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Export Diversification in a Transitioning Economy

The Case of Syria

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Abstract

How does the process of export diversification play out in a transitioning economy, especially in light of government policy aimed at trade liberalization? This paper examines this question by considering a directed policy effort by Syria—an economy transitioning from both economic centralization and resource dependence—to liberalize its trade in 2001. In addition to documenting the patterns of diversification at the aggregate level since the implementation of the policy, we also examine factors that are related to diversification at the sectoral level. Our findings suggest that, while Syria has achieved reasonably rapid export diversification, this may to a large extent be the result of structural transformations in the economy, and that further consolidation of diversification gains may require continued policy reform along the lines of strengthening Syria's weak institutional and business environment.

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Export Diversification in a Transitioning Economy: The Case of Syria

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1 Introduction

The robust positive relationship between economic performance and trade openness is a result that has, literally, been demonstrated millions of times (Sala-i-Martin 1997). Countries that have more open borders are also countries that tend to grow quickly (Frankel & Romer 1999), and many economies that expanded their trade through the second half of the 20th century have also enjoyed growth takeoffs (Jones & Olken 2008). This has led policymakers in many transition economies, eager for growth performance, to pursue strategies of trade liberalization.

Such trade liberalization policy is often accompanied by conscious industrial policy that seeks to diversify the economic base of the liberalizing economy, and thus fostering diversification in its exports. However, export diversification is itself not a monolithic strategy, and *how* a country's export structure evolves can be important. The extensive margin of export diversification can occur along several dimensions, involving expansions into new products (Hummels & Klenow 2005), new markets (Brenton & Newfarmer 2009), or up the quality ladder (Schott 2004).[1]

A question that has been less frequently considered is *what* gives rise to a greater degree of export diversification. Other than the level of economic development (Carrère, Strauss-Kahn & Cadot 2007; De Benedictis, Gallegati & Tamberi 2009), there are reasons to believe that the extent of export diversification is also influenced by trade policy (Edwards & Lawrence 2008; Estevadeordal & Martincus 2006), proximity to major markets for the export in question (Parteka & Tamberi 2008), and foreign direct investment (Gourdon & Nassif 2009). Despite these recent efforts at understanding the determinants of export diversification, much of the empirical literature has concentrated on factors that apply at the cross-country level. What is far less understood are the factors that matter at the within-country sectoral or firm level, and especially the contribution of sector-specific inputs and policies related to trade. To our knowledge, only a few papers directly address the issue of micro-level determinants of export diversification. Goldberg, Khandelwal, Pavcnik & Topalova (2008) use firm-level data from India and find that access to new imported inputs—measured by tariff declines and the subsequent prices of intermediates—can account for an expansion of domestic firm product scope. Hausmann & Klinger (2008) apply a product-space methodology to argue that the specialization patterns of South African export sectors do not bode well for future exporting efforts.

[1]There is evidence that the first-order driver of export growth is the intensive rather than extensive margin (Besedeš & Prusa 2007), although this may vary according to income, with poorer countries more likely to diversify along the extensive margin (Cadot, Carrère & Strauss-Kahn 2007). Exports of existing products into new markets also accounts for a greater share of export growth than that of new products alone (Brenton & Newfarmer 2009).

The objective of this paper is to shed light on how export diversification occurs in a transitioning economy, using Syria as a case study. Syria is often understudied as a transition economy for reasons of data scarcity and political remoteness. But there are various reasons to believe that it is a very good candidate for such an exercise. One advantage offered by the Syrian case is that the initial policy decision to liberalize trade was explicitly prompted by political accord. While this political choice could well have been in response to the already-changing structure of the economy—especially from declining oil reserves—the timing of the policy decision nevertheless offers a clear starting point for our investigations.[2] Thus, while reverse causality remains a possibility in considering liberalization and structural change, the timing of the policy decision suggests that policy played an important role.

More specifically, the paper analyzes how the pattern of export diversification evolves following an explicit government policy aimed at liberalizing the trading regime. Furthermore, conditional on such policy, what are factors that appear to be related to export diversification at the sectoral level? To address these questions, this paper begins by examining Syrian export diversification patterns and trends in detail. We find that, following trade liberalization in 2001, Syria's export basket is no longer concentrated around a small number of products. Although this is a welcome development, the data also show that the Syrian economy did not manage to diversify into products of higher value. We also find that, while Syria has taken advantage of factor substitutability between sectors in gaining access to international markets, this expansion in exports has been driven, to a large extent, by the decline in the oil sector and occurred more along the geographic, rather than discovery, dimension.

To shed more light on the mechanisms underlying sectoral diversification—especially the question of why some sectors of the Syrian economy diversified while others did not—the paper empirically examines partial correlations between measures of sectoral diversification and their potential determinants using regression analysis. Our findings reveal that a sector's initial revealed comparative advantage is positively associated with diversification while a higher trade volume signals less diversification potential. We also find that the determinants of diversification—as measured by the Herfindal index and 5-product shares—may differ from those of a simple count of the number of products a sector exports. For example, it seems that a sector's revealed comparative advantage is associated with a lesser potential for product discovery—presumably because the product

[2]The multifaceted and complex nature of any trade liberalization regime—which typically involves simultaneous efforts at both broadening the production base as well as more direct trade-related liberalization efforts—means that it is difficult to isolate the pure effect of government policy aimed at trade liberalization alone.

space is already well populated—while it correlates with a larger diversification potential overall, likely by strengthening the export of existing products previously exported at volumes below potential.

Taken together, our findings suggest that the phenomenon of reasonably rapid export diversification in Syria is in part driven by the depletion in oil reserves. However, following a directed policy of trade liberalization, the Syrian economy also appears to have taken advantage of synergies between sectors and products in gaining access to international markets, and its potential for further diversification gains remains high. Taking full advantage of Syria's potential will, however, likely require continued policy reform, especially along the lines of improving Syria's weak institutional and business environment.

This paper is organized as follows. Section 2 provides background on the reform process in Syria, followed by a description of the patterns of export diversification in Syria. Section 3 goes on to establish the relative importance of different determinants in contributing to the success of sectors in export diversification. A final section concludes by drawing policy implications.

2 Trade Liberalization and Patterns of Syrian Exports and Diversification

Syria's economic transition away from an oil-exporting, centrally-planned economy toward an economically diverse, market-based system began at the turn of the 21st century, with economic reforms that gradually integrated the economy with the global trading system. A transition program was introduced along with the 9th Five-Year Plan (FYP) in 2000, which laid out the trajectory for economic diversification and an opening to non-oil merchandise trade, and was consolidated in the 10th FYP instituted in 2006 (the main elements of both plans are summarized in Table 1).

Early reform objectives in the 9th FYP included the goal of diversification away from a dependence on oil, and the development of trade accompanied by entry into new markets. However, many of the trade policies recommended and implemented in the 9th FYP remained distortionary in nature. The government maintained an export monopoly on a range of agricultural products. While the plethora of Soviet-era state firms in charge of managing trade were merged into single entities, trade remained hampered by a host of restrictive tariffs and nontariff barriers (Table 2), and production for export suffered from a lack of quality control and a weak trade facilitation infrastructure.

Table 1: Direct and indirect trade policy measures introduced in the 9th and 10th FYPs, 2001–2010[†]

Policy dimension	Related programs	Timing	Plan
Export diversification	Allow private sector export of most public industrial products; delink exports from imports.	2001–2003	9th
	Creation of export promotion agency and quality control agencies; expand production base and improve competitiveness of firms.	2006–2007	10th
Enhance position as regional trade center	Improve physical and legal infrastructure; build and develop financial institutions.	2006–2010	10th
Improve trade facilitation	Eliminate preapprovals for most exports; eliminate government-mandated trade intermediary.	2001–2004	9th
	Improve transport and communications infrastructure; create export guarantee fund; simplify investment procedures and laws; simplify import/export licensing.	2006–2007	10th
Trade barriers	Full liberalization of GAFTA imports.	2001–2004	9th
	Tariff reduction and consolidation; tariffication of nontariff barriers.	2006–2007	10th
Macroeconomic factors affecting trade	Exempt agricultural exports from profit tax; permit repatriation of export proceeds.	2001–2004	10th
	Unification of multiple exchange rates to fixed regime.	2006–?	10th

[†] Source: Adapted from State Planning Commission (2005).

However, Syria's participation in the Arab Free Trade Area Agreement[3] spurred the continued elimination of tariffs on products. GAFTA committed Syria to maintaining its pace of trade liberalization, and policy moves to promote intra-regional liberalization served as a complement to broader multilateral efforts. These reforms were largely realized in the 10th FYP.[4] In addition to the primary goal of export diversification, the plan included reforms aimed at export promotion, tariff and nontariff barrier reduction, and trade facilitation through revisions in the legal framework. The policies were also aimed at meeting specific quantitative targets; for example, reform objectives included reducing

[3]The agreement formed the Greater Arab Free Trade Area (GAFTA), which is also alternatively referred to as the Pan-Arab Free Trade Area, or PAFTA, in the non-English-language literature.

[4]Although a systematic assessment of the 10th FYP has yet to be performed, the government's mid-term review of progress in the area of foreign trade points to a reasonable degree of success in meeting the internal benchmarks. Many of the more straightforward legislative initiatives—such as the drafting and passing of trade-related laws—have been implemented, as have the more administrative elements (such as the formation of an export promotion agency). However, the record with regard to policy-related components is a little more mixed. While overall progress has been fairly good, several areas have seen more lackluster efforts. These include little progress in the tarrification and elimination of nontariff trade barriers, and some initiatives, such as the establishment of an export guarantee fund, have fallen behind schedule.

Table 2: Changes in protection, Syria, 1999–2009[†]

Category	Tariffs			NTBs		
	2002	2009	Change (2002–09)[‡]	1999	2001	Change (1999–01)[*]
Food and live animals	21.8	16.1	-5.7	29.1	15.4	-13.8
Beverages and tobacco	58.0	37.4	-20.6	329.6	307.6	-22.0
Crude materials	6.3	5.3	-1.0	4.9	-1.1	-6.0
Mineral fuels	7.7	6.9	-0.7	17.7	-7.4	-25.1
Organic oils and fats	6.6	3.0	-3.6	31.8	18.2	-9.1
Chemicals	5.1	6.9	1.8	35.1	22.7	8.3
Manufactured goods	14.3	11.3	-3.0	51.5	43.4	-24.3
Machinery and transport	19.4	7.0	-12.4	89.9	82.1	-92.8
Miscellaneous articles	20.2	26.0	5.8	6.7	-2.9	46.4
Average	**17.7**	**13.3**	**-4.4**	**66.3**	**53.1**	**-15.4**

[†] Source: Authors' calculations based on UNCTAD TRAINS and Chemingui & Dessus (2008).

[‡] Change between 2002–09 chosen on the basis of available data. Tariffs are unweighted; import-weighted changes average -5.2.

[*] Change between 1999–01 chosen on the basis of available data. Nontariff barriers are estimated using a price-differential decomposition; see Chemingui & Dessus (2008) for details.

the balance of payments deficit to 6.6% of GDP, increasing nonoil exports by about 13% annually, and increasing private sector exports by 15% per year.

There are reasons to believe that the policy decision to diversify the production and export base was primarily a political decision that—while influenced by historical structural features of the economy—was not directly influenced by contemporaneous economic developments. While the government explicitly acknowledged the structural imbalances across industrial sectors caused by the centralized system of the past, it is also clear that the existing changes in the structure of the economy were hitherto unremarkable and hence did not play a role in its policy choice (State Planning Commission 2005, p. 48):

> [The pattern of Syrian] trade has been marked for a long time by a stereotyped nature... predominant in most developing economies... economic development has not achieved, over the last 50 years, its goals of adjusting the production structure, but... increased the dependency on importing local product inputs.

In part due to these changes, Syria has seen a surge in trade flows since 2001. Total merchandise trade increased from 44.1 percent of GDP in 1999 to 64.6 percent in 2007;

an increase of just under 47 percent in 8 years.[5] Significantly, nonoil (oil) exports rose (fell) as a share of GDP, from 5.4 (18.5) percent to 19.1 (11.6) percent. This has been led by the private sector, which now accounts for 92.8 percent of all nonoil exports from the country. The composition of nonoil exports has also moved from raw materials toward intermediate and consumer goods, with the latter two forms accounting for more than half of all nonoil exports in 2007.

At the most superficial level, the number of Syrian exports has grown significantly over the past decade. The number of merchandise products exported in 2006 has more than doubled from the low of 60 product lines in 1999, with these export numbers displaying a solid upward trend; in addition, this trend exceeds both the regional as well as lower-middle income country average, of which Syria is part (Figure 1).

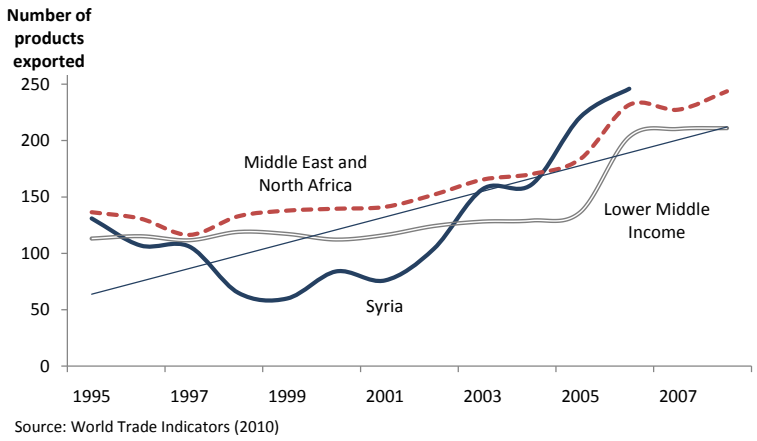


Figure 1: Number of products exported, 1995–2008, Syria, regional average, and lower-middle income country average. Syrian data not available after 2006. Number of merchandise products calculated at 3-digit SITC level, and includes only products whose value exceeds USD $100,000 or 0.3 percent of the country's total exports, whichever is smaller.

This trend is most pronounced in the period following the start of reform in 2001, coinciding with the launch of Syria's 9th FYP. Over the 6-year period between 2001 and 2006, the number of products exported grew by 144.7 percent, compared to -35.9 percent in the preceding 6-year period. This corresponds to an effective (average) annual growth rate of 16.1 percent, or the addition of about a dozen new exports lines per annum. Trade flows have surged as well, with exports doubling (in absolute terms) from SYP 243.1 billion ($5.05 billion, or 23.9% of GDP) to SYP 505.0 billion ($10.92 billion, or 29.6% of GDP) over the same period.

[5]Trade subsequently fell as a result of the global crisis and recession to 59.6 percent in 2008.

The bulk of these exports were destined for the EU—primarily Italy and France—although this has changed over time. The EU share of Syrian exports declined from 68.3 percent to 40.2 percent between 2000 and 2006, with the MNA region taking up most of the slack (increasing over the same period from 7.8 percent to 23.1 percent) (Figure 2). Part of this can be explained by (anticipated and actual) Syrian entry into GAFTA in 2005. The EU-Syria Association Agreement (EUSAA) may once again shift export patterns between the EU and the MNA region, although this remains uncertain.[6]

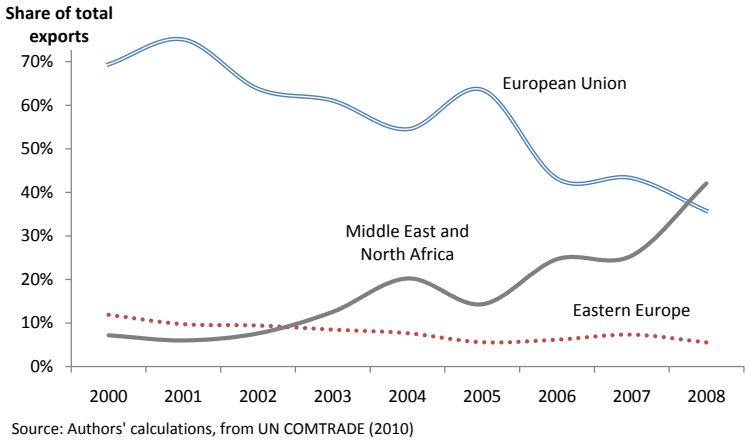


Figure 2: Changes in export destination patterns, Syria, 2000–2008. Export destination breakdown for the EU (MNA) region includes, in decreasing order of size, the main trading partners of Italy, France, the United Kingdom, and Spain (Saudi Arabia, Jordan, Lebanon, Iraq, and Egypt). Exports to other regions are negligible.

Traditionally, Syrian exports to EU countries have been in (unprocessed) petroleum and derivative oils, and this has likewise been affected by the relative decline in the share of oil exports in total exports by Syria over time. Between 2000 and 2007, nonoil exports (as a share of GDP) grew by almost 200 percent, which accounted for a significant share of the 18 percent growth rate of total exports (as a share of GDP). In contrast, exports from Syria to the other countries of the region have mainly been in food products; the growth of such exports has in fact been the main driver of the increase in MNA-related trade in nonoil products. Table 3, which lists the key products destined for Syria's main export partners, captures this pattern vividly.

We consider the extent of diversification across products and destination markets more formally by employing several standard (and some nonstandard) measures of export

[6]Negotiations on the EUSAA were completed in 2004, but political circumstances precluded its ratification by the European Parliament. Following an improvement in the political climate, the document was (re)initialed in Dec 2008, and is currently awaiting passage.

Table 3: Primary exports of Syria, 2-digit HS level, by main trading partners, 2002 and 2006

Country	HS code	Product	2002		2006	
			Value†	Share‡	Value	Share
Italy	27	Mineral fuels	2,037,453	94.6	1,882,110	88.0
	15	Animal/veg fats/oils	263	0.0	92,689	4.3
	52	Cotton	74,513	3.5	61,411	2.9
	41	Raw hides and skins	20,475	1.0	55,531	2.6
	1–97	**All exports**	2,154,214	100.0	2,139,844	100.0
France	27	Mineral fuels, oils	902,913	98.0	900,436	93.6
	61	Knitted apparel	6,768	0.7	21,475	2.2
	62	Non-knitted apparel	2,235	0.2	16,054	1.7
	39	Plastics	0	0.0	4,492	0.5
	1–97	**All exports**	921,252	100.0	961,789	100.0
Saudi Arabia	01	Live animals	266,914	49.0	218,779	22.9
	07	Edible vegetables	52,700	9.7	123,236	12.9
	62	Non-knitted apparel	17,419	3.2	74,885	7.8
	20	Prepared vegetables/fruit/nuts	7,485	1.4	20,110	2.1
	1–97	**All exports**	544,594	100.0	954,958	100.0
Iraq	84	Machinery/mechanical appliances	n/a*		174,861	25.0
	07	Edible vegetables	n/a		65,266	9.3
	22	Beverages, spirits and vinegar	n/a		58,018	8.3
	34	Soap	n/a		104,248	14.9
	1–97	**All exports**	698,737	100.0	698,737	100.0

† In thousands of USD.

‡ In percentages, calculated as share of total exports to partner country.

* Disaggregated data for Iraq prior to 2006 are not available.

diversification. Two standard measures are the Herfindahl-Hirschman index

$$H = \sum\nolimits_K \left(\frac{x_k}{\sum_K x_k} \right)^2, \tag{1}$$

which is the sum of squares of export (x) shares for each HS line, $k \in K$,[7] and the Theil index

$$T = \frac{1}{K} \sum\nolimits_K \left(\frac{x_k}{\bar{x}} \cdot \ln \frac{x_k}{\bar{x}} \right), \tag{2}$$

which is the sum of the export shares, weighted by the share relative to the mean, $\bar{x} \equiv \sum_K x_k/K$. One advantage of considering these two indices in tandem is that they possess properties that render the former more sensitive to changes in large export sectors, and

[7] To present results in an intuitive manner, we further normalize (1) by the total number of lines via $H^* = \frac{H-1/K}{1-1/K}$, to obtain an index with range $[0, 1]$.

the latter more sensitive to changes in small sectors;[8] this allows us to pin down whether changes in export diversification are driven more by changes to flows from existing export champions, or from potentially emerging products.

While it is possible to apply both the Herfindahl-Hirschman and the Theil indices to analyze diversification trends within product groups, one advantage of the Theil index is its decomposability, which allows to break export concentration trends down into concentration between product sections and concentration of products within a given section $i \in I$. In other words, it is possible to calculate the Theil index across the entire export basket and to distinguish analytically to what extent trends in diversification are driven by diversification across product groups and to what extent by diversification across products in the same group:

$$\begin{aligned} T &= T_W + T_B \\ &= \sum\nolimits_I \frac{k_i}{K}\frac{\bar{x}_i}{x}\left[\frac{1}{K_i}\sum\nolimits_{k\in i}\left(\frac{x_k}{\bar{x}_i}\cdot\ln\frac{x_k}{\bar{x}_i}\right)\right] + \sum\nolimits_I \frac{k_i}{K}\frac{\bar{x}_i}{x}\cdot\ln\frac{\bar{x}_i}{\bar{x}}, \end{aligned} \tag{3}$$

where $\bar{x}_i \equiv \sum_{k\in i} x_k/K_i$ is average exports for a given group.

In addition to monitoring diversification of the Syrian export basket across products, it is ex-ante equally interesting to examine geographic diversification trends. This can be done by calculating the Herfindahl-Hirschman index of geographic diversification by simply computing shares of destination markets (rather than products) in total exports,

$$H' = \sum\nolimits_L \left(\frac{x_l}{\sum_L x_l}\right)^2,$$

where export shares are now calculated for each country $l \in L$. Another interesting measure is the index of export market penetration introduced by Brenton & Newfarmer (2009):

$$P = \frac{\sum_K \sum_J y_{k,j}}{\sum_K \sum_J z_k}, \tag{4}$$

where y and z are indicator variables defined by

$$y_{k,j} = \begin{cases} 1 & \text{if } x_{k,j} > 0, \\ 0 & \text{otherwise;} \end{cases}$$

$$z_k = \begin{cases} 1 & \text{if } m_j > 0, \\ 0 & \text{otherwise,} \end{cases}$$

[8] This results from the fact that H (T) is convex (concave) on the shares of total export flows.

where $x_{k,j}$ are exports of a product k to importer j and m_j are imports by importer j. (4) essentially captures the aggregate market penetration of exports, where markets are defined as all countries that import a given product. The primary advantage of this measure, relative to the geographic Herfindahl, is that it not only captures the distribution of exports across markets, but importantly normalizes this distribution by the potential markets that exist for these exports.

Table 4 reports the calculated export concentration measures for the period 2001-2007. We classify the indicators according to three dimensions: (a) diversification between different products across all exports; (b) diversification across exports within defined product groups; (c) diversification by geographic destination. The first column includes a count of the number of distinct products at the 4-digit HS level. The second and third columns contain the (normalized) Herfindahl-Hirschman and the Theil index. The fourth column reports the Theil (between) measure, in other words the between-section component of the Theil measure of overall diversification. The next three columns are analogous to the first three, but instead report median values for levels of diversification in the 21 HS sections for each measure. The eighth column reports the Theil (within) measure, in other words the within-section component of the Theil measure of overall diversification. The final three columns provide, in this order, a count of the number of distinct trading partners, the (normalized) geographic Herfindahl calculated by country share of total exports, and the export market penetration index.[9]

Across all Syrian exports, there is a trend toward increasing diversification (columns 1–4). The Herfindahl index between all export lines has fallen significantly between 2001 and 2007, from a fairly concentrated 0.62 to 0.14, which is more consistent with moderate levels of diversification. This diversification trend is also broadly supported by the decomposed Theil (between) statistics, which illustrate a declining trend after 2003. By way of contrast, other economies in the region possess Herfindahls that range from well-diversified (Morocco, 0.03 and Lebanon, 0.03), to moderate diversification (Egypt, 0.14), to concentrated (Iran, 0.69 and Yemen, 0.72).[10] Seen another way, Syria has, over a seven-year period, moved from an export diversification structure consistent with oil-exporters to one more akin to non-oil exporters.[11] These changes in the extent of

[9]Notably, Table 4 leaves out one other (relatively) common measure of export diversification, the Gini index. We have chosen to do so for two main reasons. First, most of the dynamics of changes in export concentration are well captured by the other reported measures. Second, the main advantage to using a Gini index—its immutability under different sample sizes—is of less consequence in our case, where we are considering only one country with very limited changes in the availability of data.

[10]Since Herfindahls for the other economies are more stable over the period, these values are calculated as averages for the period 2001–2007, inclusive.

[11]Relative to other economies at a similar stage of development, however, Syria remains less diversified, in part due to its historical relationship with oil. For example, Honduras and Indonesia possess

Table 4: Export diversification, between and within sectors, Syria, 2001–2007[†]

	Between				**Within**[‡]				**Geographic**		
Year	Products	Herfindahl	Theil	Theil (B)	Products	Herfindahl	Theil	Theil (W)	Partners	Herfindahl	Pen
2001	142	0.62	0.45	0.26	6	0.51	0.13	0.19	49	0.21	0.00
2002	206	0.46	0.62	0.33	9	0.32	0.18	0.29	49	0.15	0.00
2003	881	0.40	3.45	1.49	30	0.24	2.22	1.95	132	0.15	0.04
2004	363	0.33	1.11	0.65	12	0.32	0.62	0.46	104	0.12	0.01
2005	651	0.38	2.27	0.98	23	0.26	1.24	1.29	128	0.14	0.02
2006	974	0.15	2.81	0.80	34	0.29	2.64	2.01	136	0.09	0.06
2007	509	0.14	1.18	0.43	18	0.31	1.17	0.75	127	0.10	0.02
Mean	532	0.35	1.70	0.71	19	0.32	1.17	0.99	104	0.14	0.02
Change (%)	258	-78	160	62	200	-40	817	296	159	-53	489

[†] Calculations applied at the 4-digit HS level and normalized assuming full quorum of 1,213 lines. Within calculations applied at the 4-digit HS level after sorting into 21 sections, with the exception of Theil (within). Geographic calculations applied to total exports and normalized assuming full quorum of 250 countries, with the exception of market penetration, which was applied at the 4-digit HS level.

[‡] Reported values are medians across sections for each year, with the exemption of Theil (within).

diversification are, we would argue, due in no small part to its policy-driven transition program, and is unique in the region, insofar as rapid diversification is concerned.

Based on the Herfindahl, most of the export diversification achieved by Syria appears to be due to changes in its larger export sectors, with a decline in oil exports as the most likely driver.[12] As such, it is uncertain whether the moderate diversification levels achieved in 2006 and 2007 are likely to persist, especially if oil prices rise in the medium run.

The 78 percent decline in the Herfindahl-Hirschman is not, however, mirrored in the (aggregated) Theil index (which better tracks changes in the share of smaller export sectors); in fact, the latter increases rapidly from 2001, peaks in 2003, before declining to lower levels that are nonetheless higher than that in 2001. This suggests that, in the 2002/03 and 2004/06 periods, the rapid expansion of export varieties—as evidenced by the number of products—has been mostly skewed toward larger lines; equivalently, export diversification has been due less to new product discovery than export declines along the intensive margin. While part of this result may be an artifact of the degree of disaggregation—the Theil declines more systematically over the period when measured at the 2-digit level[13]—the results nonetheless suggest that substantial degrees of diversification have yet to be achieved in newly emerging export lines.

This result comes into sharper focus when examining concentrated indices corresponding to diversification within sections (columns 5–8). Herfindahls remain fairly stable over the period, with a mean of 0.32 (and standard deviation of 0.09). Theils within sections are similar to their values between all product lines—the correlation coefficient is 0.92—which imply once again that smaller export sectors are not responsible for export diversification patterns. Taken together, the relatively stable Herfindahl and varying Theil indices are indicative of the fact that the median sector's exports are not due to the introduction of new products, but rather due to declines in traditional sectors occurring at a broader level in the economy.

Syria has also made some modest gains in terms of geographic diversification (columns 9–11). All three indicators corroborate the depiction of expanding export markets given by Figure 2, and suggest that diversification along the spatial dimension is reasonably healthy. It is useful to note, however, that export penetration remains relatively low in absolute terms; while penetration has grown almost fivefold between 2001 and 2007, it

Herfindahls of 0.07 and 0.03, respectively, which are half to a fifth that of Syrian levels.

[12]Besides the 37.3 percent decline in Syrian oil exports as a share of GDP between 2001–2007, the composition of oil in exports fell from 77.4 to 37.9 percent over the same period.

[13]Specifically, Theil indices calculated at the 2-digit HS level fall by 19 percent between 2001 and 2007, although the rise-and-fall pattern is replicated as well at this level of aggregation.

lags both regional nonoil-exporting economies (Jordan, 0.04 and Lebanon, 0.08) as well as oil exporters (Saudi Arabia, 0.07 and UAE, 0.20).[14]

The dynamic changes in Syria's export structure can also be captured by indices of revealed comparative advantage (RCA) (Balassa 1965), which capture the degree to which a country is specialized in exporting a given product relative to other countries exporting the same product. For a given country c in line k the index is computed as

$$RCA_{c,k} = \frac{x_{c,k}/\sum_K x_{c,k}}{\sum_L x_{l,k}/\sum_L \sum_K x_{l,k}}, \tag{5}$$

where $l \in L$ are the countries that export k. Since (5) is the export share of the country relative to the rest of the world, a value of $RCA_{c,k} > 1$ ($RCA_{c,k} < 1$) indicates a *revealed* comparative advantage (no revealed comparative advantage) in line k.

At the most aggregated level, Syrian RCA patterns display a rising comparative advantage in agricultural products, and a concomitant decline in mineral fuels.[15] These shifts coincide with the overall rise of agriculture as a productive segment of the Syrian economy—as evidenced by increases in the amount of irrigated cultivable land—and the decline of the energy sector, manifested by Syria's move away from being a net exporter of oil in 2007.

The broad RCA patterns are better understood at the section level, where sufficient variability emerges so that it is useful to present those lines that lie close to the bounds of calculated revealed comparative advantage, as well as those registering the greatest changes. The former are the product lines for which Syria has the strongest (and weakest) relative global presence in 2007, while the latter is suggestive of rising (and falling) stars. These 2-digit lines are listed in Tables 5 and A.3, respectively, along with their key underlying 4-digit drivers.[16]

The calculations presented in Table 5 suggest that the strength of Syrian exports in the agricultural sector derive from live animals, especially sheep and poultry, as well as edible vegetables. Although not reported, RCA values for many other processed agricultural products are also high. These include products traditionally associated with Syrian agricultural exports, such as animal and vegetable oils (chapter 15), especially olive oil

[14] As for our Herfindahl calculations, since export penetration indices are relatively stable over the period, these values are averages for the period 2001–2007, inclusive.

[15] A more detailed discussion of the aggregated data, in terms of both HS and SITC sections, is provided in the annex.

[16] We identify these drivers by taking bivariate regressions of the 2-digit line on the 4-digit line, and reporting the variables that yielded the top two R^2 values. Since this methodology allows for both positive and negative coefficients, it is important to keep in mind that a significant amount of the variation could be due to the negative contribution of a given 4-digit driver.

Table 5: Revealed comparative advantage, disaggregated categories, 2001–2007 (extreme values subsample)†

HS code	Product	RCA (2001)	RCA (2007)	Change (%)
	Upper bound			
14	Vegetable materials	41.09	30.36	-33
1404	Other veg products	64.89	43.49	-26
1401	Veg plaiting materials	‡	‡	
01	Live animals	4.53	18.78	314
0104	Live sheep	61.12	282.78	363
0105	Live poultry	0.24	0.22	-9
07	Edible vegetables and roots	6.02	13.81	129
0707*	Cucumbers and gherkins	0.59	3.02	410
0704	Cabbages and cauliflowers	1.27	7.40	482
54*	Man-made filaments	0.40	13.01	3,117
5407	Woven synthetics	0.62	25.40	3,973
5402	Synthetic yarn	‡	1.24	
09	Coffee, tea, and spices	6.04	10.23	69
0909	Seeds of anise	302.97	450.83	49
0901	Coffee	‡	0.24	
	Lower bound			
97	Works of art	‡	0.03	
9701	Handmade decorative	‡	0.01	
9702	Original engravings	‡	‡	
71	Pearls and precious stones	‡	0.00	
7113	Jewels	‡	‡	
26	Ores, slag, and ash	41.09	30.36	-33
03	Fish and crustaceans	‡	0.00	
0307	Molluscs	‡	0.01	
0301	Live fish	‡	‡	
90	Optical and photo equipment	‡	0.00	
9015	Surveying equipment	‡	‡	
9032	Auto reg instruments	‡	‡	

† Calculations applied at the 2-digit and 4-digit HS level. At 2-digit level, lines exhibiting highest and lowest values for 2007 were reported (excluding products that did not exist in 2007). At 4-digit level, lines with highest two R^2 values in bivariate regression were reported, except where the scarcity of observations made this impossible.

‡ No recorded exports of product in given year.

* Indicates (2-digit) product line for which RCA switched from > 1 to < 1 (if change was negative) or < 1 to > 1 (if change was positive).

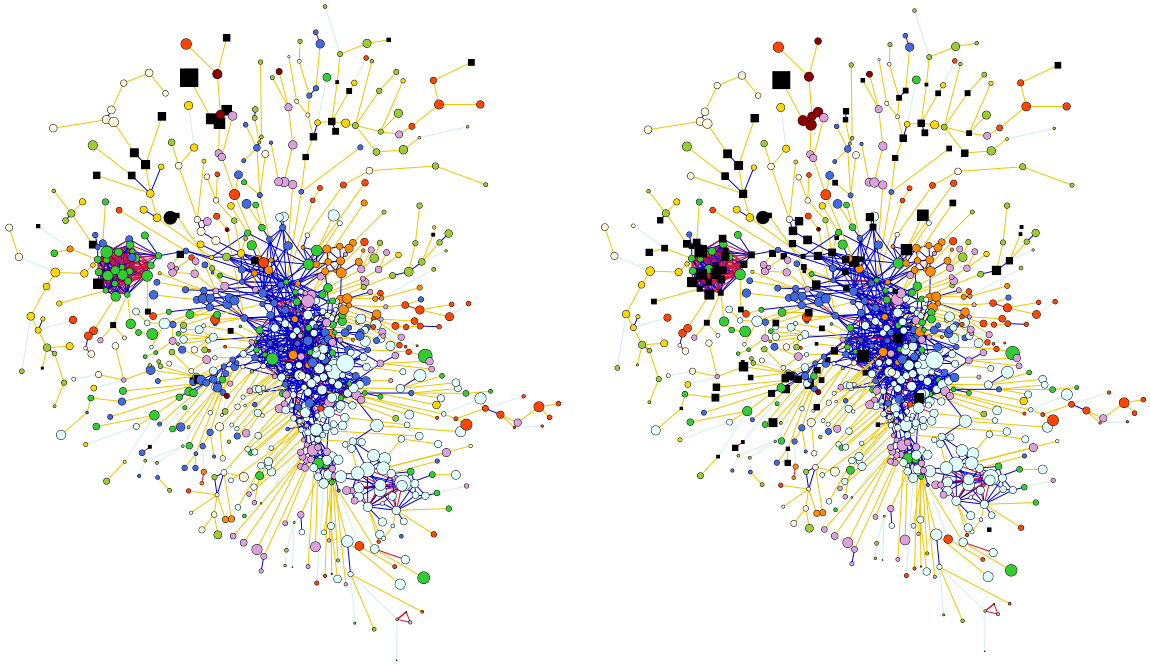
(heading 1509), as well as fruit and nut preparations (chapter 20), especially preserved nuts (heading 2006) such as pistachios and cashews.

Products which Syria has little (revealed) comparative advantage in include pearls and precious stones (chapter 71), seafood (chapter 3), and optical and photographic equipment (chapter 90). These are unsurprising: the former two depend largely on natural endowments, while the last is typically associated with high-skill, capital-intensive production, neither of which Syria is relatively more abundantly endowed.

Note that Table 5 also alludes to the possibility of production and export complementarity, especially with regard to downstream and upstream products. In particular, the production and export of vegetable materials is mostly due to cotton linters (subheading 140420); this is the upstream component that complements the well-diversified man-made

filaments (chapter 54) sector downstream.

Relative to the global product space, the overall pattern of Syrian exports appears to be clustered around products on the periphery, especially in the agricultural and textile categories located in the upper left quadrant of Figure 3. Relative to 2001, Syria has expanded its comparative advantage in those sectors, and currently holds a firm comparative advantage in those areas, as evidenced by the clusters of solid black squares in the figure.[17] Moreover, Syria's comparative advantage now also appears to include an (albeit limited) extension into the global industrial core. The ongoing structural transformation undergone by the Syrian economy since liberalization in 2000 is, again, corroborated by this alternative representation of the data.



(a) 2001 (b) 2007

Figure 3: Syrian exports in global product space, 2008. Products are classified according to 4-digit SITC product lines. Black squares indicate products exported with comparative advantage. While Syria exports some products in the global industrial core, the majority of RCA products are located in the upper-left periphery comprising agriculture and garments. Network visualization produced with Cytoscape (Shannon *et al.* 2003).

Textiles, more generally, are also one of the most dynamic sectors in terms of Syrian exports, having switched from nonspecialization to specialization.[18] This contrasts

[17]The product space representation for Syria for earlier years (1985 and 2000) are available online, and accessible via http://www.chidalgo.com/productspace/country.htm.

[18]A fuller discussion of the sectors which display the greatest changes in RCA is relegated to the annex.

against the mineral fuels, where declines in RCA are among the sharpest among export lines. Clearly, the underlying export patterns of the Syrian economy are rapidly changing, and in some cases dramatically so.

Up to this point, we have examined diversification trends and changes in the RCA indices of the goods in the Syrian export basket. While the RCA index given by (5) formalizes the specific product lines for which a country has relative specialization, it does not capture important features about the nature of the goods exported. Hausmann, Hwang & Rodrik (2007) argue that the *type* of goods exported can be important for the process of development and industrialization. In particular, a given product line p can be classified by the productivity level associated with it. The PRODY index aggregates the per capita output levels across all countries exporting a given product, weighted by the revealed comparative advantage of each country in the product:

$$PRODY_p = \sum\nolimits_L \frac{x_{l,p}/\sum_K x_{l,k}}{\sum_L x_{l,p}/\sum_L \sum_K x_{l,k}} \cdot GDP_l = \sum\nolimits_L RCA_{l,p} \cdot GDP_l, \tag{6}$$

where GDP_l is the GDP per capita of country l. The index (6) aggregates the per capita output levels across all countries exporting the product k, weighted by the revealed comparative advantage of each country in the product. Further aggregation across all exports, weighted by their respective export shares, yields the embodied productivity level associated with the export basket of country c:

$$EXPY_c = \sum\nolimits_K \frac{x_{c,k}}{\sum_K x_{c,k}} \cdot PRODY_k. \tag{7}$$

In contrast to the positive trends in measures of export diversification, the productivity level associated with Syria's export basket has exhibited a negative trend. Figure 4 charts the evolution of (7) for Syria; for the time period 2001–2007, while the mix of the export basket became more diversified, the goods that Syria diversified into embodied lower levels of productivity. This decline is nontrivial: 31 percent (45 percent) when output per capita measured in constant U.S. dollars (PPP-adjusted international dollars). To be fair, this trend decline in $EXPY$ does appear to be consistent with the historical experience of other natural-resource exporting countries, such as Canada and Norway (Hausmann *et al.* 2007).

It is important to keep in mind that although Syria's policy of increased trade liberalization involved government policy explicitly aimed at opening the economy to trade, the Syrian government did not mandate specific sectors of the economy that would be targeted by the liberalization effort. Importantly, it did not adopt a strategy of "picking

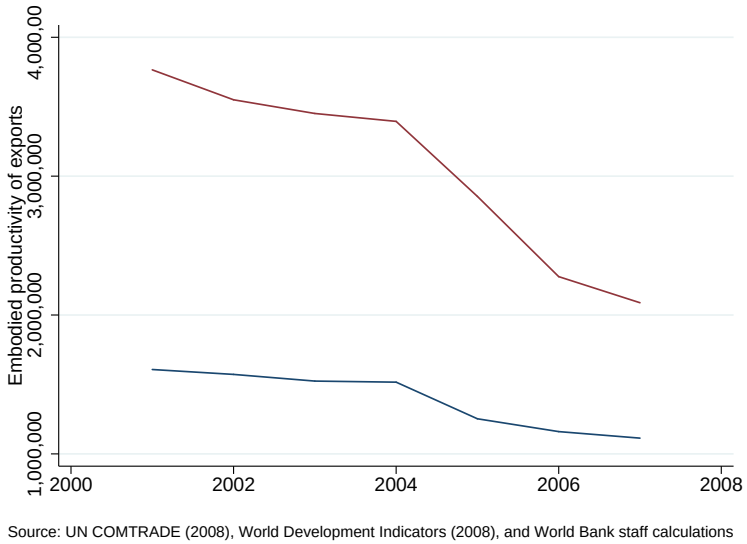


Figure 4: Embedded productivity of export basket, Syria, 2001–2007, calculated from 4-digit HS lines. EXPY calculated with per capita gross domestic product in constant 2000 U.S. dollars (maroon line) and constant 2005 PPP-adjusted international dollars (navy line).

winners" that was common in the East Asian growth experience between the 1980s and early 1990s (World Bank 1993).[19]

How likely is Syria to break away from the relatively low levels of embedded productivity in its export basket? To better understand the potential diversification paths behind Syria's export basket, we formalize the ease of transition to other export products. We first compute the proximity between two hypothetical goods p and q, which is an inverse measure of the distance between these goods, as conditional probability that a country exports product q (product p) given that it already exports product p (product q)(Hidalgo, Klinger, Barabási & Hausmann 2007):

$$\phi_{pq} = \min \left\{ Pr\left(\rho_p = 1 | \rho_q = 1\right), Pr\left(\rho_q = 1 | \rho_p = 1\right) \right\}, \tag{8}$$

where ρ is an indicator variable that measures, for a given country c in product p, is given

[19]However, it would be an exaggeration to instead argue the opposite extreme, that there was no government intervention in the economy. Certain sectors, especially the agricultural and oil sectors, enjoyed government subsidies and price guarantees for their output, and in some cases was dominated by state-owned enterprises.

by

$$\rho_{p,c} = \begin{cases} 1 & \text{if } RCA_{p,c} > 1, \\ 0 & \text{otherwise,} \end{cases}$$

so that the conditional probability $Pr\left(\rho_p|\rho_q\right)$ is calculated across all L countries. These are then further calculated for all K product lines, which yields a $K \times K$ matrix of proximity values.

By aggregating proximity values for all other $K-1$ products around a given product line p, we obtain the paths emanating from that product:

$$paths_p = \sum_K \phi_{p,k}, \tag{9}$$

which serves as a summary measure of the *potential* export patterns of the product, as opposed to the *current* export patterns that are captured by the RCA measure (5).

The proximity measure (8) has been previously calculated by Hidalgo *et al.* (2007) at the 4-digit SITC level (totaling 775 product categories). Here, we consider the equivalent measure at the 2-digit HS level (96 product categories), but instead of taking the average values of export data for a number of years, we compute (8) on an annual basis for each year between 2001–2007. In the interests of space, we limit the results presented in Table 6 to the five product lines exhibiting the strongest RCA values, as reported in Table 5. For comparison, we also include the three lines with the largest and smallest path values in 2007.

It is evident that, for some product lines at least, there has been evolution of the path structure over time. Man-made filaments (chapter 54), coffee, tea, and spices (chapter 9), and soap (chapter 34) show a generally rising trend, whereas clocks and watches (chapter 91) demonstrates a fairly distinct falling trend. This suggests that, at the global level at least, these lines present rising (or, respectively, falling) export opportunities over time.

For Syria, the paths corresponding to the lines consistent with its RCA are fairly broad. Three lines (chapters 1, 7, and 14) fall slightly above the median path value for 2007 (of 21.48), and the other two are relatively close to the median of the distribution. This suggests that the export diversification potential of goods for which Syria has a comparative advantage is reasonably good. Notwithstanding the expansion into goods with lower embedded productivity (Figure 4), therefore, the export basket for Syria demonstrates a clear possibility of further diversification in the future.

How likely is it that Syria will in the near future specialize in products it is currently

Table 6: Selected product paths, aggregated categories, 2001–2007†

HS code	Category	2001	2002	2003	2004	2005	2006	2007
	Strongest RCA lines							
14	Vegetable materials	21.78	21.81	21.23	22.01	21.55	23.08	22.57
01	Live animals	21.17	21.48	20.61	21.15	20.58	22.30	22.56
07	Edible vegetables & roots	23.87	24.66	23.86	23.44	24.46	24.39	24.97
54	Man-made filaments	17.86	19.16	18.60	17.43	19.38	21.64	20.89
09	Coffee, tea, and spices	17.07	17.62	18.47	18.39	17.63	18.54	19.47
	Broadest paths							
19	Prepared grains	26.14	25.99	26.40	27.31	27.89	28.76	29.02
68	Stone and plaster art	28.32	27.93	27.03	27.25	27.46	27.98	28.66
34	Soap	26.02	24.62	24.91	25.36	26.90	28.09	27.92
	Narrowest paths							
75	Prepared grains	11.49	8.42	8.54	8.98	8.08	7.14	7.24
91	Stone and plaster art	10.57	10.70	10.40	10.21	9.49	8.42	7.32
45	Soap	8.02	6.04	5.51	5.26	6.31	7.14	8.03

† Calculations applied at the 2-digit HS level, representing top five lines at upper bound of Table 5. Broadest (narrowest) paths represent lines with highest (lowest) path values in 2007.

not exporting? If our proximity measure is indeed a good indicator of factor substitutability between products and thus the likelihood that a country can produce one good if it produces the other the measure can be used to assess how likely it is that Syria will start exporting goods in the future that it currently does not reveal a comparative advantage in. This relationship between the proximity of new potential products to the current production structure can be represented more formally by calculating the RCA-weighted path to the total path:

$$\omega_{p,c} = \frac{\sum_K \rho_{k,c}\phi_{pk}}{\sum_K \phi_{pk}}, \tag{10}$$

where ρ is defined as before as an indicator variable that takes on unity if $RCA_{p,c} > 1$ and zero otherwise. (Hidalgo *et al.* 2007) refer to (10) as the density of a particular product p for a given country c which measures the closeness of a product in terms of factor substitutability to other products that Syria is already exporting with revealed comparative advantage. Put another way, it is the distance-weighted proportion of products connected with good p that Syria exports. ρ is bounded by $[0, 1]$ and higher values imply that country c has relatively more export possibilities surrounding its exports of product p. We report calculations of (10) for all lines at the 2-digit level in Table 7.

In Table 8, we report densities for all products for which Syria did not have revealed comparative advantage in 2007. We also present each products RCA and products are ranked by the percentage change in their RCA over the period 2001-2007. The average density for all product lines is 0.324, but for goods that Syria currently does not

Table 7: Selected product densities, aggregated categories, 2007†

HS code	Product	RCA (2007)	Change (%)	Density
6	Live trees	0.07	-87	0.429
5	Animal products	0.83	-31	0.333
12	Oil seed	0.34	-17	0.371
23	Food residue & waste	0.15	29	0.422
24	Tobacco	0.10	35	0.344
56	Wadding yarns, and twine	0.27	83	0.387
68	Stone, plaster, and cement	0.51	241	0.257
46	Straw	0.56	304	0.410
18	Cocoa	0.81	473	0.369
74	Copper	0.18	533	0.193
21	Miscellaneous edible preparations	0.44	613	0.392
49	Books, newspapers, and pictures	0.68	617	0.197
51	Wool and animal hair	0.67	666	0.254
33	Essential oils	0.48	848	0.197
83	Miscellaneous base metals	0.16	1,283	0.297
42	Leather	0.42	1,502	0.312
76	Aluminium	0.51	1,511	0.322
38	Miscellaneous chemical products	0.17	2,980	0.358
95	Toys, games, and sports equipment	0.09	3,116	0.236
84	Nuclear reactors	0.18	3,582	0.343
48	Paper and paperboard	0.32	3,786	0.193
44	Wood	0.09	3,811	0.294
39	Plastics	0.65	3,865	0.294
73	Iron or steel articles	0.58	4,508	0.419
30	Pharmaceuticals	0.37	4,661	0.290
94	Furniture	0.52	10,612	0.355
87	Vehicles	0.01	22,546	0.370
96	Miscellaneous manufactured articles	0.81	123,780	0.320
35	Albuminoidal substitutes	0.88	‡	0.322
50	Silk	0.70	‡	0.236
78	Lead	0.57	‡	0.220
43	Furskins	0.47	‡	0.322
69	Ceramics	0.44	‡	0.402
36	Explosives	0.43	‡	0.314
92	Musical instruments	0.28	‡	0.406
32	Tanning/dyeing extract	0.21	‡	0.331
59	Coated fabrics	0.19	‡	0.220
85	Electrical machinery	0.17	‡	0.287
72	Iron and steel	0.11	‡	0.329

† Calculations applied at the 2-digit level. Change in RCA calculated between 2001 and 2007. For lines with incalculable RCA changes, only those with RCA in 2007 above 0.1 were reported.

‡ Indicates nonexistence of exports in 2001.

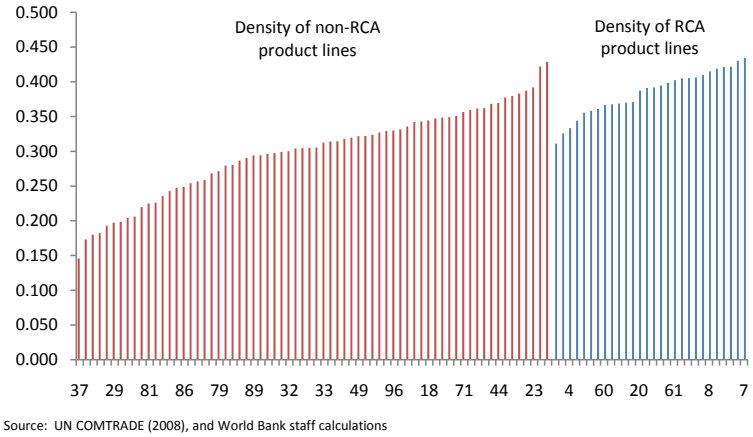


Figure 5: Density of product lines with (blue) and without (red) revealed comparative advantage for Syria, 2 digit HS level, 2007. Selected HS codes reported on the horizontal axis correspond to slightly thicker bars.

export with revealed comparative advantage, the average density is 0.299. The overall distribution of product densities, as captured in Figure 5, reflects this distinction well.

It is especially interesting to observe that the density values for many of the sectors which have shown large increases in revealed comparative advantage over the past years are high. This shows that the Syrian economy has taken advantage of the factor substitutability between sectors with a strong export performance and sectors which had previously not found access to international markets. Some examples are miscellaneous chemical products (chapter 38), iron or steel articles (chapter 73), furniture (chapter 94), and miscellaneous manufactures (chapter 96). Other sectors with high density values are live trees (chapter 6), food residue and waste (chapter 23), straw (46), miscellaneous edible preparations (chapter 21) and wadding yarns and twine (chapter 56). While these numbers may indicate export potential for Syria in these sectors, it is important to note that the analysis relies on proximity indicators between products which are computed at the global level. This, in turn, implies that there may be impediments specific to the Syrian economy, which may render their production and export unprofitable.

3 Potential Determinants of Sectoral Export Diversification in Syria

In the previous section, we analyzed the patterns of export diversification in Syria after the initiation of the reform agenda with the 9th Five-Year Plan in 2000. We found that

the Syrian export basket has indeed become less concentrated although Syria does not appear to have diversified into higher value production. In this section, we seek to better understand why diversification has occurred in some sectors, while not in others. More specifically, we try to offer insight into the the question of how sectoral characteristics and government policy aimed at trade liberalization may affect the process of export diversification in the economy.

The analysis presents inference from simple linear regressions of export diversification measures on trade policy and outcome variables. It is important to notice that, in the absence of an obvious instrument, we are unable to fully control for potential endogeneity in the relationships examined. Indeed, as mentioned in previous sections, one may also be reasonably skeptical of the claim that trade liberalization as a political decision was entirely independent of structural change in the Syrian economy; the long term decline of the oil sector could also speak in favor of this argument. A word of caution is therefore in order when interpreting the results. Our preference is to interpret the estimated coefficients as partial (conditional) correlations, rather than causal relationships.

The regressions results are reported in Table 8.[20] We focus on diversification in a given 2-digit HS sector, using the corresponding 6-digit lines. We construct the dependent variable in the regressions as the percentage change, between 2002 and 2007, of one of three diversification measures: (a) the number of 6-digit products exported; (b) the Herfindahl index based on 6-digit lines; and (c) the share of the largest 6-digit line between 2002 and 2007.[21] These measures are analogous to change in product, Herfindahl, and product share indices commonly employed in cross-country analyses of export diversification.

It is important to note that a factor associated positively with export diversification would be expected to carry a positive sign in regressions with the first measure (specifications *D1–D3*) and a negative sign in the latter two measures (specifications *D4–D9*), given the nature of the indicators used as a dependent variable in the regressions. We include as controls the (natural logarithm) of the initial (year 2002) values of sector-specific density as given by (10), RCA as given by (5), PRODY as given by (6), trade volume, and the tariff rate. While we also experimented with taking changes in the variables as regressors, we consider the use of the initial values of each respective variable as a more accurate representation of the sector's diversification potential throughout the period. This approach also has the added advantage of alleviating endogeneity concerns. That

[20] We also considered a cruder approach, with Probit regressions where the dependent variable was whether a sector became more diversified or not. The results obtained were qualitatively similar, and are available upon request.

[21] Utilizing the 6-digit HS to calculate diversification indicators at the 2-digit HS level allows us to maximize the level of disaggregation while still recovering sensible indicators at the aggregated level, since the number of exported 6-digit lines in any given 4-digit line is generally very small.

said, endogeneity may still be an issue if, for instance, the expectation of further product concentration in a given sector (e.g. a long term decline in a major sub-sector) leads to policy decisions (e.g. tariff changes) or a decline of the sector as a whole.

Our key policy variable on the right hand side is the statutory tariff, computed as the average tariff in each 2-digit category.[22] Variables that capture more the structural changes of the economy include trade volume—which serves as our proxy for sector-specific output effects[23]—along with measures identified in Section 2 as related to diversification potential.

The partial correlation between export diversification and two of the explanatory variables we use is significantly different from zero across all regressions. Intuitively, one may expect further diversification to be less likely in a sector that has already achieved a revealed comparative advantage, because the product space might already be very dense. However, the density of the product space may also produce synergies that lead to further diversification. Interestingly, the regressions show that an increase in RCA is associated with a reduction in the number of products exported (the coefficient entering with a negative sign). Yet, when using the Herfindahl index and the share indicator as dependent variables, the sign of the coefficient continues to be negative.

Although seemingly contradictory at first glance, tis finding may have interesting implications. The results may in fact suggest that, while revealed comparative advantage in a sector actually hinders the discovery of new products (presumably because the product space is already well populated), it nevertheless may prove conducive to diversification overall (potentially by strengthening the export of existing products previously exported at inefficiently low volumes). Thus, as a country's relative specialization in a sector rises, diversification in that sector will occur more through exporting existing products to new markets. The finding by others (Amurgo-Pacheco & Pierola 2008; Brenton & Newfarmer 2009) that export growth along the extensive margin is weighted toward the geographic, rather than discovery, channel is thus consistent with the results presented here.

We find an analogous result for the trade volume variable, albeit in the opposite direction: Larger trade volumes are associated both with a higher number of products exported and more concentration in the sector's exports. Intuitively, it makes sense that a larger sector is better able to discover new products; it is perhaps surprising, however, that the dominating effect appears to be one that strengthens subsectors that are already

[22]The fact that a full tariff schedule for Syria was only published in 2002 (from the UNCTAD TRAINS database) and 2007 (directly from Syrian Customs) determined the starting and ending point of our sample.

[23]Unfortunately, actual production output data were only available at the sectoral level at a highly disaggregated level—for agriculture and mining/manufacturing—and so were not usable for the analysis.

Table 8: Partial correlations between sectoral export diversification and potential determinants thereof, 2002 and 2007 †

	Diversification measure (% change)								
	Number of products			Herfindahl			Share of largest line		
	(*D1*)	(*D2*)	(*D3*)	(*D4*)	(*D5*)	(*D6*)	(*D7*)	(*D8*)	(*D9*)
Density	1.646	1.516	1.197	-0.221	-0.178	-0.207	-0.250	-0.197	-0.140
	(0.900)*	(0.887)*	(0.861)	(0.638)	(0.624)	(0.595)	(0.951)	(0.934)	(0.891)
RCA	-0.725	-0.727	-0.709	-0.253	-0.252	-0.249	-0.373	-0.372	-0.376
	(0.130)***	(0.130)***	(0.131)***	(0.103)**	(0.103)**	(0.101)**	(0.138)***	(0.137)***	(0.135)***
Trade volume	0.31	0.306	0.261	0.298	0.298	0.294	0.240	0.241	0.249
	(0.127)**	(0.126)**	(0.123)**	0.096***	(0.095)***	(0.091)***	(0.134)*	(0.133)*	(0.127)*
PRODY	-0.54	-0.476		-0.024	-0.042		0.112	0.086	
	(0.362)	(0.356)		(0.253)	(0.246)		(0.384)	(0.375)	
Tariff	-0.126			0.038			0.051		
	(0.130)			(0.092)			(0.138)		
Constant	9.192	7.73	0.752	-3.129	-2.678	-3.305	-3.390	-2.795	-1.540
	(5.680)	(5.474)	(1.647)	(3.966)	(3.782)	(1.161)***	6.023	(5.761)	(1.706)
N	58	56	58	58	56	58	58	56	58
R-squared	0.50	0.19	0.18	0.49	0.18	0.17	0.47	0.18	0.17

† 6-digit HS lines used to generate diversification measures at the 2-digit sectoral level. Share of largest line computed as largest export share of 6-digit line within each 2-digit sector. All variables are (natural) logarithms of initial values, unless otherwise reported. Standard errors are reported in parentheses. * indicates significance at 10 percent level, ** indicates significance at 5 percent level, and *** indicates significance at 1 percent level.

large exporters. di Giovanni & Levchenko (2009) find a similar result in a different context, namely that more openness tends to lead to greater product concentration.

Ex ante, we expect density to be positively related to export diversification, since higher values should imply that a sector has a higher export potential. At the cross-country level this was shown by Hidalgo *et al.* (2007). The coefficients reported in the first row of Table 8 confirm that this is likely to be the case. The results suggest that a 1 percent increase in sectoral density in 2002 is associated with an increase in the number of products exported until 2007 of between 1.2 and 1.6 percent.

Having in mind the caveat that trade liberalization may not be independent of structural change, we now consider the relationship between sectoral export diversification and trade liberalization. Although tariffs operate by restricting *imports*, there are *a priori* reasons why lower tariffs at a 2-digit sectoral level may be associated with more diversification at the 6-digit level. Reductions in tariffs in a given sector could reduce the costs of complementary inputs located within the sector; this is relatively common among manufactured products. For example, reductions in tariffs in cotton (HS 52) would lead to lower costs for raw cotton (HS 520100), which would in make it more likely that a textile producer would choose to produce and export plain woven cotton fabrics (HS 521111). Similarly, a reduction in tariffs in motor vehicles (HS 87) would allow exporters of small motor cars (HS 870321) to benefit from a lower import price of engine-fitted chassis (HS 870600). Of course, this measure would be imperfect, since it would not capture reductions in the cost of other critical inputs, such as capital goods, nor would it include inputs that are closely related by tied to a different 2-digit HS sector.

We see this ambiguity reflected in the coefficient estimates for tariffs. Throughout the regressions, the tariff variable typically enters with a coefficient that is not statistically different from zero—regardless of whether we use the logged average tariff or the change in average tariffs over the period (not reported) as an explanatory variable. However, Table 8 also shows that the tariff variable carries the expected sign throughout all regressions, and that the fit of the model improves dramatically with the inclusion of the variable. This suggests that we cannot rule out a role for tariffs in determining export diversification—as shown in Goldberg *et al.* (2008)—and that the problem in our regressions may ultimately be due to both endogeneity in the specifications as well as tariffs being important in some sectors but not in others.

Finally, while we would expect a more sophisticated export basket to be conducive to diversification, the PRODY measure does not enter the regressions with coefficients significantly different from zero, and their signs are unstable. We therefore refrain from drawing any inference from these coefficient estimates.

4 Conclusion

Since the 1960s, the Syrian economy has operated as a largely centralized economy with significant state intervention. A transition process, put in place in 2000 and consolidated over the decade, has also meant structural changes in the Syrian economy away from oil dependence, and its gradual integration with the global system of trade. This paper has assessed whether and why the transformation of the external sector has been successful, in terms of increasing Syria's competitiveness and diversifying its export mix. As a first step, we examined Syrian export diversification trends in some detail, finding that the Syrian export basket has indeed become less concentrated since the initiation of the reform agenda. However, the results also suggest that the rapid expansion in the number of products exported has been driven mainly by changes in larger export sectors, with a decline in oil exports as the likely key driver. What is more, in contrast to the positive trends in measures of export diversification, the productivity level associated with Syria's export basket has been demonstrably negative. Consequently, while the content of Syria's exports has became broader in scope, the goods that Syria has diversified into have embodied lower levels of productivity.

We also have attempted to improve our understanding of the diversification process in a transitioning economy by asking why some sectors of the Syrian economy have diversified, while others have not. More specifically, we tried to answer the question of how sectoral characteristics and trade-liberalization policy may relate to the process of export diversification in the economy. In the light of potential endogeneity concerns, and in the absence of an obvious choice of instrumental variable, we prefer to interpret the results of our regressions as partial correlations rather than causal relationships.

Keeping this in mind, our regressions suggest that a sector's trade volume and its initial revealed comparative advantage exhibit important comovements with our measures of export diversification, while tariffs and the density index appear to be less strongly correlated. One of our most interesting findings is that revealed comparative advantage in a sector may actually *hinder* the discovery of new products (due to an already crowded product space), although the variable appears to be positively related to other more comprehensive measures of diversification. This result—that export diversification is driven by greater export intensity at the sectoral level, but involving existing products going to new markets—is consistent with the broader cross-country literature studying patterns of export diversification (Amurgo-Pacheco & Pierola 2008; Brenton & Newfarmer 2009).

Looking into the future, the export diversification potential for sectors in which Syria

has revealed comparative advantage appears to be reasonably good. Subject to the caveat that such future expansion may be into goods with lower embedded productivity, Syria's export basket does demonstrate the potential for continued diversification; our analysis has shown that some sectors have already taken advantage of their seemingly high factor substitutability with existing export champions. Other sectors, in contrast, have been identified as showing export potential, but have not, to date, attained revealed comparative advantage. Syria's product space is no longer very concentrated around few products in general—or hydrocarbons with a corresponding narrow set of capabilities in particular—but, on the other hand, it does not appear to be moving in the direction of high value added trade.

An interesting policy question in this regard is how Syria can better take advantage of its strong but unused export potential in various higher value-added activities, and whether this shift is likely to take place autonomously or is contingent on other policy measures, such as activist industrial policy or horizontal measures aimed at building institutions and improving Syria's business environment. On the basis of this paper's results, it appears that further policy intervention may be necessary to strengthen Syria's growth and diversification prospects. We would, however, argue that vertical industrial policy may not be the solution at this point in time, and that horizontal interventions aimed at Syria's weak institutions are needed to allow the country to gain steam, and to take advantage of its considerable export and growth potential.

The analysis in this paper has shown that Syria's success as a transition economy cannot be taken for granted, and that policy inactivity bears significant risks.[24] A cynical take of this paper's results would suggest that as oil reserves have been mostly depleted, Syrian trade has shifted back to the profile of a lower income non-resource based economy and that opening up the economy has not been sufficient to raise its value profile and transform its economy. This begs the question what certain transition economies—such as the Baltic states (Bernatonyte 2011) and Romania (Hausmann *et al.* 2007)—have done differently to more successfully transform their economies. More generally, the success of Eastern European transition economies in upgrading their production structures and export baskets in the aftermath of the breakdown of the Soviet bloc is striking. While industrial policy has played a more prominent role in some transition economies, one aspect that clearly sets Syria apart is its weak institutions and business environment. This is crucial, since such factors have been shown to be key for raising productivity and growth (Barseghyan 2008).

[24]We would like to thank an anonymous referee for some good suggestions on the policy implications presented here.

On the basis of the findings in this paper, it would appear that continued policy vigilance is required, in order to allow the Syrian economy to successfully transition toward an even more diversified economy with a strong industrial base. Such policies go beyond trade liberalization. Horizontal measures strengthening both institutions and the business environment—across all sectors—will be essential. In practice, this includes measures that would shrink the size of Syria's large shadow economy, provide finance to small and medium enterprises, reduce barriers to entry for small firms, eliminating privileges for large and long-standing private sector firms, as well as privatizing some of their state-controlled counterparts. We regard this as a first-best policy, since such reforms would raise total factor productivity and, in turn, raise the embedded productivity of its (currently low value) export basket.

Activist industrial policy, on the other hand, would likely not be the appropriate choice at this stage. First, vertical policy intervention may simply be infeasible and potentially counterproductive in the presence of weak institutions and a business environment severely weakened by corruption and nepotism. Second, while the recognition and support for certain broad *classes* of exports—such as manufactures with high values of equation (6)—may lead to improved export and output performance (Hausmann *et al.* 2007), a focus on one or two narrowly-defined *products* can easily lead to resource misallocations and export disappointments (Easterly, Reshef & Schwenkenberg 2009). Finally, activist industrial policy may send the wrong signal in a country with a traditionally large state sector and a command economy.

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Appendix

In this appendix, we provide a more detailed discussion of RCA computations. Tables A.1 and A.2 document calculations of (5) for Syria at the most aggregated level, for the period 2001–2007, for 2-digit HS and 1-digit SITC sections, respectively. Agricultural products (HS 1–4, SITC 1) all display rising trends, with three of the four HS sections switching from having no revealed comparative advantage in 2001 to demonstrating clear specialization by 2007 (the exception is vegetable products, which maintained revealed comparative advantage over the period), and an almost doubling of RCA for the SITC section. Textiles (HS 11), another product that has traditionally featured in the Syrian export mix, also demonstrates increasing specialization (as has, more recently, HS 12 footwear and headgear). These are likewise reflected in the slightly more aggregated manufactured goods category (SITC 6).

The trend in increased comparative advantage exhibited by the agricultural sector over the 2001–07 period is especially interesting. The improvement in RCA indices in this sector has occurred alongside improvements in the amount of irrigated cultivable land—at an average annual rate of 3.11 percent (NAPC 2006)—as well as in the context of repeated water deficits, the most recent incident being a three-year drought that began in 2007. The export potential of the agricultural sector is a finding that has been corroborated by other studies (Atiya 2008; Lançon 2005) using different methodologies, although there is some concern that the long-term viability of the sector as a source of export strength may be compromised by reduced subsidy support as a result of the country's declining oil revenues.

In contrast, mineral products—of which oil is the largest component for Syria—demonstrates a fairly rapid decline in specialization, falling to a nadir in 2006 before picking up slightly in 2007 (for section HS 5; SITC 3 shows no such recovery). If this trend is maintained, Syria will despecialize in mineral products by 2009[25], consistent with its shift into being a net importer of oil in 2007.

Table A.3 highlights the most dynamic products in the export mix. As can be seen, increases in RCA (in percentage changes) outstrip decreases by several orders of magnitude. While this disparity in part due to the fact that positive changes often start from a smaller base, the more general pattern in the data nonetheless points to larger changes in RCA on the positive side. Moreover, while Syria does not specialize in many of these sectors (as seen in the upper half of the table), it has also attained specialization in many others (as seen in the lower half of the table).

Among the fastest growing goods are woven fabric (chapter 58), beverages (chapter 22), and miscellaneous manufactured articles (chapter 96). The first two have, over the 2001–2007 period, switched from nonspecialization to specialization. This is reflective of the most dynamic export sectors. Bottled waters (heading 2201), for example, did not exist as an export line in

[25]Based on a linear regression of RCA on the time trend, $RCA_t = -0.96t + 1933.5$, such that $\hat{RCA}_{2009} = 0.97$.

Table A.1: Revealed comparative advantage, aggregated categories, 2001–2007†

Sec	Category	2001	2002	2003	2004	2005	2006	2007
1	Animal products	0.41	2.81	2.14	2.88	2.14	2.29	2.23
2	Vegetable products	2.66	3.13	3.28	3.04	2.86	5.01	4.87
3	Organic oils and fats	0.21	0.60	2.26	1.82	4.36	5.07	5.23
4	Prepared foodstuff	0.13	0.27	0.50	0.89	0.89	1.28	1.57
5	Mineral products	8.44	7.67	6.90	6.17	5.11	2.96	3.20
6	Chemical products	0.01	0.03	0.08	0.12	0.27	0.47	0.44
7	Plastics and rubber	0.01	0.04	0.11	0.15	0.25	0.50	0.50
8	Hide and leather	0.04	0.48	0.45	0.50	0.53	1.28	1.48
9	Wood products	0.00	0.01	0.06	0.04	0.08	0.08	0.09
10	Paper products	0.02	0.05	0.13	0.13	0.17	0.44	0.34
11	Textiles	1.08	1.35	1.51	1.58	1.72	3.89	3.95
12	Footwear and headgear	0.12	1.09	0.96	0.80	0.70	2.23	2.70
13	Stone, ceramic, and glass	0.04	0.07	0.21	0.48	0.44	0.46	0.29
14	Precious stones and metals	‡	‡	0.00	0.00	0.01	0.01	0.00
15	Base metals	0.01	0.03	0.10	0.21	0.18	0.29	0.27
16	Machinery and appliances	0.00	0.01	0.02	0.02	0.04	0.18	0.17
17	Transportation equipment	0.00	0.01	0.01	0.01	0.02	0.01	0.01
18	Instruments and apparatus	‡	‡	0.00	0.00	0.01	0.01	0.01
19	Arms and ammunition	‡	‡	0.00	‡	0.00	0.08	‡
20	Miscellaneous manufactured	0.00	0.02	0.11	0.11	0.12	0.42	0.41
21	Art and antiques	‡	‡	0.01	‡	0.05	0.03	0.01

† Calculations applied to 21 HS sections, which aggregate the 97 lines at the 2-digit HS level.
‡ No recorded exports of products in given year.

Table A.2: Revealed comparative advantage, aggregated categories, 2001–2007†

SITC	Category	2001	2002	2003	2004	2005	2006	2007
0	Food and live animals	1.27	1.90	2.07	2.49	2.61	2.31	9.65
1	Beverages and tobacco	0.09	0.25	0.25	0.31	0.28	0.28	0.07
2	Nonfuel crude materials	1.66	1.65	1.59	1.96	1.79	1.60	1.96
3	Mineral fuels	7.83	8.31	7.46	6.33	5.05	4.94	0.06
4	Organic oils and fats	0.36	0.28	2.20	2.60	4.73	4.24	0.10
5	Chemicals	0.08	0.13	0.09	0.18	0.20	0.16	1.06
6	Manufactured goods	0.34	0.30	0.37	0.47	0.36	0.37	1.26
7	Machinery & trans eqmt	0.02	0.02	0.02	0.05	0.03	0.04	0.09
8	Misc mfg articles	0.41	0.35	0.36	0.40	0.40	0.40	0.35
9	Other commodities	0.13	0.12	0.15	0.09	0.08	0.05	1.22

† Calculations applied at the 1-digit SITC level.

2001; by 2007, exports of bottled waters were estimated at USD $33,793,053, or 0.3 percent of all exports. Given the relatively low per-unit price of bottled waters, this seemingly small share is not insignificant. Other types of exports, such as brooms and brushes (heading 9603), have grown at a very rapid pace, and it is likely that some of these product lines will attain specialization in the near future.

On the negative side of the ledger, some of Syria's more traditional exports appear to be receding in importance. Although mineral fuels (chapter 27) and edible fruit (chapter 8) have sustained comparative advantage, the declines in RCA—especially for crude petroleum (heading

2709)—suggest that these lines will diminish in importance in the Syrian export basket in the medium term, especially if the rate of decline is sustained.

Table A.3: Revealed comparative advantage, disaggregated categories, 2001–2007 (greatest changes subsample)†

HS code	Product	RCA (2001)	RCA (2007)	Change (%)	HS code	Product	RCA (2001)	RCA (2007)	Change (%)
Decrease					**Increase**				
06	Live trees and plants	0.51	0.07	-87	94	Furniture and bedding	0.00	0.52	10,612
0602	Other live plants	1.10	0.07	-94	9403	Other furniture	0.01	1.06	10,126
0603	Cut flowers	0.01	0.02	190	9406	Prefabricated buildings	‡	0.19	
05*	Other animal products	1.20	0.83	-31	87	Vehicles	0.00	0.01	22,546
0504	Offal	2.61	1.59	-39	8707	Motor vehicle bodies	‡	0.12	
0506	Bones	‡	‡		8708	Motor parts	0.00	0.03	13,603
12	Oil seed	0.41	0.34	-17	96	Miscellaneous manufactured	0.00	0.81	123,780
1211	Plants for perfumery	3.21	3.27	2	9603	Brooms and brushes	‡	3.11	
1205	Rape or colza seeds	‡	‡		9609	Pencils	‡	0.78	
27	Mineral fuels and oils	9.06	3.47	-62	25*	Salt, sulphur, earth	0.02	1.67	9,660
2709	Crude petroleum	15.46	6.29	-59	2510	Natural calcium phosphates	‡	35.74	
2710	Non-crude petroleum	2.69	1.63	-40	2509	Chalk	‡	‡	
14	Vegetable materials	41.09	30.36	-26	58*	Special woven fabric	0.03	5.64	21,473
1404	Other veg products	64.89	43.49	-33	5804	Tulles and net fabrics	0.19	18.38	9,566
1401	Veg plaiting materials	‡	‡		5808	Braids in piece	‡	53.33	
08	Edible fruit and nuts	4.18	3.11	-26	22*	Beverages and spirits	0.00	1.49	89,021
0807	Melons	8.48	5.76	-32	2202	Sweetened waters	0.01	6.68	47,533
0802	Other nuts	4.97	4.39	-12	2201	Unsweetened waters	‡	12.73	

† Calculations applied at the 2-digit and 4-digit HS level. At 2-digit level, lines exhibiting greatest positive and negative changes were reported (excluding products that did not exist in either 2001 or 2007). At 4-digit level, lines with highest two R^2 values in bivariate regression were reported. The upper (lower) half reports lines with RCA < 1 (> 1).

‡ No recorded exports of product in given year.

* Indicates (2-digit) product line for which RCA switched from > 1 to < 1 (if change was negative) or < 1 to > 1 (if change was positive).