the trade partner as a proportion of the unit value of this product at the global level, i.e., at the level of all countries. If the relative unit value is greater than one, the product has a greater unit value in the bilateral trade than in global trade. However, it is advisable to proceed with care when interpreting the findings as, even at the level of greatest disaggregation, tariff codes can cover a wide range of products with different prices. Thus, differences in unit values reflect not only price differences but also different product baskets. In other words, if imports of a product from a certain country have a relative unit value of 1.5, this does not *necessarily* mean that imports from that country are 50% costlier than the average for imports from the whole world. The reason may have to be sought in a greater presence of subproducts that are dearer because of quality or different characteristics.[25]

Efforts to calculate relative unit value come up against the difficulty that volume is not recorded for certain tariff codes. In these circumstances, MAGIC ignores trade flows when calculating relative unit values. Consequently, there are two situations in which relative unit values are not reported: when there is no trade, and when trade flows are not reported with volumes. For the reasons given, relative unit values and volume share are only significant for fairly homogeneous products. In other words, it is possible that freak values may appear for these indicators because of a lack of homogeneity or because volume data are lacking.

The following notation has been adopted for calculating relative unit value:

T_i^j is the value of trade in product i between the country of reference and trade partner j.

V_i^j is the volume of trade in product i between the country of reference and trade partner j.

As on other occasions, superscript o means all countries (global trade).

Because different units of measurement are used for volume, aggregating products would not make sense for this variable. Consequently, volume is available only at the maximum level of disaggregation, where relative unit value is defined as:

$$RUV_{it}^j = \frac{T_{it}^j / V_{it}^j}{T_{it}^o / V_{it}^o}$$

Similarly, (market) share in volume terms is defined as:

$$SV_{it}^j = \frac{V_{it}^i}{V_{it}^o}$$

[24]   The validity of the results also depends on the assumptions of product homogeneity and increasing returns to scale.
[25]   See Aiginger (1997 and 2001), Fontagné and others (2007), Schott (2003 and 2004), Hummels and Klenow (2005) and Machinea and Vera (2007) for different analyses using unit value as an indicator of vertical quality differentiation.

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