Export Competitiveness and Trade Agreements: Analysis and Insights from Israel's Experience

Ronen, Eyal and Benizri, Yohan

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Eyal Ronen Yohan Benizri [1]

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Abstract

Israeli manufactured export performance has been on a growth path for the past two decades. This growth is partly due to the continuing shift in Israeli export specialization patterns from traditional products towards technology-intensified exports. However, Israel's strong export competitiveness also derives from proliferating free trade agreements (FTAs) with its trading partners, especially the European Union (EU). This paper analyzes export statistics to provide data validating the positive impact of recent FTAs on Israel's export comparative advantages across all sectors between 1995 and 2015. It employs an econometric framework to examine stability and specialization trends, as well as convergence. Furthermore, the authors add to the literature by performing a survival analysis, using the Kaplan-Meier Survival Rate model, to identify particular Israeli export sectors that have benefited from a longer period of competitive advantage than other sectors due to the EU-Israel Association Agreement.

JEL Classifications: F13, F14
Keywords: Export Competitiveness, Survival Analysis, Trade Agreements.

[1]The co-authors are Dr. Eyal Ronen of the Hebrew University of Jerusalem, email: shapironen@gmail.com and Mr Yohan Benizri of Sidley Austin LLP, email: yohan@benizri.com. The opinions expressed in the article are those of the authors and do not necessarily reflect the views of University of XJerusalem or Sidley Austin LLP, or its clients.

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1 Introduction

Since 2000, the state of Israel has nearly tripled its manufactured exports in global markets. This expansion has been associated with a substantial structural change in Israel's export composition. Israel exporters have shifted from traditional labor-intensive products to more innovative and technology-intensive manufacturing goods, which now account for approximately half of Israeli exports. Israel's principal exporting sectors are, currently, chemicals and pharmaceuticals, machinery and electronic equipment, optical and medical instruments, and more.

Israeli expanded and diversified its exports while embarking on a forward-looking policy of concluding free trade agreements (FTAs) with its largest trading partners. The first such FTA was a trade agreement with the European Union (EU) in 1975, which, although not fully mutual at first, marked the beginning of a new era. Before this agreement, Israel's export success in global markets was relatively negligible, and the agreement set a precedent for other FTAs such as the FTA with the United States, which came several years later.

Policy makers generally agree that Israel's FTAs, signed over the past two decades, have improved its export competitiveness. However, empirical evidence to support this claim has been lacking. In general, economic trade theory is supportive with respect to the beneficial impact of preferential trade agreements (PTAs) on the trade between the parties to these arrangements (Krishna, 1998; Freund, 2000). The empirical literature is also filled with various approaches that validate the trade-enhancing nature of PTAs and have found that the trade creation effect greatly exceeds trade diversion (Robinson and Thierfelder, 2002; Lloyd and MacLaren, 2004). However, robust data based on export statistics has been lacking.

Using an econometric framework and a survival analysis (employing the Kaplan-Meier Survival Rate model), this research paper concludes that FTAs were indeed beneficial in promoting the competitiveness of Israeli exports, compared to the exports that do not fall under FTAs. The survival analysis also validates the positive contribution of FTAs to higher probabilities of longer-lasting export relative comparative advantage. In some cases, overall averages over the past 20 years do not reveal the benefits of a particularly FTA for Israeli export competitiveness, highlighting the importance of analyzing the trajectory of how the contribution of the FTAs evolves over the years.

2 Methodology and Data

The economic literature recognizes that a variety of indicators and indices can be used to quantify export competitiveness. These include the Export Intensity Index, Market Share, the Comparative Export Performance (CEP) index, and the Revealed Comparative Advantage (RCA) Index. The Export Intensity Index is a measure that explores whether a country exports more to a given destination than to the world (Kojima, 1964). Market share is calculated as the share of export from country i to country j, divided to country j total imports of the particular product. The CEP index measures the export specialization of a country for a particular product group, using the formula: CEP = $ln((X_{iC}/X_C))/(X_{iW}/X_W)$. X_{iB} represents the exports of a specific country; X_{iW} represents world exports of good i and X_W is the total of all world exports. When the CEP index in a specific market is greater than 0, this means that a country has a comparative export advantage in that market compared to the world as a reference.

This paper analyzes Israeli export competitiveness using the Balassa index (a type of RCA index). The Balassa index is based on the work of Balassa (1965), who refined the concept of Liesner (1958), The index calculates comparative export advantage based on Ricardian trade theory, using the following equation:

$$RCA_{ij} = \left(\frac{X_{ij}}{X_{it}}\right) / \left(\frac{X_{nj}}{X_{nt}}\right) \tag{1}$$

X represents the export flows from a given country j, of a given sector or product i, while t is a group of products and n is a group of countries. A revealed comparative advantage (or disadvantage) index of exports is calculated by comparing the export share in the total exports of the country with the export share in the total exports of a reference group of countries. The interpretation of the RCA index is relatively straightforward. If the value of the index is greater than 1, the country has a revealed comparative advantage, i.e., the country is relatively specialized in producing and exporting the product under consideration. If the value is $0<RCA<1$, the country has a comparative disadvantage. The RCA index has been evaluated by several studies, including Jambor (2013), Leromain and Orefice (2014), and Levchenko and Zhang (2016)

After employing the Balassa index, we proceed to calculate the Revealed Symmetric Comparative Advantage (RSCA) index, in order to have the distribution symmetric around zero, and to avoid potential bias in the regression coefficients (Dalum et al. 1998) . We employ the following eqaution:

$$RSCA^t_{ij} = \frac{RCA^t_{ij} - 1}{RCA^t_{ij} + 1} \tag{2}$$

The RSCA takes values between -1 and 1, with the values of $0<RSCA<1$ indicating a comparative export advantage, compared to negative values that suggest a comparative export disadvantage.

Next, we analyze the stability of the RSCA index, from the years 1995 to 2015, inclusive, using a regression analysis of the dependent variable RSCA index at time t (for sector i in country j) against the lagged operator of RSCA at the previous time t_{-1}. The parameters α and β are standard linear regression estimators, and ε is a residual term. The stability analysis is based on Galtonian regression model presented by Hart & Prais (1956) and later developed by Cantwell (1989) in the context of specialization. The equation is the following:

$$RSCA_{ij}^{t} = \alpha_i + \beta_i RSCA_{ij}^{t-1} + \varepsilon_{ij} \tag{3}$$

If β=1, the unchanged pattern of RSCA between periods t_{-1} and t, indicates no change in the overall degree of specialization in the export of a sector i. If β>1, which is also called β divergence, the existing specialization is strengthened, meaning that a low level of specialization in the initial period leads to less specialization in the future. If 0<β<1 (convergence) sectors with initial low RSCAs increase over time on average, while sectors with initial high RSCAs decrease their values. Moreover, when β=R (The sign R represents the correlation coefficient of the regression) the pattern of a given distribution is unchanged. When β>R, then the degree of specialization has grown, leading to divergence. If β<R, the degree of specialization has fallen, i.e., more convergence has developed (Bojnec and Fert, 2008).

Lastly, to explore the duration of the revealed comparative advantages at the sector level, we employ duration (survival) analysis. This type of analysis has not been done before to explore sector-specific export competitiveness. The approach aims to address some of the questions related to the probabilities of maintaining an export comparative advantage, several years after FTAs enter into force. This paper is also the first to analyze the probabilities of Israel maintaining its export relative comparative advantage in the EU, several years after the entry into force of Israel's FTA with the EU.

The reference parameters for evaluating the dynamics are the start year and the end year. We estimate survival functions focusing on the RTA index across agro-food product groups. The survival function, S(t), is estimated non-parametrically using the Kaplan-Meier product limit estimator. It is assumed that a sample contains n independent observations denoted (*ti*; *ci*), i = 1, 2,..., n, where *ti* is the survival time, while *ci* is the censoring indicator variable C (take the value of 1 if failure occurred, and 0 otherwise) of observation i. Moreover, we assume that there are m<n recorded times of failure. Then, we denote the rank-ordered survival times as t(1) >(2) >... >(m). We let nj denote the number of subjects at risk of failing at tj, while dj denote the number of observed failures.

The Kaplan-Meier estimator of the survival function is then:

$$\hat{S}(t) = \prod_{t(i)<t} \frac{n_j - d_j}{n_j} \tag{4}$$

with the convention that S(t)=1 if t <t(1). Many observations are censored, but we note that the Kaplan-Meier estimator is robust to censoring and uses information from both censored and non-censored observations.

3 Israel's Export Competitiveness in Global Markets

3.1 Evolution of Israel's Exports competitiveness

Israel's export competitiveness in its global markets is calculated using the Balassa index, as provided in equation 1, while the results are depicted in Table 1. As shown in the Table, the revealed comparative advantage (RCA) index of Israeli exports is, on average, greater than 1 for most of its FTA partners. Therefore, FTAs benefit Israeli export competitiveness on average. Although Israeli exporters benefit from relatively better market conditions in these markets, however, the trend is typically negative, meaning that as time passes, these advantages weaken, as in the cases of Canada, Mexico, Hungary, Bulgaria, and Romania, as well as of all Mercosur partners except Argentina. In some of these countries, the negative trend is quite understandable, given that the first two countries signed NAFTA with the United States, while the last two joined the EU in 2007. More importantly, however, as this paper confirms, the advantages of preferential agreements simply tend to fade away over time.

Table 1 Israel's Revealed Comparative Advantage (RCA) of Exports to FTA Partners

	Date of Entry into Force	*Average 1995-2000*	*Average 2001-2005*	*Average 2006-2010*	*Average 2011-2015*	*Average*
Jordan	*Oct. 1995*	*1.322*	*1.263*	*1.470*	*2.018*	***1.524***
Canada	*Jan. 1997*	*1.455*	*1.299*	*1.015*	*0.995*	***1.194***
Poland*	*Jan. 1998*	*1.067*	*1.228*	*1.025*	*1.076*	***1.101***
Czech Rep.*	*Jan. 1997*	*1.005*	*1.091*	*1.030*	*1.067*	***1.050***
Hungary*	*Jan. 1998*	*1.220*	*1.139*	*0.969*	*0.758*	***1.023***
Turkey	*May 1997*	*1.323*	*0.920*	*0.897*	*0.925*	***1.009***
Bulgaria **	*Jan. 2001*	*1.174*	*1.025*	*0.828*	*0.662*	***0.904***
Mexico	*July 2000*	*1.012*	*0.779*	*0.827*	*0.853*	***0.860***
Romania **	*Jan. 2001*	*0.979*	*0.851*	*0.831*	*0.717*	***0.844***
Brazil	*April 2010*	*1.287*	*0.898*	*0.630*	*0.733*	***0.882***
Argentina	*April 2010*	*0.746*	*0.783*	*0.764*	*0.840*	***0.784***
Paraguay	*April 2010*	*1.705*	*1.002*	*1.168*	*0.933*	***1.169***
Uruguay	*April 2010*	*1.249*	*1.103*	*1.021*	*1.067*	***1.105***
European Union	*Jan. 1996****	*1.120*	*1.045*	*1.053*	*1.031*	***1.060***

** Joined EU in 2004. ** Joined EU in 2007.*
**** The trade agreement with EU entered into force prior to the Association Agreement (June 2000).*

The impact of Israel's FTAs becomes more nuanced if one examines sectoral data; some sectors appear to obtain a significant comparative advantage whereas others gain no benefit. These sectors are not necessarily the largest in volume, nor are they the sectors that receive the most attention, such as the technology-intensive products that have been exported most recently.

According to the data depicted in Table 2, which is based on the Balassa index, only three sectors reveal a significant comparative advantage: stone and glass, chemicals, and miscellaneous. Among those three, stone and glass has experienced a significant decrease in the past two decades, while chemicals have enjoyed a growth trend. Israel also benefits from a steady advantage in miscellaneous, primarily thanks to its traditional markets for religious articles. In all other sectors, Israeli exports have had a comparative disadvantage, and these sectors include machinery and electronics, food, metals, and transportation. In some sectors, such as minerals, as well as textiles and clothing, the situation has even substantially deteriorated over the years.

Table 2 Evolution of Israel's Comparative Advantage, By Product Groups

	Average 1995-2000	***Average 2001-2005***	***Average 2006-2010***	***Average 2011-2015***
Stone and Glass	*10.0*	*10.9*	*8.80*	*6.09*
Chemicals	*1.38*	*1.48*	*2.13*	*2.50*
Miscellaneous	*1.05*	*0.90*	*1.02*	*1.16*
Vegetable	*1.34*	*1.19*	*1.21*	*0.98*
Plastic or Rubber	*1.00*	*0.93*	*0.97*	*0.95*
Machinery and Electronics	*0.84*	*0.81*	*0.77*	*0.71*
Food Products	*0.55*	*0.46*	*0.59*	*0.61*
Metals	*0.47*	*0.45*	*0.45*	*0.49*
Textiles and Clothing	*0.92*	*0.78*	*0.59*	*0.45*
Fuels	*0.11*	*0.15*	*0.30*	*0.41*
Minerals	*0.82*	*0.45*	*0.38*	*0.39*
Wood	*0.14*	*0.19*	*0.31*	*0.33*
Transportation	*0.18*	*0.19*	*0.31*	*0.22*
Animal	*0.10*	*0.08*	*0.16*	*0.22*
Hides and Skins	*0.10*	*0.12*	*0.12*	*0.15*
Footwear	*0.15*	*0.11*	*0.14*	*0.12*

Source: Own calculations based on the Comtrade database with the WITS (2017) software.

3.2 Stability and Export Specialization

In this subsection, we examine whether FTAs have altered the makeup of Israeli exports over time. We analyze the stability of the Israeli export specialization by performing regressions on the revealed symmetric comparative advantage (RSCA) with its lagged operators. We begin by performing an analysis on all Israeli exports, at the highest level of aggregation, based on results of the estimation of equation 3. We categorize the exports into those that benefit from the advantages of access to markets with FTAs and those that do not (Table 3). The β values, in the first case, are higher compared with exports to countries that do not have FTAs with Israel, with an average of approximately 73% after one lag, increasing to 75% in the 15th lag. Moreover, it seems that if we ignore the country and sector variation, from the broad perspective, the β/R ratios in the two types of destinations remain close to 1, as the years progress. The overall data, therefore, suggests that the distribution has remained stable over the years, despite the existence of the FTAs.

Table 3 Stability of the RSCA Index Between 2000 and 2015, By Destination

Export Destination	*Lag*	*β*	*p-value*	*R^2*	*R*	*β/R*	*n*
No FTA	*1*	*0.681*	*0.000*	*0.464*	*0.681*	*0.999*	*13,583*
	8	*0.699*	*0.000*	*0.540*	*0.735*	*0.951*	*8,836*
	15	*0.672*	*0.000*	*0.453*	*0.673*	*0.998*	*3,982*
With FTA	*1*	*0.732*	*0.000*	*0.534*	*0.731*	*1.002*	*7,946*
	8	*0.735*	*0.000*	*0.540*	*0.735*	*0.999*	*5,190*
	15	*0.746*	*0.000*	*0.549*	*0.741*	*1.006*	*2,360*

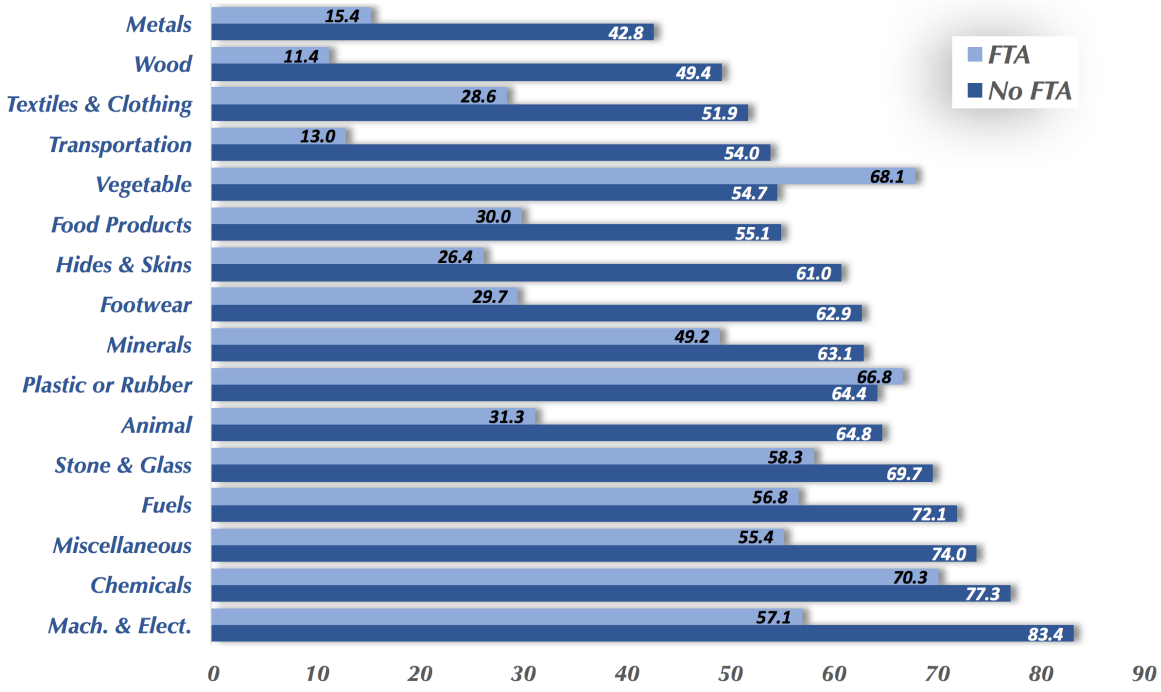
However, if we zoom in and explore sectoral variation, FTAs seem to have led to export specialization in some sectors and to de-specialization in others. We analyze the degree of divergence for each of 16 sectors, between the years 2000 and 2015. The results for the first and last lags are shown in Table 4. When running the model with a single lag, the β values seem to vary around 66%, meaning that the degree of export specialization has not changed considerably. Moreover, when increasing the number of time lags to 15, the β values remain relatively similar, implying that the dispersion of distribution is relatively stable. The β/R ratios, however, show that the pattern of revealed comparative advantage has tended to converge in most sectors, except for animal, food products, and metals. A relatively strong de-specialization has occurred in the footwear, textiles and clothing, and transportation sectors. These results are in line with Laursen (2000), who asserts that when trade specialization is related closely to technological specialization at the country level, specialization patterns can be expected to remain stable over very long periods.

Table 4 Stability of the RSCA Index Between 2000 and 2015, by Sector

Product Group	*Lag*	β	*p-value*	R^2	*R*	β/R	*n*
Animal	*1*	*0.442*	*0.000*	*0.188*	*0.434*	*1.020*	*669*
	15	*0.311*	*0.000*	*0.0784*	*0.280*	*1.111*	*203*
Chemicals	*1*	*0.515*	*0.000*	*0.2651*	*0.515*	*1.001*	*1,902*
	15	*0.459*	*0.000*	*0.2239*	*0.473*	*0.970*	*572*
Food Products	*1*	*0.664*	*0.000*	*0.4308*	*0.656*	*1.011*	*1,376*
	15	*0.680*	*0.000*	*0.4314*	*0.657*	*1.035*	*410*
Footwear	*1*	*0.470*	*0.000*	*0.222*	*0.471*	*0.998*	*749*
	15	*0.492*	*0.000*	*0.2943*	*0.542*	*0.908*	*224*
Fuels	*1*	*0.665*	*0.000*	*0.465*	*0.682*	*0.976*	*373*
	15	*0.728*	*0.000*	*0.5606*	*0.749*	*0.972*	*106*
Hides & Skins	*1*	*0.392*	*0.000*	*0.1576*	*0.397*	*0.988*	*804*
	15	*0.425*	*0.000*	*0.178*	*0.422*	*1.008*	*241*
Machinery & Elect.	*1*	*0.492*	*0.000*	*0.2466*	*0.497*	*0.990*	*2,138*
	15	*0.478*	*0.000*	*0.2336*	*0.483*	*0.990*	*636*
Metals	*1*	*0.434*	*0.000*	*0.1843*	*0.429*	*1.011*	*1,753*
	15	*0.419*	*0.000*	*0.1649*	*0.406*	*1.031*	*523*
Minerals	*1*	*0.506*	*0.000*	*0.2591*	*0.509*	*0.995*	*902*
	15	*0.504*	*0.000*	*0.2744*	*0.524*	*0.963*	*258*
Miscellaneous	*1*	*0.344*	*0.000*	*0.1195*	*0.346*	*0.995*	*1,840*
	15	*0.348*	*0.000*	*0.126*	*0.355*	*0.980*	*531*
Plastic or Rubber	*1*	*0.499*	*0.000*	*0.2473*	*0.497*	*1.004*	*1,844*
	15	*0.439*	*0.000*	*0.2031*	*0.451*	*0.974*	*542*
Stone & Glass	*1*	*0.654*	*0.000*	*0.4317*	*0.657*	*0.995*	*1,469*
	15	*0.699*	*0.000*	*0.498*	*0.706*	*0.990*	*430*
Textiles & Clothing	*1*	*0.496*	*0.000*	*0.2451*	*0.495*	*1.002*	*1,525*
	15	*0.409*	*0.000*	*0.1905*	*0.436*	*0.937*	*453*
Transportation	*1*	*0.375*	*0.000*	*0.15*	*0.387*	*0.969*	*1,146*
	15	*0.380*	*0.000*	*0.1692*	*0.411*	*0.923*	*328*
Vegetable	*1*	*0.740*	*0.000*	*0.5487*	*0.741*	*0.999*	*1,576*
	15	*0.737*	*0.000*	*0.5417*	*0.736*	*1.001*	*455*
Wood	*1*	*0.539*	*0.000*	*0.3024*	*0.550*	*0.981*	*1,463*
	15	*0.566*	*0.000*	*0.3236*	*0.569*	*0.995*	*430*

If we further investigate the degree of mobility in the RCA indices by sector, using the mobility index based on Markov transition probability matrices (Figure 1), we find a significant gap between the mobility to destinations that have an FTA with Israel and the mobility to destinations that have no FTA. In general, this indicates that Israel has a high competitive potential in countries without FTAs. This occurs in the context of the relatively low mobility of the RCA index in most of Israels export sectors. We see the largest mobility gaps between the two types of destinations in the transportation and wood sectors, with 41% and 37.9%, respectively, and the lowest gaps in the chemical, stone and glass, and minerals sectors.

Figure 1 The Mobility of RCA indices, 1996-2015, by Sectors



Source: Authors own calculations based on WITS (2017)

3.3 Survival Analysis using Kaplan-Meier Model

In this subsection, we present the results of our survival analysis of Israel's exports in global markets, using the Kaplan-Meier survival rates. We apply Kaplan-Meier survival analysis to the data on RCA of Israeli exports from 1995 to 2015, inclusive, for all possible sectors, across all markets. The results of the Kaplan-Meier survival analysis for the 10th and the 15th year after the FTAs are reported in Table 5. The table shows the chances of maintaining an RCA index>1, distinguishing between products exported to countries that do not have an FTA with Israel and products exported to countries that do have an FTA with Israel.

Use of the Kaplan-Meier model produced two main results. Firstly, Israel's FTAs contributed positively to Israels experiencing higher probabilities of export RCA for ten or more years. In all sectors except vegetable and plastic or rubber, the probabilities of keeping the indices RCA>1 are dramatically higher when FTAs are involved, compared to exports to destinations where no FTA with Israel exists. The significantly large gaps between the two groups, after 10 years, are further amplified when studying the probabilities after 15 years, reaching up to 86.1% in the transportation sector. We note that the existence of an agreement expands the median duration for an Israeli export advantage by 3 years to 16 in total.

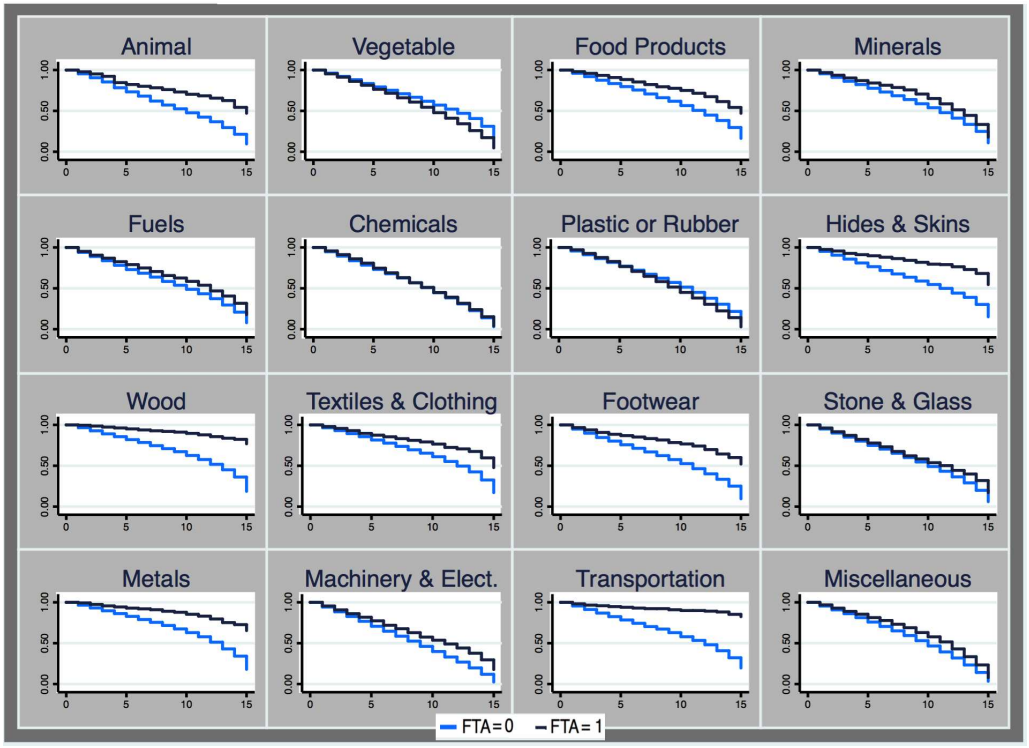
Table 5 Survival Analysis of Israel's Comparative Advantage

Product Group	*The Kaplan-Meier Survival Rates After 10 Years*		*The Kaplan-Meier Survival Rates After 15 Years*	
	Exports to Countries Without FTAs	*Exports to Countries With FTAs*	*Exports to Countries Without FTAs*	*Exports to Countries With FTAs*
Animal	*59.4%*	*74.4%*	*37%*	*63.6%*
Chemicals	*56.4%*	*60.4%*	*31.8%*	*34.3%*
Food Products	*65.8%*	*79.1%*	*44.1%*	*66.3 %*
Footwear	*61%*	*77.7%*	*39.7%*	*67.7%*
Fuels	*55.8%*	*63.6%*	*35.3%*	*45.7%*
Hides and Skins	*60%*	*80.9%*	*41.6%*	*72.7%*
Machinery and Elect.	*53%*	*61.5%*	*27.1%*	*41.9%*
Metals	*69.9%*	*89.1%*	*51.2%*	*80.5%*
Minerals	*61.4%*	*70.1%*	*40.2%*	*50.5%*
Miscellaneous	*59.3%*	*68.7%*	*33%*	*45.6%*
Plastic or Rubber	*61.7%*	*63.6%*	*38.5%*	*34.2%*
Stone and Glass	*58.8%*	*62.2%*	*36.1%*	*42.7%*
Textiles and Clothing	*67.6%*	*79%*	*48%*	*67%*
Transportation	*64.3%*	*89%*	*46.2%*	*86.1%*
Vegetable	*65%*	*61.6%*	*45.1%*	*35.4%*
Wood	*68.6%*	*90.9%*	*50.3%*	*85%*

Secondly, the chances of maintaining an export comparative advantage are significantly higher for markets with an FTA than for those without one. Although the survival probabilities at the commencement of the period in all sectors range from 95% to 99%, it is true that these probabilities are reduced drastically by the end of the period in all cases (although with large variation among the sectors). Furthermore, when products are exported to destinations without FTAs, the probabilities of keeping the revealed export comparative advantage index greater than 1 are relatively high after 10 periods, ranging between 53% in the machinery and electronics sector to 69.9% for the metal sectors. Nevertheless, when products are exported to destinations with FTAs, the chances of maintaining an advantage are significantly higher, ranging between 60.4% for the chemical sector to 90% for the transportation, wood, and metal sectors. In addition, after 15 years, the Israeli export RCA dramatically decreases in markets without an FTA, compared to markets with FTAs in which Israeli exporters still enjoy a significant positive experience.

Figure 2 depicts the trend in the probabilities across the years, differentiated by sector, according to whether exports are directed to a partner with or without an FTA.

Figure 2 Kaplan Meier Survival Analysis, by Sectors (W/O FTAs)



4 Israel's Export Competitiveness in the European Union

We now turn to the performance of Israeli exports to the European Union (EU), Israel's largest trading partner by far and the second biggest market for Israeli exports. The total Israeli exports to the 28 Member States of the EU in 2016 amounted to USD 15.8 billion, which is slightly over 26% of Israels total exports to global markets. The five largest markets for Israeli exports in the EU are the UK, Belgium, the Netherlands, Germany, and France, accounting for 73% of the exports to the EU. In terms of volume, the major export sectors to the EU are chemical products, machinery and electronic equipment, pearls and precious stones, plastics or rubber, and optical and medical instruments. These five sectors are responsible for 82% of the total Israeli exports to the EU.

4.1 Background on the Association and Interim Trade Agreement

To study the impact of Israel's FTAs on export competitiveness, this paper focuses on Israel's FTA with the EU, now part of the EU-Israel Association Agreement that took effect in 2000. This FTA with the EU is Israel's first FTA and arguably its most important, particularly because it has been liberalized, upgraded, and expanded over the years. The FTAs geographical coverage has also increased steadily as more states have joined the EU. In 1975, when the EU signed its first FTA with Israel, the EU consisted of only 9 member states, which were the original 6 founding states (Belgium, Germany, France, Italy, Luxembourg, and the Netherlands) and 3 newly acceding members: the UK, Ireland, and Denmark. By the time the EU and Israel signed their first association agreement, the EU consisted of 15 Member States (with the addition of Greece, Spain, Portugal, Austria, Finland, and Sweden).

In January 1996, an updated, interim trade agreement entered into force as part of the EU-Israel Association Agreement. When the Association Agreement took effect in 2000, this completed a series of agreements between Israel and the EU, including a scientific and technical cooperation agreement associating Israel with the EUs R&D program (effective 1999); an agreement on procurements for telecommunications operators and on government procurement (effective 1997); and an agreement on good laboratory practice. In 2010, after long negotiations, a very important annex was also added to the Association Agreement, which included a significant update to tariff concessions given by both sides in the agri-food sector.

4.2 Export Competitiveness in the EU Markets

Overall, it appears that Israels FTA with the EU has not helped its export competitiveness. If one tracks the revealed comparative advantage (RCA) of all Israeli exports to the EU from 1996, when the trade agreement came into force, to the present, one sees the RCA decrease from an average of 1.12 in the first 5 years after the trade agreement to 1.04 since 2000. However, an overall average often hides an important message revealed by deeper analysis. An investigation of variation by sector reveals that the Association Agreement appears to have contributed to Israeli export competitiveness in several sectors.

4.2.1 Export Competitiveness, By Member States

As seen in Table 6, the comparative advantage of Israeli exports to the EU varies by Member State. The highest comparative advantage in the past 5 years, on average, occurs in Portugal, Denmark, Lithuania, and France. By contrast, the lowest advantage for these years occurs in Cyprus, Malta, and Bulgaria. But the trend across the entire 1995-2015 period is more important for certain Member States. Data for the entire period shows a significant growth trend in RCA across the Member States of Denmark, Portugal, and Slovenia. A decline is reported in exports to Greece, Malta, Austria, and Bulgaria, and Israels RCA also changed in these countries from advantage to disadvantage.

Table 6 Israel's Revealed Comparative Advantage (RCA) of Exports to the EU markets

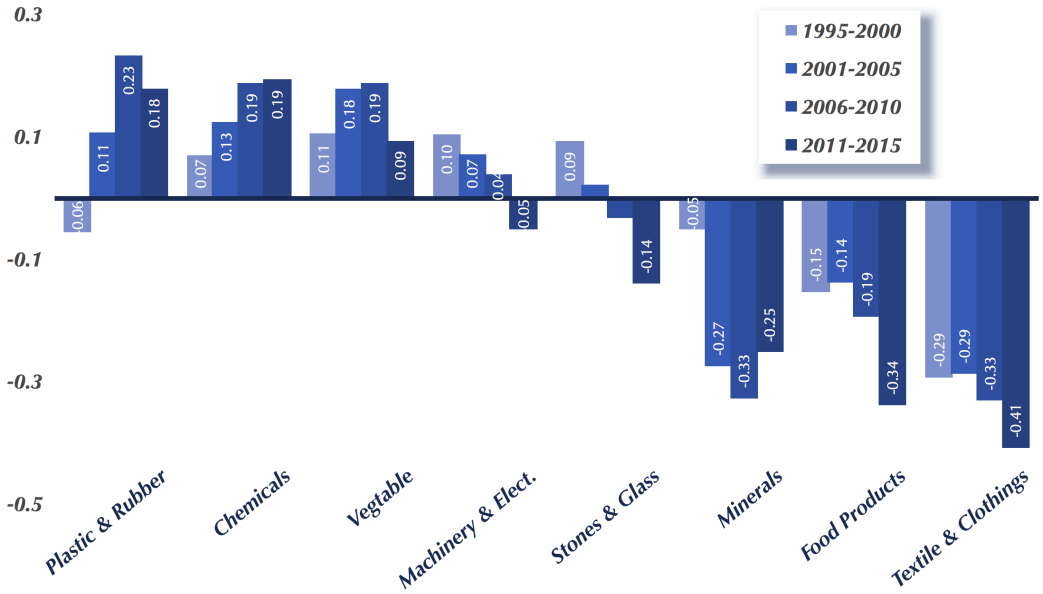
	Entry into Force	Average 1995-2000	Average 2001-2005	Average 2006-2010	Average 2011-2015	Average
Poland*	*Jan. 1998*	*1.067*	*1.228*	*1.025*	*1.076*	***1.101***
Czech Rep.*	*Jan. 1997*	*1.005*	*1.091*	*1.030*	*1.067*	***1.050***
Hungary*	*Jan. 1998*	*1.220*	*1.139*	*0.969*	*0.758*	***1.023***
Bulgaria**	*Jan. 2001*	*1.174*	*1.025*	*0.828*	*0.662*	***0.904***
Romania**	*Jan. 2001*	*0.979*	*0.851*	*0.831*	*0.717*	***0.844***
EU	*Jan. 1996*	*1.120*	*1.045*	*1.053*	*1.031*	***1.060***
Austria		*1.372*	*1.045*	*1.075*	*0.910*	***1.123***
Belgium		*0.833*	*1.003*	*1.154*	*1.093*	***1.053***
Cyprus*		*0.996*	*0.786*	*0.487*	*0.366*	***0.671***
Denmark		*1.003*	*1.006*	*0.920*	*1.589*	***1.136***
Estonia*		*1.196*	*0.943*	*1.304*	*1.187*	***1.146***
Finland		*1.529*	*1.214*	*1.275*	*1.200*	***1.335***
France		*1.311*	*1.308*	*1.151*	*1.249*	***1.269***
Germany		*0.973*	*0.908*	*0.944*	*0.899*	***0.933***
Greece		*1.497*	*1.152*	*1.041*	*0.774*	***1.137***
Ireland		*1.070*	*1.010*	*1.104*	*0.941*	***1.054***
Italy		*0.983*	*1.019*	*1.007*	*0.916*	***0.981***
Latvia*		*1.069*	*1.043*	*1.052*	*1.239*	***1.096***
Lithuania*		*1.119*	*1.207*	*1.384*	*1.255*	***1.231***
Luxembourg		*0.894*	*1.032*	*1.158*	*0.944*	***1.013***
Malta*		*1.300*	*1.074*	*0.932*	*0.616*	***1.004***
Netherlands		*1.050*	*1.146*	*0.958*	*0.842*	***1.003***
Portugal		*0.975*	*1.195*	*1.542*	*2.244*	***1.458***
Slovak Republiic*		*1.091*	*1.080*	*1.249*	*1.084*	***1.113***
Slovenia*		*0.632*	*0.688*	*0.796*	*1.238*	***0.850***
Spain		*0.907*	*0.918*	*0.863*	*0.812*	***0.883***
Sweden		*0.981*	*0.970*	*1.022*	*0.938*	***0.986***
United Kingdom		*1.057*	*1.064*	*1.153*	*0.961*	***1.061***

** Joined EU in 2004. ** Joined EU in 2007.*

4.2.2 Export Competitiveness By Sectors

As seen in Figure 3, the comparative advantage of Israeli exports to the EU also varies significantly by sector. One can find high RSCA values (and strong specialization) in the plastic or rubber, chemicals, vegetable, machinery, and electronics sectors. Thus, the FTA with the EU appears to have increased Israeli competitiveness in these sectors. On the other side, one finds low RSCA values (and strong de-specialization) in the minerals, food products, textiles, and clothing sectors. One also notes a decreasing specialization trend in the machinery and electronics sectors, as well as in food products, textiles, and clothing.

Figure 3 Israel's Exports RCSA in the European Union, By Main Sectors



Source: Authors own calculations

4.3 Stability and Export Specialisation in EU Markets

In terms of RCA values, therefore, the effect of the Association Agreement on Israeli exports is mixed. This picture persists if one focuses specifically on the stability of the comparative advantages of Israeli exports to the EU markets. We perform such a stability analysis in this subsection by performing regressions on the revealed symmetric comparative advantage (RSCA) from the years 1996 to 2015, inclusive. This methodology produces results showing that the degree of divergence across countries, as shown by the values of β, are relatively high. When increasing the number of time lags, the β values measurably decrease, but they remain high in most of the Member States. The relatively high β values in Table 7 reveal that trade patterns have not altered considerably between the start and end years. The β/R ratios show that, in most of Member States, the degree of specialization has fallen, meaning that the pattern of revealed comparative advantage has tended to converge since the FTA with the EU entered into force.

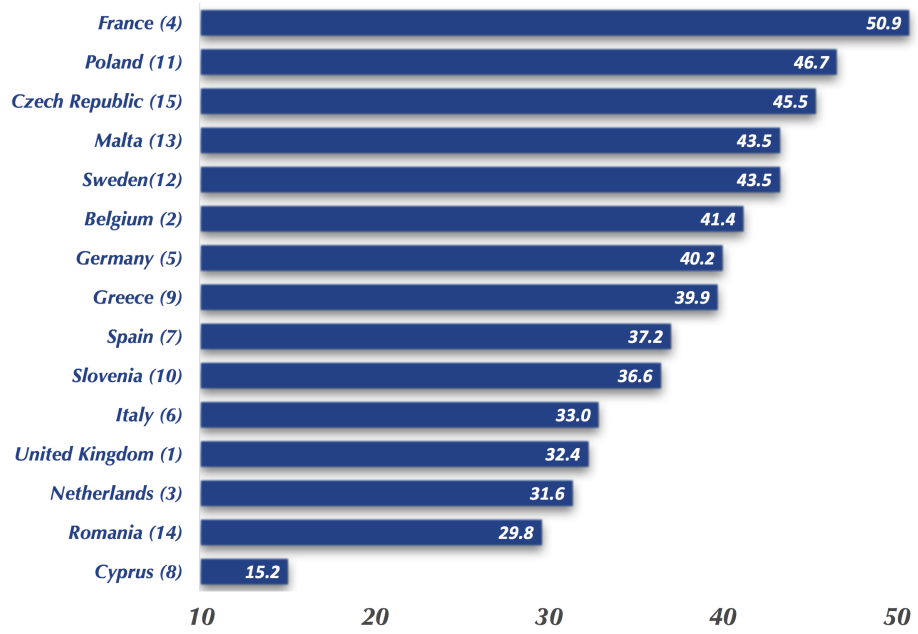
Next, we check the degree of mobility in the RSCA indices among the top 15 destinations of Israeli exports in the EU market. In general, the higher the degree of mobility of the RSCA index, the more stable the comparative advantage potential is for Israel. Once again, we find variation across Member States, although our analysis implies a relatively high degree of mobility of the index in most of Israels export destinations in the EU. We used the mobility index based on the Markov transition probability matrices (Figure 4). Note the numbers in brackets, which show the

Table 7 Stability of the RSCA Index Between 1996 and 2015, by Member States

Member State	β	R^2	β/R	Member State	β	R^2	β/R
Austria	0.76	0.60	0.98	Latvia	0.98	0.52	0.67
Belgium	1.11	0.95	1.14	Lithuania	0.96	0.5	0.98
Bulgaria	1.01	0.65	1.25	Luxembourg	1.07	0.95	1.03
Cyprus	0.81	0.81	0.9	Malta	0.18	0.02	0.42
Czech Rep.	0.80	0.61	1.02	Netherlands	0.98	0.91	0.99
Denmark	0.72	0.35	1.22	Poland	0.81	0.64	0.90
Estonia	0.45	0.28	0.85	Portugal	0.64	0.54	0.80
Finland	0.87	0.65	1.08	Romania	0.66	0.4	0.81
France	0.83	0.77	0.95	Slovak Rep.	0.29	0.07	0.54
Germany	0.91	0.79	1.02	Slovenia	0.67	0.46	0.82
Greece	0.69	0.42	1.06	Spain	0.91	0.88	0.95
Hungary	1.05	0.5	1.48	Sweden	0.68	0.53	0.82
Ireland	0.63	0.32	1.11	United Kingdom	0.88	0.75	0.82
Italy	0.88	0.73	1.03				

ranking of each destination by the volume of the Israeli exports. The highest mobility rates for Israeli exports are for Cyprus, Romania, and the Netherlands, while the lowest rates are found in France, Poland, and the Czech Republic. The UK and the Netherlands, which are ranked high in terms of Israeli volumes of exports, still have a relatively large untapped export potential.

Figure 4 The Mobility of RSCA indices Between 1996 and 2015, by Member States



Source: Authors own calculations based on WITS (2017)

4.4 Survival Analysis using Kaplan-Meier Model

Finally, we evaluate the probabilities that Israel will maintain its RCA in the EU several years after the entry into force of the Association Agreement in 2000, compared to the survival chances for Israeli export competitive advantages outside the EU. The estimates of the Kaplan-Meier survival analysis for Israels exports to the EU markets, compared to the Israeli exports to the rest of the world, are reported in Table 8. We report the results for three different time frames: the 5th, 10th, and 15th year after the Association Agreement entered into force. Note that the results shown for Israeli exports to non-EU markets include states which have a relatively similar trade agreement with Israel, which only emphasizes the export benefits to Israel of its trade agreement with the EU.

Table 8 Survival Analysis of Israel's Comparative Advantage to the EU

Product Group	*The Kaplan-Meier Survival Rates Exports to EU*			*The Kaplan-Meier Survival Rates Export to Non-EU*		
	After 5 Years	*After 10 Years*	*After 15 Years*	*After 5 Years*	*After 10 Years*	*After 15 Years*
Animal	*90.9%*	*75%*	*63.9%*	*83.6%*	*59.9%*	*37.8%*
Chemicals	*84.9%*	*61%*	*34.5 %*	*78.7%*	*56.4%*	*31.8%*
Food Products	*89,7%*	*75.8%*	*60.4%*	*84.2%*	*67%*	*46%*
Footwear	*88.1%*	*78.6%*	*71%*	*81.5%*	*61.4%*	*39.8 %*
Fuels	*81.2%*	*64.6%*	*46.8%*	*76.7%*	*55.9%*	*35.4%*
Hides and Skins	*89.8%*	*81.3%*	*72.4%*	*79.8%*	*60.6%*	*42.6%*
Machinery and Elect.	*72.4%*	*59.9%*	*38.8%*	*77.6%*	*53.5%*	*27.8%*
Metals	*96.2%*	*87.8%*	*78.4%*	*85.7%*	*70.6%*	*52.2%*
Minerals	*83.9%*	*69.8%*	*49.3%*	*80.2%*	*61.9%*	*41%*
Miscellaneous	*84.8%*	*68.6%*	*44.7%*	*80.5%*	*59.5%*	*33.4%*
Plastic or Rubber	*87.3%*	*64.1%*	*35.2%*	*81%*	*61.7%*	*38.2%*
Stone and Glass	*81.7%*	*62.8%*	*44.4%*	*79.5%*	*58.8%*	*35.9%*
Textiles and Clothing	*92.3%*	*82.3%*	*74.6%*	*83.6%*	*67.2%*	*47.1%*
Transportation	*93.1%*	*87.6%*	*83.9%*	*83.2%*	*65.3%*	*47.5%*
Vegetable	*82%*	*59.8%*	*33.7%*	*83.1%*	*65.4%*	*45.3%*
Wood	*96%*	*91.9%*	*89%*	*84.9%*	*68.9%*	*50.5%*

Data from this analysis validate the significant and positive contribution of the FTA with the EU for Israeli export advantage, in the majority of sectors. At the outset, we note that the median duration for the whole sample of exports to the EU is 13 years, compared to 10 years for Israeli exports to the rest of the world. Furthermore, the gap between the survival rates, differentiated by the type of destination, is notably larger as time progresses, meaning that the probability of maintaining the Israeli export RCA is significantly higher after 15 years compared to after 5 years. At the end point of the analysis, the survival rates are especially higher for exports to the EU in traditional labor-intensive sectors, such as wood, textiles and clothing, footwear, and hides and skins.

5 Concluding Remarks

The paper asserts that, in general, Israel's FTAs have contributed significantly and positively to its export competitiveness, although the effect varies by sector and often diminishes over time. For global exports overall, Israel's FTAs contributed positively to Israel experiencing higher probabilities of export RCA for 10 or more years. In other words, the chances of Israel maintaining a comparative advantage are significantly higher for export destinations with an FTA than for export destinations without an FTA. With respect to the trade aspect of the EU-Israel Association Agreement, which has had, not only a positive impact on certain sectors, but contributed to a stable comparative advantage potential for Israel within the EU market. Most importantly, the results of a survival analysis using the Kaplan-Meier Survival Rate model show that the probability of Israel maintaining its export relative comparative advantage for longer is significantly higher for Israeli exports to the EU than for Israeli exports to the rest of the world. The use of survival analysis is the main contribution of this paper; survival analysis suggests that particular export sectors can expect longer periods of competitive advantage if FTAs enter into effect.

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Appendix

Table 9 Classification in Harmonized System Codes

Sector	*Description (Product Group)*	*Chapters (HS2)*
01	*Animal*	*01 - 05*
02	*Vegetable*	*06 - 15*
03	*Food Products*	*16 - 24*
04	*Minerals*	*25, 26*
05	*Fuels*	*27*
06	*Chemicals*	*28 - 38*
07	*Plastic or Rubber*	*39 - 40*
08	*Hides and Skins*	*41 - 43*
09	*Wood*	*44 - 49*
10	*Textiles and Clothing*	*50 - 63*
11	*Footwear*	*64 - 67*
12	*Stone and Glass*	*68 - 71*
13	*Metals*	*72 - 83*
14	*Machinery and Electronics*	*84 - 85*
15	*Transportation*	*86 - 89*
16	*Miscellaneous*	*90 - 99*