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The Foreign Exposure of Public Companies
Traded on the Tel Aviv Stock Exchange[1]

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החשיפה לחו״ל של החברות הציבוריות הנסחרות בבורסה לניירות ערך בתל אביב

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תקציר

מחקר זה בוחן את מאפייני החשיפה לחו״ל של החברות הציבוריות הלא-פיננסיות הנסחרות בבורסה לניירות ערך בתל אביב. חברות אלה מפנות לשוק הבין-לאומי יותר ממחצית ממכירותיהן. מאחר שחשיפתן לחו״ל עלולה להוות ערוץ תמסורת שדרכו משברים מחוץ למדינה מחלחלים למשק המקומי, על היבטיו הריאלי והפיננסי, חשוב לחקור אותה במסגרת המאמץ להבין את הקשרים בין סיכונים גלובליים לסיכונים בשוק ההון ובכלכלה המקומיים.

אנו אומדים מודל לתמחור בין-לאומי של נכסים (International Capital Asset Pricing Model, ICAMP) ובמסגרתו מסבירים את תשואת המניה באמצעות (1) פקטור מקומי שמדד ת״א 100 מייצג ו-(2) פקטור עולמי שמדד FTSE All-World מייצג. אנו מוצאים כי שיעור המכירות שהחברות הציבוריות מפנות לחו״ל משפיע באופן חיובי ומובהק על רגישותם של מחירי מניותיהן לפקטור העולמי במודל : ההשפעה של שינויים במדד המניות העולמי על מנייתה של חברה במדד ת״א 100 שכל מכירותיה מופנות לשוק הבין-לאומי גבוהה ב-40% מהשפעתם על מניה של חברה במדד ת״א 100 שכל מכירותיה מופנות לשוק המקומי. ממצאינו מעלים כי משקיעים ישראלים, לרבות המשקיעים המוסדיים, אינם חשופים לשוקי ההון העולמיים רק ישירות, דרך השקעותיהם בנכסים זרים, אלא גם בעקיפין, דרך השקעותיהם בחברות הציבוריות הנסחרות בבורסה המקומית. נתונים מצרפיים מעידים כי חשיפתם המנייתית העקיפה מגדילה בכ-40% את סך חשיפתם המנייתית לחו״ל.

The Foreign Exposure of Public Companies Traded on the
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Abstract

This paper examines features of the foreign exposure of publicly held nonfinancial companies that are traded on the Tel Aviv Stock Exchange. These companies direct more than half their sales to international markets. As their foreign exposure is liable to serve as a transmission channel through which crises in other countries reach the domestic economy—in both its real and financial aspects—it is important to study it in order to understand the connections between global risks and risks to the domestic capital market and economy.

We estimate an International Capital Asset Pricing Model (ICAPM) and use it to explain stocks' return through (1) a domestic factor representing the Tel Aviv 100 Index (TA-100) and (2) a global factor representing the FTSE All-World Index. We find that the proportion of international sales by a public company has a statistically significant positive effect on the sensitivity of its shares to the global factor in the model: the impact of changes in the global stock index on the share of a TA-100 company that directs all its sales to international markets is 40 percent greater than their effect on a TA-100 company that directs all its sales to the domestic market. Our findings indicate that Israeli investors, including institutional investors, are not only exposed to international markets directly, through their investment in foreign assets, but also indirectly, through their investment in public companies traded on the domestic stock market. Aggregate data show that the indirect equity exposure increases their equity exposure to abroad by about 40 percent.

1.   Introduction

Investors in the capital market who wish to establish a foreign exposure may do this directly, by investing in foreign markets, or indirectly, by investing in domestic assets that entitle their holders to returns on foreign assets (e.g., domestic mutual funds and ETFs that invest in foreign assets) or in domestically traded firms that have foreign exposures. This study focuses on firms that have foreign exposures and are traded on the Tel Aviv Stock Exchange (TASE), and examines their foreign exposure through the prism of their international sales.

Israel is an interesting case study for research on foreign exposure. Its economy is small, open, and export-intensive, with exports accounting for about one-third of GDP. Furthermore, since the 1990s Israel has been lowering barriers to bidirectional investment flows: Today, nonresidents are allowed to invest freely in firms traded on the TASE and residents may do the same in firms traded on foreign exchanges, all paying the same tax rate on their capital gains.[1] Finally, some publicly held firms in Israel are dual-listed— trading concurrently on the TASE and on foreign bourses—strengthening the Israeli market's integration into global markets and boosting the correlation between stock indices at home and those abroad. Contrastingly, and unlike Ireland for example—on which several studies on this topic have focused—Israel has not adopted an extreme taxation and regulation policy in order to attract foreign firms. Therefore, most firms in Israel, and the large majority of those traded on the TASE, are Israeli. Accordingly, the results of such research may be relevant for a large group of small and open markets in which public corporations tend to be domestic in nature but export intensive. These small and open markets are highly exposed to global economic developments via, among other things, the effects of these developments on the pricing of publicly held firms that are traded on the domestic exchange.

The literature on foreign exposure centers on the context of multinational corporations (MNCs) but does not offer a standard definition of these entities, something that explains some of the variance in the results delivered by studies in this field (Aggarwal et al., 2011). The conventional claim in the literature is that, from the economic standpoint, MNCs are differentiated in their ability to exploit arbitrage in both the real and the financial markets by utilizing an international network of activity that spans different geographies,

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[1] See Stein (2015) for discussion of the longitudinal change in capital gains taxation of tradable securities in Israel and differences in investment taxation between foreign securities and those traded on the TASE.

currencies, and businesses (Aabo et al., 2010). Insofar as the world's capital markets are not totally interlocked and, particularly, in view of barriers to financial investment flows, a firm generates added value for its investors by diversifying itself internationally (Hughes, Logue, and Sweeney, 1975; Agmon and Lessard, 1977). Thus, Errunza and Senbet (1984) contend that MNCs provide a risk dispersion service that can mitigate idiosyncratic risk by "perfecting" the markets. What is more, direct corporate investment solves the segmentation problem that arises in international capital asset pricing models (Errunza and Losq, 1982). Thus viewed, MNCs serve investors as a surrogate for international markets—markets that are imperfect due to various investment constraints and the direct and indirect costs of investing in foreign markets, e.g., those related to gathering information, contending with corporate-governance differences, and political risks. (For a discussion of these costs and their magnitudes, see Cooper, Sercu, and Vanpee, 2012). Conversely, foreign activity exposes firms to unique risks including exchange-rate risk, changes in international prices of goods and services relative to domestic prices, and supply and demand shocks abroad.[2] From the standpoint of firms that sell mainly in foreign countries, the fact that they choose to be traded on the domestic exchange may indicate that this exchange allows them to trade at lower costs than those associated with foreign markets, notably the cost of raising capital.[3] This issue is particularly relevant in an era typified by consolidation of bourses and the disappearance of small capital markets.

The measurement of a company's multinationality, i.e., the extent of its international activity, poses a complex empirical question (Errunza and Senbet, 1984). Various measures of the level of a company's international operations may reflect different aspects of such activity—such as breadth (number of countries/geographic regions where the firm is active) and depth (from relatively superficial activity, such as that limited to imports and exports, to direct investment, establishing subsidiaries, joint ventures, etc.)—and each aspect may be reflected in several measures (Aggarwal et al., 2011). In this study, we will make use of the international distribution of the company's sales as a measure of its multinationality and as an indication of the specific areas to which it is exposed. The international distribution of the company's sales is one of the two most common methods in the literature for identifying multinationality (Aggarwal et al., 2011). Furthermore,

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[2] Amihud, Bartov, and Wang (forthcoming) find that the implicit risk of international activity—when measured on the basis of the proportion of foreign sales in the firm's total sales—is priced both as a characteristic of the company and as a systemic risk factor.

[3] Froot and Dabora (1999) offer evidence to the effect that stock prices are influenced by the trading location.

public firms' financial statements indicate that the geographic distribution of their sales is the class of data most frequently referenced in dealing with the extent of their international activity. Indeed, a comprehensive check that we performed shows that other kinds of data on international activity are much less common. To check our findings for robustness, however, we will use, in addition to sales data, less-common data that pertain to the geographic distribution of the firms' long-term assets (Table 1). These assets may reflect a supply-side exposure, whereas sales represent demand for a firm's products. We believe, however, that substantial sales in a foreign country may create an exposure to events in that country even if the company has no meaningful stake in assets there, whereas holding assets in a given country without this being reflected in sales in that country is likely, in our judgment, to create a lower dependency on economic developments there, with the possible exception of real estate firms.

We use data on nonfinancial firms traded on the TASE in 2006–2012 (an unbalanced panel) and that were included in the Tel Aviv 100 Index in at least one of those years. This sample allows an optimum capture of the average distribution of foreign sales by large publicly held firms in Israel and longitudinal changes in these firms' geographic exposure.[4] In the study, it will be shown that, as one would expect in a small and open economy, most publicly held firms in Israel direct much of their sales to foreign markets. The study will also show how these firms' sales are distributed among different regions around the globe and will compare this distribution with that of Israel's exports.

Since sales by Israel's publicly held companies are heavily internationalized, the question is whether their real exposure is also reflected in a substantial financial exposure to global stock indices. To investigate this issue, we use an international capital asset pricing model (ICAPM). ICAPMs, evolving since the 1970s, describe the return on a stock using global and domestic factors. Lessard (1974) proposes a model that explains a stock return via two factors, one domestic and one global.[5] Berrill (2010) expands this model to

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[4] During the sample period, these firms constituted, on average, 87 percent of the total market value of MNC stocks on the TASE.

[5] Earlier proposals for explaining returns within the framework of an international capital asset pricing model (ICAPM) include Agmon (1972) and Solnik (1974). In some of the early models, return is explained via a global factor without a domestic one. Researchers, however, have found that domestic factors also play a role in explaining the development of return (Adler and Solnik, 1974). Since the current study finds a strong correlation between the return on a domestic stock index and that of a global index, the use of one factor only (global or domestic) is liable to cause an upward bias in the coefficient due to the potential effects of the omitted factor.

include a factor for each region around the world. The current study invokes an asset pricing model that uses one domestic factor and one global factor, and also a domestic factor and a factor for each region separately. Although the Israeli market is small and open, we find that the global factor has less of an impact than the domestic one.

Agmon and Lessard (1977) use an ICAPM to investigate the relation between firms' real international activity and their financial exposure to foreign markets. They find that the stocks of firms that engage in relatively extensive international activity are more affected by the global factor, and less affected by the domestic factor, than the stocks of firms that are more active in the domestic market. Having found that global stock indices have little average effect on the stock returns of Israel's publicly held companies even though these firms do much of their selling abroad, we wish to examine the possibility of a connection between the geographic distribution of the firms' sales and the sensitivity of their stocks to the global stock indices. Evidently, when firms direct much of their sales to foreign destinations, their stocks are more sensitive to changes in the global stock index and even tend to be less affected by the domestic stock index. Our main results appear to be robust to different estimation methods and are stronger for dual-listed firms than for others. Furthermore, an aggregate check appears to show that when the indirect equity exposure to foreign countries is added to the direct equity exposure, as happens when investors buy the stocks of firms that are traded on the TASE and that sell abroad, the estimated total equity exposure to abroad among Israeli investors rises by some 40 percent.

The study contributes to the literature on MNCs, the potential international diversification that they offer their investors, and the extent of their exposure to the domestic and global factors within an international capital asset pricing model. The study investigates these issues not only in reference to the global market at large but also in regard to specific geographic regions, testing the real exposure and estimating the financial exposure in each region. Whereas most studies in this field focus on firms traded in the United States—a large market where exports account for a rather small share of GDP (12.6 percent in 2015)—this study centers on Israel, a small and open market typified by free capital flows and strong integration with international financial markets. Accordingly, its findings may be relevant for a broad range of markets that have similar characteristics.

The study continues as follows: Section 2 describes the sample that we use and presents descriptive statistics on the geographic distribution of sales of publicly traded firms on the TASE. In Section 3, these firms' financial exposure to global stock indices is

estimated and the connection between the estimated coefficients and the distribution of the firms' sales is examined. Section 4 discusses the results and concludes.

2. Data and descriptive statistics

2.1 Data

The Tel Aviv Stock Exchange is typified by low liquidity (Israel Securities Authority, 2014), particularly in the stocks of relatively small firms—those not included in its main index, the Tel Aviv 100. Therefore, we chose to focus on relatively large Israeli firms, those included in the TA-100 in at least one year between 2006 and 2012. In addition, following the convention in the literature, we exclude financial services companies from the sample. We obtain 130 companies that meet the criteria. We use data on sales by publicly held companies that are traded on the TASE and their geographic distribution, the firms' long-term assets and their geographic distribution, the returns on holdings of the firms' stocks, and the returns on global indices and various regional indices. The data on the geographic distribution of the assets are panel data for 2006–2012; those on the geographic distribution of sales are divided into cross-sectional data for 2012 and panel data for 2006–2012. The cross-sectional data for 2012 are more comprehensive, and are used to present the most recent picture. The 2006–2012 panel data are slightly less comprehensive in terms of the number of firms covered each year. They do, however, allow us to analyze the longitudinal development of the geographic distribution of Israeli companies' sales and long-term assets. Furthermore, insofar as some of the observations in 2012 are unrepresentative of the firms' routine activity, these data are representative to a greater extent.

2.1.1 Cross-sectional data on the geographic distribution of sales

Cross-sectional data for 2012 include data on sales, including geographic distribution, by 110 firms that were listed for trading on the TASE in 2012 and that issued financial statements for that year. To gather the data, we manually examined the firms' 2012 financial statements and assigned the sales data to six geographic regions: Israel, North America, Latin America, Europe, Africa, and Asia-Pacific. Firms that did not release numerical or textual data on the geographic distribution of their sales were filtered out of the sample, leaving 106 companies for which domestic and foreign sales could be differentiated and 103 for which the regional distribution of sales could be identified.

2.1.2   Panel data on the geographic distribution of sales and long-term assets

The panel data on the geographic distribution of sales and long-term assets are based on Bloomberg data for firms traded on the TASE in 2006–2012.[6] In 2012, the last sample year, the system contains some data on the geographic distribution of sales by 101 firms and the geographic distribution of long-term assets for twenty-six firms, out of the 115 that released financial statements that year. Table 1 tracks the development of the population of firms for which sales and long-term assets data during the sample period exist in the system.

Our main examination relates to each firm and focuses on the distribution of its average sales to each region during the sample period. We filtered from the sample firms for which Bloomberg lacks adequate details on the geographic distribution of sales during the sample period. This left us with 119 firms for which the data allow us to distinguish between domestic and foreign sales, and eighty-five for which the data enable us to differentiate sales by regions.

Table 1

Firms for which Bloomberg data show annual sales and long-term assets, number of firms reporting each year (non-financial-service firms included in the TA-100 Index at least once between 2006 and 2012)

Year	Firms on which Bloomberg has sales distribution data	Firms on which Bloomberg has long-term asset distribution data	Firms traded on TASE
2006	88	18	122
2007	115	29	123
2008	104	26	123
2009	110	29	124
2010	107	27	126
2011	106	26	120
2012	101	26	115

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[6] Before 2006, the sample of firms from the Bloomberg system was not large enough.

2.1.3   Data on returns

We gathered the daily closing prices of all firms in the sample, adjusted for dividends and benefit shares, for each trading day between the beginning of January 2006 and the end of December 2012. We then converted the prices into US dollars and calculated the total US dollar monthly return on each stock on the basis of the last trading day each month.

We also gathered daily data on the FTSE All-World Index (hereinafter: FTSE All-World), a daily index calculated by the Financial Times Stock Exchange on the basis of market capitalization, representing the performance of the mid-cap and large-cap stocks in developed and emerging markets. The FTSE All-World Index covers more than 90 percent of the market value of stocks available for investment around the world. To ensure that the results presented below are not driven by the choice of this particular global index, we repeated all the checks on the basis of the Morgan Stanley Capital International (MSCI) All Country World Index and obtained results that were qualitatively identical and quantitatively nearly identical (the correlation between the two indices is 99.8 perecnt and stable). Finally, we collected daily data on the FTSE indices for various geographic regions—one index for each geographic region chosen.[7]

2.2   *Descriptive statistics on the geographic distribution of sales*

In this subsection, we relate to the firms in the sample—non-financial-services companies traded on the TASE that appeared in the TA-100 Index at least once between 2006 and 2012—and plot the geographic distribution of their sales in various cross-sections, as well as their longitudinal development.

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[7] In regard to Africa, we did not find Bloomberg data on the historical returns of the FTSE/JSE All Africa Index. We did, however, find return data for the FTSE index for South Africa and its counterpart for the rest of Africa. By blending the two indices and factoring in South Africa's weight (38.89 percent), we created a weighted index for all of Africa.

2.2.1 *The geographic distribution of sales in 2012*

Figure 1 divides the sample firms' total sales between Israel and the rest of the world. Figure 2 distributes global sales among the chosen geographic regions on the basis of the firms' financial statements for 2012.[8]

Figure 1
Sales by Public Companies in the Sample:
Distribution between Israel and Abroad, 2012

Abroad 53% Israel 47%

Figure 2
Sales by Public Companies in the Sample:
Distribution by Geographic Areas in the Study

- North America
- Europe
- South America
- Asia-Pacific
- Africa
- Countries not classified into areas

North America 39%, Europe 38%, South America 3%, Asia-Pacific 6%, Africa 1%, Countries not classified into areas 13%

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[8] This, as stated, is the distribution obtained from the data of firms that reported geographic distribution of sales. It resembles the distribution obtained from the data for firms on which the Bloomberg system contains relevant information for 2012.

Figure 3 presents the firms' total sales in 2012 by regional distribution and for each industry in the nonfinancial business sector.[9,10] It shows that companies in the manufacturing, biomed, and technology industries are more international-oriented in their sales than are firms in other industries, and that firms in other industries do most of their selling in Israel.

Figure 3
Sales by Public Companies in the Sample:
Distribution by Geographic Areas in the Study by Industry, 2012
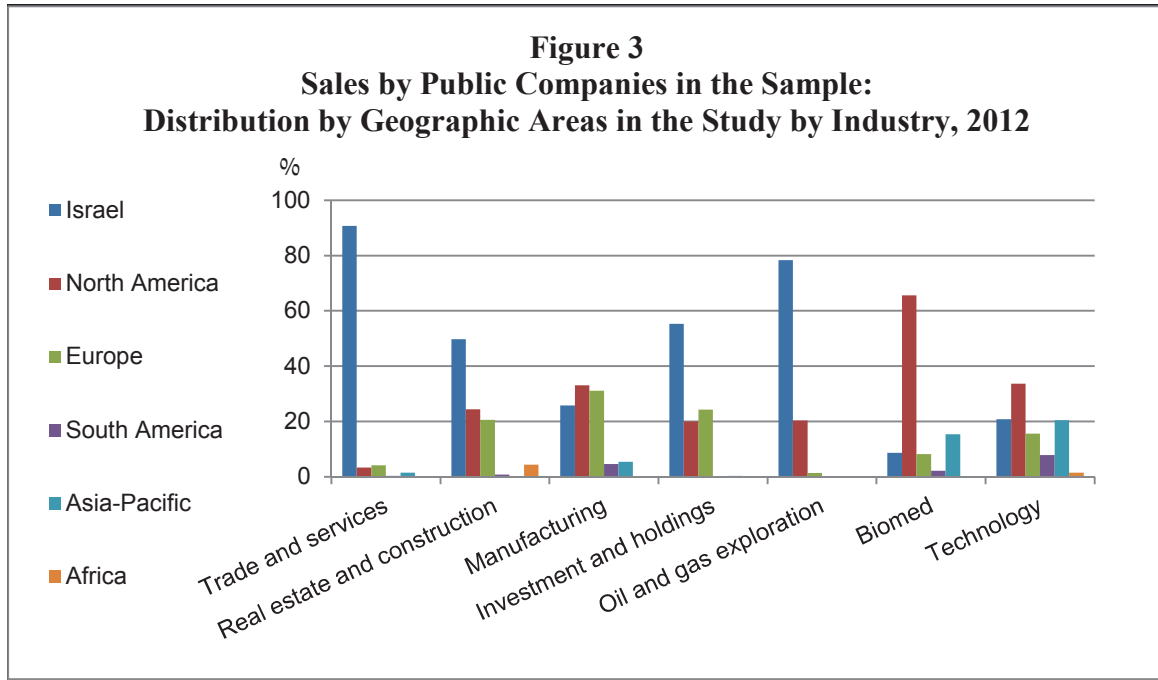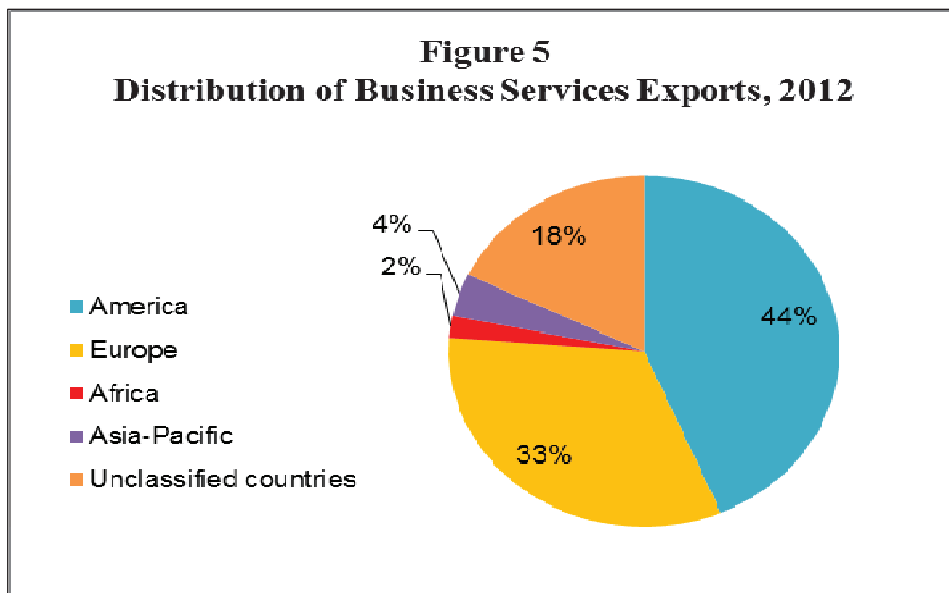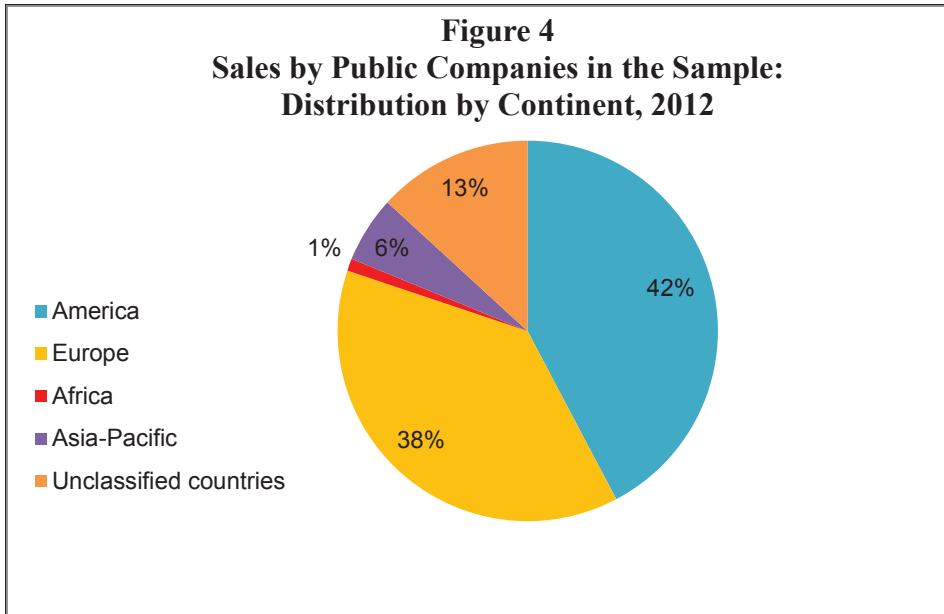

2.2.2 Firms publicly traded on the TASE and Israel's exports—comparative geographic distribution
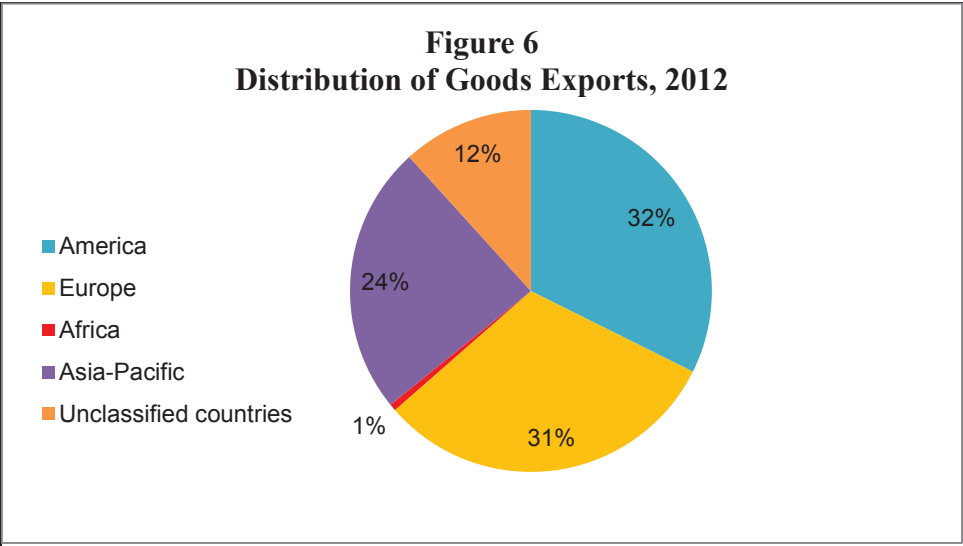
It is of interest to compare the distribution of the sample firms' foreign sales with that of all firms in Israel. Figure 4 parses the distribution of the total exports of the sample firms by continent. Figures 5 and 6 do the same for the distribution of Israeli exports of business services and goods, respectively, on the basis of data from the Israel Central Bureau of Statistics (hereinafter: CBS). The figures show that the distribution of large public companies' sales resembles the distribution of sales by business service exporters more than those of goods exporters. The reason for this is that nearly 89 percent of the

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[9] The classification into industries is based on the TASE classification, and may differ from those of the Israel Central Bureau of Statistics and the International Standard Industrial Classification of All Economic Activities.

[10] Notably, the distribution of sales by firms classified as holding companies (the Investment and Holdings industry) resembles that of firms in the sample at large. This mitigates concern that the "double counting" of these firms' subsidies (due to their consolidation in the holding companies' financial statements) would skew the distribution of sales.

sample firms belong to the business services industries as defined by the CBS. Compared with the distribution of the public companies' sales, goods exporters sell much more to Asia and less to North America.

Figure 4
Sales by Public Companies in the Sample:
Distribution by Continent, 2012

- America
- Europe
- Africa
- Asia-Pacific
- Unclassified countries

13%
1%
6%
42%
38%

Figure 5
Distribution of Business Services Exports, 2012

- America
- Europe
- Africa
- Asia-Pacific
- Unclassified countries

4%
2%
18%
44%
33%

Figure 6
Distribution of Goods Exports, 2012

- America
- Europe
- Africa
- Asia-Pacific
- Unclassified countries

32%
31%
24%
12%
1%

2.2.3   The geographic development of companies' sales 2006–2012[11]

The proportion of foreign sales among the sample companies in 2006–2012 was 53.6 percent on average. Figure 7 plots the development of total sales to each of the six geographic regions relative to the sample companies' total sales. The Figure shows that the domestic market's share of the large publicly traded companies' sales increased between 2006 and 2010 at the expense of sales to the rest of the world, but then declined while sales to foreign developed markets increased. Emerging markets' share of sales has been relatively low and stable in recent years. The Asia-Pacific region's share of sales slumped at the beginning of the sample period and leveled off at a relatively low plateau in recent years.

Figure 7
Sales by Public Companies in the Sample:
Development of Geographic Distribution, 2006–12 (percent)

- North America
- Europe
- South America
- Asia-Pacific
- Africa
- Israel (right scale)

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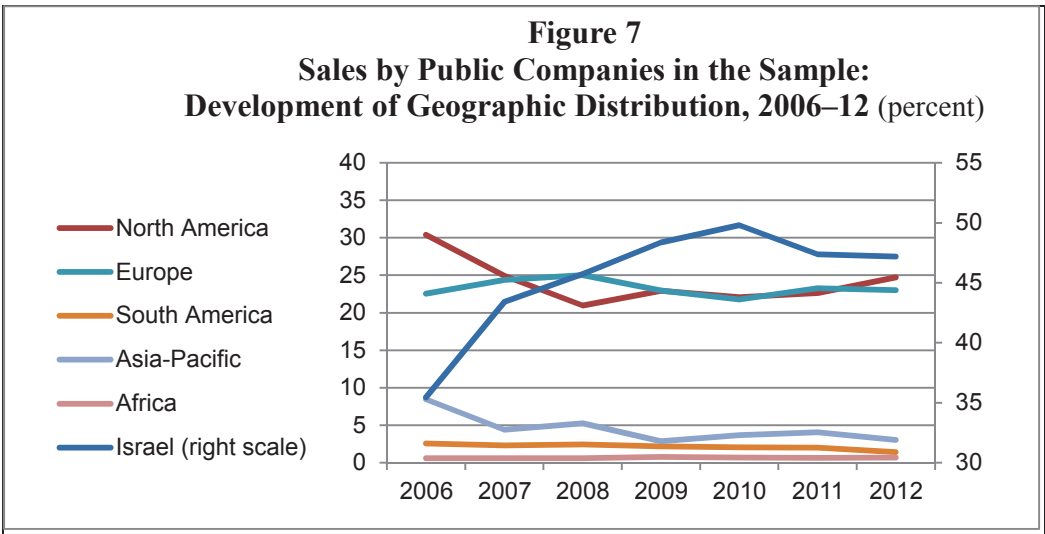
[11] The data in this subsection and in the estimations in ensuing sections are based on the geographic distribution of sales by publicly traded companies for which data are readily available on the Bloomberg system.

2.3 *Geographick developments of firms' sales in 2006–2012*

Appendix Table 1 presents descriptive statistics on the average monthly returns (simple US dollar mean) on stocks traded on the TASE, by year. The Table includes both the aggregate of firms traded on the TASE in 2006–2012 and our sample (which, as stated, includes all non-financial-services firms that appeared in the TA-100 Index at least once during the sample period and for which we have data on geographic distribution of sales during those years).[12]

Appendix Table 2 presents descriptive statistics on the US dollar monthly returns of the TA-100, the FTSE All-World, and the FTSE indices for the selected regions. It shows that the Latin America index delivered the highest average return and the Africa index the highest median return during the sample period. The TA-100, in turn, yielded a higher average return than the All-World but a slightly lower median return.

Appendix Table 3 compares the average correlations between the returns of sample firms that sell to a given region and those of the regional index that represents the same region with the TA-100 return in 2006–2012, all of which all of which are based on the geographic distribution of sample companies' sales. The table also parses the average correlations by subgroups in accordance with the share of the companies' sales to the region. In addition, for comparison purposes, the first column of the table shows the correlation between the TA-100 and the regional indices.

Appendix Table 3 demonstrates that, counterintuitively, a high proportion of sales to a given region is not mirrored in strong correlations with the index of the same region. Sometimes, the stocks of firms that have the highest proportion of sales in the region actually exhibit the lowest correlations with the region's index. This finding evidently traces to an omitted-variable problem. Namely, in contrast to Equation (1), estimated below, a simple check of the correlation between the return on a foreign index and the return on a domestic stock overlooks the effect of the return of the domestic index. Consequently, the correlation may be regarded as a biased estimate of the effect of the foreign index return on the domestic stock return. The direction of the bias is not clear

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[12] A separate Jarque-Bera test for each stock shows that for 74 percent of sample firms one can refute the hypothesis that the returns are normal-distributed at a 5 percent significance level. An augmented Dickey-Fuller test indicates that the hypothesis about the existence of a unit root can be refuted for 99 percent of firms in the sample at a 5 percent significance level. Furthermore, a series of stationarity tests on the panel (Levin, Lin, and Chu, 2002; Im, Pesaran, and Shin, 2003; Maddala and Wu, 1999; Choi, 2001) indicates that the hypothesis of the existence of a unit root in the data on returns at any accepted level of significance may be refuted. These tests support the use of standard time-series econometrics, which we indeed use in the ensuing analysis of the data.

because when firms increase the proportion of international activity in their sales, two contrasting effects ensue: the direct correlation between the return on the global index and that on the stock grows stronger, but the correlation between the stock return and the return on the TA-100 Index becomes weaker—and the TA-100 Index, as the first column of the table shows, is strongly correlated with global indices (0.85 correlation with the FTSE All-World).[13] In the next section, we estimate how the global stock indices affect firms' stock returns in addition to their impact on the TA-100 Index.

3. The firms' international financial exposure

3.1 Estimating an international capital asset pricing model

In the previous section, we showed that much activity of publicly held companies in Israel focuses on foreign markets, as one would expect from large firms in a small and open economy. Therefore, we wish to test the extent to which their stocks are affected by developments in foreign financial markets and domestic economic developments. We also want to see whether the firms' stocks are specifically affected by the financial markets in the regions where they are active.

To do this, we use a basic model of the kind proposed by Lessard (1974), which models the return on a stock as a variable explained by a domestic factor and a global factor[14]:

$$(1)\ R_{i,t} = \alpha_i + \beta_i F_{w,t} + \gamma_i F_{L,t} + \varepsilon_{i,t}$$

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[13] These data raise a question that lies outside the focus of this study: Why do the correlations between the TA-100 and the regional indices exceed those between the returns on the stocks of firms that sell to the same region and the regional indices? A possible explanation is that the sectoral composition of the TA-100 resembles that of the global indices more than does the distribution of the sectoral composition of firms that sell in foreign markets. For a preliminary check of this possibility, we calculated the differences between the sectoral composition of the global indices and that of firms that sell to the same region, on the one hand, and the sectoral composition of the TA-100 on the other (by calculating the squared sum of the deviations between each sector's share in the global indices and its share among firms that sell to that region/the TA-100). We found that the similarity between the TA-100 and the global indices is no greater than that between the firms that sell to the region and the global indices. However, financial services companies are overweighted in both the global indices and the TA-100 and the characteristics of these companies' returns tend to be more homogeneous among the countries. We leave this question to future research.

[14] There are also models that include more than one domestic factor and/or more than one global factor on the basis of various risk factors such as those identified by Fama and French (1993). See, for example, Fama and French (1998) and Griffin (2002). This study focuses on the basic model, composed of one domestic factor and one global factor/global factors parsed by regions. In the robustness checks that we perform later on, we also consider an alternative based on the factors identified by Fama and French (1993).

where $R_{i,t}$ represents the return on stock i in month t; α_i, β_i, γ_i are constant parameters for stock i; $F_{w,t}$ represents the global factor in period t; $F_{L,t}$ represents the domestic factor in period t; and $\varepsilon_{i,t}$ is an error term that is normally distributed with zero expectation.

Like Agmon and Lessard (1977), we estimate Equation (1) above for all companies in the sample and test the hypothesis that β_i and γ_i are positively and negatively affected, respectively, by foreign markets' share of the companies' sales. We estimate Equation (1) on the basis of the data on each company's monthly US dollar returns in 2006–2012. We filter from the estimation firms that have fewer than thirty monthly observations during the relevant period. As a proxy for the global index, we use the monthly US dollar return of the FTSE All-World. As a proxy for the domestic index, we use the monthly US dollar return of the TA-100. We estimate the equation using OLS (ordinary least squares) with an adjustment for heteroskedasticity and serial correlation of the residuals (Newey and West, 1987).

Table 2 presents the estimation results and shows that the return on stocks on the TASE is affected much more strongly by the domestic index than by the global one. The estimation also demonstrates that the TA-100 has a positive effect, at a 5 percent level of significance, on 85.7 percent of firms examined; the FTSE All-World, in contrast, has a significant positive effect on only 8 percent. The table also clearly shows that the median of the global-factor coefficient increases from -0.28 when firms do not sell abroad to -0.07 when foreign sales do take place. When a firm's foreign sales exceed 50 percent of its total sales, the median of the global-factor coefficient is positive at 0.06 percent; when the fraction rises to 75 percent (as it does among forty-nine companies), it climbs to 0.12. Namely, the higher the cutoff of the sample is in terms of foreign sales as a proportion of total sales, the greater the distance of the median of the global-factor coefficient from the corresponding level for the sample population at large, and this distance grows in tandem with an increase in the share of the firms' sales abroad. The median of the domestic-factor coefficients, in contrast, declines when the share of foreign sales rises.

Table 2

The relation between global and domestic returns and returns obtained on the Tel Aviv Stock Exchange by the stocks of non-financial-services firms appearing in the TA-100 Index at least once in 2006–2012

	Total sample		Companies that sell internationally		Companies that do not sell internationally	
	FTSE All-World	TA-100	FTSE All-World	TA-100	FTSE All-World	TA-100
Observations (N)	112	112	84	84	28	28
Avg. coefficient	-0.11	1.23	-0.08	1.25	-0.21	1.14
Median coefficient	-0.09	1.18	-0.07	1.20	-0.28	1.14
S.D. of coefficients	0.61	0.66	0.68	0.72	0.44	0.42
	Companies that sell more than 25% internationally		Companies that sell more than 50% internationally		Companies that sell more than 75% internationally	
	FTSE All-World	TA-100	FTSE All-World	TA-100	FTSE All-World	TA-100
Observations (N)	74	74	59	59	49	49
Avg. coefficient	-0.05	1.23	0.01	1.17	0.16	1.01
Median coefficient	-0.01	1.19	0.06	1.05	0.12	0.88
S.D. of coefficients	0.70	0.73	0.75	0.76	0.67	0.69

The findings in Table 2 are consistent with international studies showing that the return on a stock is determined mainly by the market where the stock is traded and not by the markets where the firm operates (Chan, Hameed, and Lau, 2003). The average size of the global-factor coefficient that we found, however, is below the average in Ireland (Berrill, 2010) and far below the U.S. average of 0.21 among companies at large (Cai and Warnock, 2012). Furthermore, the domestic factor is found to have a stronger impact than was discerned in other studies. In the next section, we ask whether the effect of the domestic and global factors on stock yields is related to the firms' form of activity. Namely, are firms that make a larger share of their sales abroad more sensitive than others to developments in the global stock market?

3.2 The effect of distribution of sales on sensitivity of returns to domestic and global factors

To determine whether activity abroad affects the sensitivity of returns to global and domestic factors, we use a two-stage estimation. In the first stage, presented above, the effects of the global and domestic factors are estimated on each stock separately within the framework of time series. In Stage 2, which follows, we estimate within a cross-sectional framework how foreign sales as a share of each firm's total sales affects the coefficients that were estimated in Stage 1. To this end, we estimate two separate equations:

$$(2a)\ \widehat{\beta_i} = \ a + bIS_i + u_i$$

$$(2b)\ \widehat{\gamma_i} = \ a' + b_i'IS_i + u_i'$$

where $\widehat{\beta_i}$ denotes the coefficient of the global factor that was estimated for firm i in Stage 1, $\widehat{\gamma_i}$ denotes the share of foreign sales in firm i's total sales, and u_i and u_i' are error terms that are distributed normally with zero expectation. This two-stage method for estimating the effect of foreign activity on stock sensitivity to domestic and global factors was proposed by Agmon and Lessard (1977), who also estimate Stage 2 by means of OLS. While acknowledging that the coefficients obtained in Stage 1 are estimated with an error, Agmon and Lessard claim, correctly, that insofar as the error is not correlated with the share of foreign sales, it will not skew the coefficients estimated in Stage 2, although it will affect significance. To cope with this issue, Cai and Warnock (2012) estimate an equation similar to (2a) but use weighted least squares (WLS) in the estimation, in which the weights are the inverse of the standard deviation of $\widehat{\beta_i}$. The use of WLS in Stage 2 makes it possible to take into account that the dependent variable itself was estimated with an error in Stage 1. To correct even further, we use the Newey-West method in Stage 1. As a result, our weights are based on standard deviations adjusted for heteroskedasticity and serial correlation of residuals. The absence of adjustment in the estimation of the residuals does not bias the coefficients estimated in Stage 1 but may create a bias in the weights used in Stage 2, thereby introducing an error in the examination of the hypothesis.

Table 4 (below) presents the results of the estimation of the Stage 2 equations in both estimation methods discussed above—OLS and WLS—the weights of which are based on the inverse of the standard deviation of the coefficient (global or domestic, as the case may be) in Stage 1 (hereinafter: WLS-beta). Panel 1 presents the results for the global factor (Equation 2a); Panel 2 does so for the domestic factor (Equation 2b).

Table 3

The relation between the Share of Foreign Sales and Exposure

to Global and Domestic Factors

Panel 1: Global factor		
	OLS	**WLS-beta**
Observations (N)	112	112
coef IS	0.40	0.38
p-value IS	0.6%	0.0%
Adjusted R^2	5.7%	10.3%
Panel 2: Domestic factor		
	OLS	**WLS-beta**
Observations (N)	112	112
coef IS	-0.21	-0.22
p-value IS	17.3%	8.8%
Adjusted R^2	0.8%	1.7%

The main result in Table 3 is that the effect of the world index return on the returns of stocks on the TASE is significantly greater among companies that do a considerable share of their selling abroad. The coefficient stands at around 0.4 in the various specifications, i.e., if a firm is traded on the TASE and makes all of its sales abroad, its stock is expected to be 1.4 times more sensitive to developments in global markets than that of a firm that does all its selling in the domestic (Israeli) market. While the share of foreign sales has a significant effect on the coefficient of the global factor, the proportion of foreign sales has—as expected—a negative effect on the domestic-factor coefficient. This coefficient, however, is not statistically significant at a 5 percent level.

We find that the share of foreign sales affects the global factor less intensely than Cai and Warnock (2012) find and more intensely than Agmon and Lessard (1977) report. As for the domestic factor, Agmon and Lessard (1977) find that the share of foreign sales affects it significantly, whereas Cai and Warnock (2012) do not examine this effect because their preliminary check did not yield evidence that such an effect exists.

Thus far, we have presented results on the basis of the average volume of each firm's foreign sales throughout the sample period (2006–2012). Importantly, however, our sample period includes 2008, at the end of which the global crisis crested, and amid the crisis environment the global economy was typified by acute heterogeneity. To determine whether the relation between the geographic distribution of a firm's sales and the sensitivity of its stock to the global and domestic factors occurred farther on and,

particularly, to see whether the results that we presented are sensitive to changes in the economy surrounding the global financial crisis, we repeated Stage 2 of the estimation separately for three subperiods: 2006–2007 (preceding the crisis), 2008–2009 (peak of the crisis), and 2010–2012 (after the peak of the crisis). Table 4 presents the results of the OLS estimation for each of these subperiods.

Table 4

The relation between share of foreign sales and exposure to global and domestic factors in different sample periods

Panel 1: Global factor				
	2006–2012 excl. 2008–2009	2006–2007	2008–2009	2010–2012
Observations (N)	117	99	105	110
coef IS	0.69	1.27	−0.03	0.46
p-value IS	0.0%	0.0%	90.6%	0.7%
Adjusted R^2	13.5%	16.0%	0.0%	5.8%
Panel 2: domestic factor				
	2006–2012 excl. 2008–2009	2006–2007	2008–2009	2010–2012
Observations (N)	117	99	105	110
coef IS	-0.57	-0.58	0.19	-0.45
p-value IS	0.0%	0.0%	44.8%	1.2%
Adjusted R^2	10.4%	11.5%	0.0%	4.9%

The Table shows that in the peak years of the financial crisis the share of foreign sales had no significant effect on the sensitivity of stock returns to the global and domestic factors. In the pre-crisis and post-crisis years, in contrast, the proportion of foreign sales had a highly significant positive effect and the coefficient in the pre-crisis years was very large. Similarly, in the crisis subperiod, the sensitivity of the stocks to the domestic factor was not affected by the share of foreign sales, whereas in the pre-crisis and post-crisis subperiods it was affected significantly and negatively. Given these results, we repeated Stage 2 for 2006–2012 but omitted the peak crisis years (2008–2009). Here we found that the share of foreign sales has a positive and significant effect on the coefficient of the global factor that was estimated in Stage 1 and a negative and significant effect on the coefficient of the domestic factor estimated in Stage 1, and it affects them more intensely than do the coefficients calculated for the entire sample period (including the peak crisis years).

In view of these results, it seems that, at the peak of an acute financial crisis, developments in stock markets affect domestic stocks less via firms' real activity than by other factors. After the crisis crests, in contrast, it is evident that the geographic distribution of sales again affects the relation between stock returns in Israel and the returns of global and domestic indices. In the literature on cross-country financial contagion, it is common to distinguish between contagion based on fundamentals and that originating in the behavior of active economic agents.[15] Israeli firms' real activity abroad is a potential path of transmission for contagion based on fundamentals. In practice, Israel's contagion at the pinnacle of the global crisis appears to have been transmitted not on this path but through other channels, perhaps the kind that do not flow from the fundamentals of firms and the economy. This finding reinforces the view that cross-country financial contagion in times of crisis is a phenomenon that deviates from the correlation that exists among financial markets in the absence of crisis.[16]

We perform several additional checks to make sure that the results obtained do not originate in the estimation method. In particular, we try to cope with concern about the existence of a correlation among the coefficients of different firms that were estimated in Stage 1. First, we repeat Stage 2 of the estimation using generalized estimating equations (GEE) to contend with the possibility of a correlation between the global-factor and domestic-factor coefficients of firms that belong to the same industry in the Stock Exchange classification—coefficients that we used in Stage 2 of the estimation. The results of this estimation resemble those obtained when the OLS method was used. (The results are available from the authors upon request.)

Then we repeat the entire two-stage estimation but do so by using a single-stage estimation method. This is another way to cope with the concern of a dependency between the global-factor and domestic-factor coefficients that were estimated in Stage 1 (Cai and Warnock, 2012). We perform the single-stage estimation by means of the following pool regression:

$$(4)\ \mathrm{R}_{i,t} = (\beta_0 + \beta_1 IS_i) * F_{w,t} + \gamma_i F_{L,t} + \varepsilon_{i,t}$$

where the parameters are defined as above.

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[15] For an explanation of the differences between the two types of contagion and references to articles on the topic, see Classens and Forbes (2013).

[16] The extent of contagion observed in international crises—exceptional or merely the outcome of the interdependency among markets that exists in ordinary times—is disputed in the literature. (See, for example, Forbes and Rigobon, 2002.)

In this estimation, the coefficient of the interaction variable, β_1, captures the extent to which foreign sales affect the sensitivity of stock returns to the global index. This coefficient receives the value of 0.59 and is significant at a 1 percent level. The β_0 coefficient, in contrast, captures the effect of the global index on firms that do not sell abroad and receives a negative value: -0.37. These results are consistent with those in Tables 3 and 4 above. Accordingly, it seems that our results are not driven by a dependency among the coefficients that we estimated for the different firms, and are robust to a variety of estimation methods.

Finally, we estimate two equations that resemble Equations (2a) and (2b) above but replace the variable that represents the firm's share of foreign sales, IS_i, with a variable representing the share of long-term assets that the firm holds outside of Israel, $ILTA_i$:

$$(5a)\ \widehat{\beta}_\iota = \delta + cILTA_i + \sigma_i$$

$$(5b)\ \widehat{\gamma}_\iota = \delta' + c_i'ILTA_i + \sigma_i'$$

where the other definitions are identical to those above, with changes of sign where necessary. Table 5 below presents the results of the estimation of the Stage 2 equations for long-term assets using both estimation methods, OLS and WLS. Panel 1 presents the results for the global factor (Equation 5a); Panel 2 does the same for the domestic factor (Equation 5b).

Table 5

Relation between share of long-term assets held abroad by a company and exposure to global and domestic factors

Panel 1: Global factor		
	OLS	**WLS-beta**
Observations (N)	29	29
coef IS	0.37	0.05
p-value IS	23.8%	85.3%
Adjusted R^2	1.6%	0.0%
Panel 2: Domestic factor		
	OLS	**WLS-beta**
Observations (N)	29	29
coef IS	-0.28	-0.23
p-value IS	39.5%	38.9%
Adjusted R^2	0.0%	0.0%

It is true that the coefficients in Table 5 receive the expected sign but are they not significantly different from zero. When Table 5 is compared with Table 4, we see that the geographic distribution of long-term assets has much less explanatory power than the geographic distribution of sales—due, among other things, to the paucity of observations. Concurrently, however, it should be noted that when the estimation using the OLS method is observed, one sees that the estimated effect of the share of the firm's long-term assets abroad on its sensitivity to the global factor resembles—in terms of its level, although not in statistical significance—the estimated effect of the share of foreign sales.

Thus far, we have treated all of the sample firms as full-fledged Israeli companies. Several large companies traded on the Tel Aviv Stock Exchange are, however, dual-listed[17], or foreign:

a. Dual-listed companies are those recorded concurrently on the TASE and on a foreign bourse. In particular, the TASE offers firms that are traded on American and London exchanges a special track by which they may list their shares for trading as dual-traded stocks. During the sample period, there were forty-six non-financial-services companies in the TA-100 Index, for which sales data were available to us, that were also listed on a foreign exchange.

b. Foreign companies incorporated in a country other than Israel may be traded on the TASE. On the date of our check (during 2014), ten non-financial-services firms in the TA-100 Index for which sales data are available to us were incorporated in a country other than Israel.

One would expect dual-listed firms and also, perhaps, those incorporated in a foreign country to be more sensitive to developments in the global market than companies traded only on the TASE and registered in Israel.[18] To see if this is so, we repeat the basic Stage 2 estimation in its various specifications but add, alternatingly, (1) a dummy variable for dual-listed companies and a variable for the interaction of this variable with the share of foreign sales, and (2) a dummy variable for foreign companies and a variable for the interaction of this variable with the share of foreign sales.

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[17] Here and below, we do not distinguish between dual-listed firms and dual firms, even though there is a de facto difference in the reporting requirements that apply to the respective types of firms. Further details about dual firms are available (in Hebrew) at http://www.tase.co.il/Heb/Listings/DualListing/Overview/Pages/Overview.aspx.

[18] Schreiber (2013) finds that shares traded on both the TASE and NASDAQ were significantly affected by returns in both markets.

In all specifications examined, the interaction variable between dual-listed companies and share of foreign sales has a positive and significant effect on the coefficient of the global factor and a negative and significant effect on the coefficient of the domestic factor. Namely, when dual-listed firms do much of their selling abroad, their sensitivity to developments in global (domestic) markets is greater (smaller) than that of non-dual firms that make a similar proportion of their sales in foreign venues. In addition, adding the variable for dual-listed firms improves the explanatory power of the model.

In contrast to the interaction variable between dual companies and the share of foreign sales, the interaction variable between foreign firms and the share of foreign sales showed no significant effect on the global factor coefficient in any of the specifications that we tested. This outcome may have been affected by the small number of foreign firms that were traded on the TASE during the sample period. It may also, however, suggest that the decision about the place where the company is registered—basically a legal/regulatory decision—is less relevant in our context than the financial decision about where the stock is traded.

The focus thus far has been on differences in the geographic distribution of the sample companies' sales. These firms, however, are differentiated not only in their countries of activity but also within their home countries. Perhaps, then, their sectors of activity affect the relationship between their proportion of foreign sales and the sensitivity of their stock to domestic and global factors. Our sample—non-financial-service firms that appeared at least once on the TA-100 Index between 2006 and 2012—is not large enough to estimate the model in reference to the Stock Exchange's industry classification because certain industries are populated by few companies. To surmount this problem, we use the entire database of publicly held companies in our possession, including the Yeter Index companies, and repeat the estimation in Equations (2a) and (2b) for each TASE industry. To overcome the poor liquidity of small-firm stocks that are traded on the exchange, we estimate Stage 2 of the model using the WLS method, which uses weights that are inverse to the Amihud illiquidity index.[19,20] Table 6 presents the results. The oil and gas exploration industry is omitted due to the small number of observations.

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[19] It is common to use the Amihud index (Amihud, 2002) to estimate the extent of an asset's liquidity or the lack thereof. The index is calculated using the following formula, where R_t represents the return on the stock on day t and $-Vol_t$ represents the trading volume in the stock on day t:

Table 6

Relation between share of foreign sales and exposure to global and domestic factors, by industry classification

	Biomed	Commerce and services	Real estate	Holding companies	Manufacturing	Technology
Panel 1: Global factor						
Observations (N)	22	97	114	61	100	55
coef IS	0.89	0.23	0.52	0.17	0.21	0.72
p-value IS	14.2%	16.1%	0.5%	49.8%	39.6%	0.1%
Adjusted R^2	6.0%	1.0%	6.1%	-0.9%	-0.3%	16.3%
Panel 2: Domestic factor						
	Biomed	Commerce and services	Real estate	Holding companies	Manufacturing	Technology
Observations (N)	22	96	109	61	100	55
coef IS	-0.81	-0.08	-0.49	0.30	-0.58	-0.34
p-value IS	14.1%	57.1%	4.3%	30.9%	18.0%	1.1%
Adjusted R^2	6.1^	0.0%	2.9%	0.1%	0.8%	10.0%

As the Table shows, the results in some industries resemble the general outcomes presented above but are not significant in most cases. In particular, the stocks of real estate and technology companies that have more sales abroad, are more (less) sensitive to financial developments in the foreign (domestic) market. In other industries, the results are not statistically significant and sometimes carry the opposite sign of that expected, although not significantly so (the coefficient of holding companies with respect to the domestic factor).

3.3 *Substituting regional indices for the All-World Index*

In the estimation thus far, we used the FTSE All-World index as a proxy for the global factor. Multinational firms, however, operate in various regions around the world.Tthe distribution of their sales among these regions may be very different from the regional

$$illq = \frac{1}{N} \sum_{t=1}^{n} \sqrt{\frac{|R_t|}{Vol_t}}$$

[20] A check that we ran shows that the average level of the Amihud index is 7.5 times greater for Yeter Index stocks than for TA-100 stocks—indicating that the mid-cap stocks included in the Yeter Index are much less liquid than those of the TA-100.

weights of the FTSE All-World. For this reason, Berrill (2010) proposes a model comprised of six regions around the globe in lieu of one global index but does not find that the distribution of the firms' sales by regions has a strong effect on the behavior of their stocks.

The check that follows resembles that suggested by Berrill (2010), but uses slightly different geographic regions and employs the FTSE regional indices as a proxy for the behavior of the regional financial markets. For this purpose, we re-estimate Equation (1) but define the global factor, $F_{w,t}$, not as the FTSE All-World index but as a vector composed of the returns of the five different FTSE regional indices in period t. Accordingly, we define β_i as a vector of the coefficients of the five indices measured for each firm i. On this basis, Equation (1) may be rewritten as follows:

$$(5) \; R_{i,t} = \alpha_i + \sum_{j=1}^{5} \beta_{i,j} R_{j,t} + \gamma_i F_{L,t} + \varepsilon_{i,t}$$

where j=1–5 denotes the five global regions that we chose (North America, Europe, Latin America, Africa, and Asia-Pacific), $R_{j,t}$ denotes the return of the FTSE index for region j in month t; $\beta_{i,j}$ is a constant parameter for stock i that captures the effect of the return in region j, and the remaining definitions are identical to those presented above. Much as in the results shown in Table 3, when regional indices are used as the model factors that explain the returns of firms on the TASE, the average of the TA-100 coefficient is very close to 1.25 whereas the average of coefficients for the various regions ranges from -0.1 to 0.07.

Having estimated Stage 1 for each firm, we now re-estimate Equation (2a). However, instead of using the firm's proportion of foreign sales—IS—we use the share of the firm's sales to the region being examined. Accordingly, we estimate five equations of the following form:

$$(6j) \; \widehat{\beta_{i,j}} = a_j + b_j RS_{i,j} + u_{i,j}$$

where $RS_{i,j}$ denotes the share of sales of firm i to region j and the remaining definitions are identical to those given above but adjusted to region j.

In the cases of North America, Europe, and Latin America, the coefficient of the share of sales to the region (RS) in Equation (5j) is positively signed in most specifications but is

different from zero at a 5 percent significance only for of Europe, and only when WLS is used with weights based on the inverses of the Amihud index.

Generally speaking, the results differentiated by regions do not indicate, in most cases, that the effect is statistically different from zero. Evidently, sales to a specific region, unlike the share of foreign sales at large, do not explain the effect of a regional index on a stock return. One possible explanation for this is that the regional index does not capture the distribution of Israeli firms' sales in the region well. Since most corporate statements do not include a breakdown of sales by country, it is difficult to attain a better adjustment of the examined index to the activity of the firms within the region. In the future, however, there may be room for an attempt to examine alternatives to the FTSE indices for the various regions, such as indices based on pairing the stock indices of the large countries in each region with weights based on gross national income, as Berrill (2010) proposes.

3.4   *Robustness checks*

We performed several additional checks to make sure the results presented are not driven by the underlying currency, errors in Stage 1 of the estimation due to problematic modeling of the global factor, the omission of relevant variables that affect returns, or faulty classification of firms in Stage 2 of the estimation. The results of the checks are not presented here and are available from the authors upon request.

3.4.1   *The global factor*

In most parts of the study, we treated the FTSE All-World Index as a proxy for the global factor. As noted at the beginning of this paper, the results are robust to the replacement of this index with the MSCI World. Jorion and Schwartz (1986), however, claim that due to the relation between the domestic index and the world index, one must first extract the orthogonal component of the domestic index from the world index and use only that for the checks. In our judgment, this is irrelevant in the Israeli case because Israel has a negligible influence on the world index. To eliminate all doubt, however, we adopt this procedure in our robustness checks. Namely, we extract the orthogonal part of the TA-100 from the FTSE All-World Index by running the FTSE All-World on the TA-100, and use the series of residuals from this regression as an estimator of the global factor that is orthogonal to the domestic factor. The results obtained, in both Stage 1 and Stage 2, resemble the main results presented above. The share of foreign sales continues to positively and significantly affect—at the magnitude

that we presented—the sensitivity of stocks to the global factor. The effect of the share of foreign sales on the sensitivity of stocks to the domestic factor, in contrast, is not significantly different from zero.

3.4.2 Additional factors

Fama and French (1993) show that in addition to market risk—a risk proxied by the domestic stock index—stock return is also affected by company size (a size factor) and the company book-to-market ratio (a value factor). Various studies probe the effect of these factors, some doing so within the framework of an international capital asset pricing model (e.g., Griffin, 2002). Since this issue is not the focus of the current study, we focus on estimating a simple ICAPM model in most of our work here. We wish, however, to ascertain that our results are not driven by our omission of the company-size variable or the book-to-market ratio. Therefore, we repeat the Stage 1 estimation adding both of these factors. To calculate the size factor, we take the monthly return in the lowest size quintile in each sample month and subtract from it the return in the highest size quintile in that month. To calculate the value factor, we take the monthly return in the highest value quintile (the firms that have the highest book-to-market ratio) in each sample month and subtract from it the monthly return in the lowest value quintile.

Adding the size and value factors slightly lowers the average coefficients estimated for the domestic and global factors but, on average, adds little to the explanatory power of the model in the first estimation stage. In the second estimation stage, as we recall, the relation between the share of a company's foreign sales and the sensitivity of its stock to global and domestic factors is examined. Here a strong similarity was obtained, both qualitatively and quantitatively, between the results based on the model including only global and domestic factors and the results predicated on the model that also includes size and value factors. Consequently, the effect of international activity on the sensitivity of a stock to events in the global financial markets originates neither in the omission of a size factor nor in the omission of a value factor from the asset-pricing model used for the estimation.

3.4.3 Firms with no data on the distribution of sales

Wherever we lacked data on the geographic distribution of a company's sales, e.g., insufficient observations, we filtered the firm out of the estimation. It may be presumed

that most of these companies release no explicit information about sales distribution because they sell only in Israel. A sample check that we performed shows that this assessment is valid for most firms. Therefore, we repeat the estimation using the assumption that all such companies sell only domestically. Although this relaxed definition adds ten firms to the estimation, the results obtained are qualitatively similar and quantitatively stronger than those obtained from the smaller sample. Namely, the stocks of firms that do much of their selling abroad are more (less) affected by the global (domestic) stock index than those of firms that focus on the domestic market, and the difference is significant.

3.4.4   Focusing on firms that sell abroad

Throughout this study, we address ourselves to the full contingent of publicly held companies that are traded on the TASE and that publish the requisite data. Since some of these firms do not sell internationally, the concern arises that the results originate only in differences between the firms that sell internationally and those that do not. Therefore, the question is: Given that a firm sells abroad, does an increase in the proportion of its foreign sales make its stock more sensitive to the global factor and less sensitive to the domestic factor? To answer, we repeat the estimation only for those firms whose share of foreign sales exceeds zero.

The results obtained are qualitatively similar to those presented thus far: As the share of foreign sales climbs, the effect of the global (domestic) factor on the stock rises (falls). From the quantitative perspective, the results pertaining to the subsample of firms that sell abroad are stronger than those for the entire sample in terms of the positive effect of the global factor and the negative effect of the domestic one. Therefore, the fact that our sample includes a large concentration of firms that operate only in Israel (27 percent of the total sample) lowers the coefficients and mitigates the significance of the results obtained.

4.   Implications for measurement of Israeli Investors' foreign exposure and home bias

In the previous sections we showed that, on average, Israel's large publicly held firms made 53.6 percent of their sales abroad in 2006–2012. This means that publicly held multinational companies provide Israeli investors with an indirect exposure to international markets. This exposure helps to mitigate the domestic investors' home bias, i.e., their

tendency to overweight their investments in the domestic market relative to the extent derived from standard models of investment portfolio diversification.

In this section, we attempt an initial assessment of the effect of the findings on the home bias of investors in Israeli stocks. Cai and Warnock (2012), using American data on investors' holdings and share of foreign sales at the individual company level, show that when the indirect exposure to international markets—via investment in domestic firms that operate abroad—is taken into account, it almost doubles the estimated foreign equity exposure of the American investors. A parallel check for Israel, based on data at the individual company level, is left to future research. Below we present an aggregate check based on the composition of the public's portfolio of financial assets and the composition of the institutional investors' portfolio at the end of 2015 (Bank of Israel, 2016). Specifically, we use a simplifying assumption: Our findings in regard to large nonfinancial firms—concerning the geographic distribution of foreign sales and the sensitivity of stocks to the global stock index—are valid for the aggregate of publicly held firms traded on the Tel Aviv Stock Exchange and held by Israeli investors. We also disregard the holdings of non-publicly-held Israeli firms. Finally, the check deals only with capital exposure and overlooks the implicit direct and indirect foreign exposure created by additional investment instruments such as bonds, deposits, and so on.

To calculate Israeli investors' indirect foreign exposure, it may be assumed that the geographic distribution of companies' revenues is representative of their foreign exposure. If we assume that foreign sales translate accurately into foreign exposure, we may estimate domestic investors' foreign exposure by multiplying Israeli investors' holdings in publicly held firms in Israel by the publicly held companies' share of foreign sales. We found, however, that foreign sales do not translate precisely into financial exposure to foreign markets. Instead, a 1 percentage-point increase in foreign sales increases the exposure of the companies' investors to developments in international capital markets by 0.4 percentage points. Accordingly, it appears that in addition to the factors already mentioned—Israeli investors' holdings in publicly held companies traded on the Tel Aviv Stock Exchange and foreign markets' share of the companies' sales—a correct estimation of the indirect foreign exposure should also take into account the coefficient that we estimated of the relation between the share of foreign sales and the sensitivity of firms' stocks to developments in the global stock index.

At the end of 2015, 14.9 percent of the Israeli public's portfolio of financial assets was invested domestically and the value of the stocks came to NIS 494 billion. Under the

aforementioned assumptions, 53.6 percent of this value came from foreign sales, implying a real exposure of NIS 264.7 billion. Given our estimate of the financial exposure originating in foreign sales, this real exposure translates into a financial exposure of NIS 105.9 billion. By comparison, at the end of 2015, 8.1 percent of the Israeli public's asset portfolio was invested in foreign stocks (including Israeli securities traded abroad), which were worth NIS 269 billion.[21] Consequently, when we take Israeli investors' direct equity exposure to foreign markets and augment it by the indirect exposure, their total equity exposure to the rest of the world increases by nearly 40 percent and their home bias declines considerably.[22]

At the end of 2015, Israel's institutional investors (pension funds, insurance companies, provident funds, and advanced-training funds) invested 7.3 percent of their investment portfolio in domestic stocks, the value of which came to NIS 99 billion. Under the aforementioned assumptions, 53.6 percent of this value came from sales abroad, for a real exposure of NIS 53.1 billion. Given our estimate of the financial exposure that originates in sales abroad, this real exposure translates into a financial exposure of NIS 21.2 billion. By comparison, 10.4 percent of domestic institutional investors' portfolio was invested abroad at the end of 2015 and was worth NIS 141.2 billion.[23] Thus, adding institutional investors' indirect foreign exposure to the direct equity exposure boosts their total foreign equity exposure by 15 percent, mitigating these investors' home bias.[24] The effect of the indirect equity exposure on the institutional investors is smaller because these investors hold a much smaller proportion of shares in Israel than the general public. Therefore, the foreign exposure implied by these holdings has less of an effect on their total foreign exposure.

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[21] This sum does not account for nearly NIS 45 billion in ETFs that track foreign stock indices and are traded on the TASE.

[22] Theoretically, to make the comparison uniform, the foreign firms' sales made in Israel should be offset from Israelis' direct investment in foreign stocks (Cai and Warnock, 2011). Since the Israeli market is relatively small, however, such an offset is unlikely to have much of an effect on the results presented.

[23] This sum does not account for approximately NIS 15 billion in institutional investors' holdings at the end of 2015 of ETFs that track foreign stock indices and are traded in Tel Aviv.

[24] Theoretically, to make the comparison uniform, the institutional investors' direct holdings in foreign stocks should be offset from the foreign firms' sales in Israel (Cai and Warnock, 2011). Since the Israeli market is relatively small, however, such an offset is unlikely to have much of an effect on the results presented.

5.   Summary and conclusions

In this study we examined, for the first time, the implications of multinational firms'
activity on Israeli investors' financial exposure to the rest of the world generally and to the
regions where these companies operate particularly. Gathering data on publicly held
nonfinancial Israeli firms that appeared at least once in the TA-100 Index, we showed that
Israeli publicly held companies maintain substantial activity abroad. In 2012, for example,
they made 53 percent of their sales in other countries. Most of these companies' activity
focuses on developed markets. Their exposure to emerging markets and the Asia-Pacific
region is relatively small. It is also shown that companies in the manufacturing,
technology, and biomed industries of the Tel Aviv Stock Exchange make a larger share of
sales abroad than do those in other industries. Notably, the geographic distribution of
publicly held companies' foreign sales more closely resembles that of exports of business
services, according to surveys by the Central Bureau of Statistics, than it does the
distribution of exports of goods according to customs data. To examine Israeli firms'
financial exposure to the rest of the world, in Stage 1 we estimated an international capital
asset pricing model that tests the effect of a domestic and a global factor on the pricing of
Israeli firms' stocks. In Stage 2, we investigated the relation between the geographic
distribution of the companies' sales and the effects of the domestic and global factors. In
Stage 1, we found that the global factor has a significant effect on only a few firms. The
main effect in the model originates in the domestic factor, i.e., the TA-100 Index. In Stage
2, we found that the share of foreign sales by publicly held companies in Israel has a
positive and significant effect on the sensitivity of the returns of their stocks to the global
factor. In contrast, only in certain specifications was the proportion of foreign sales found
to have a negative and significant effect on the sensitivity of the domestic factor. We also
discovered that the global and domestic factors are especially sensitive to the share of sales
abroad (positively and negatively, respectively) among companies listed for trading on
both the TASE and a foreign bourse. In contrast, we found no similar phenomenon among
foreign firms. The use of the companies' long-term assets (instead of the geographic
distribution of their sales) as the metric of their international activity yielded similar,
although statistically weaker, findings. When the model was expanded to include a
domestic factor and a factor for each region, the share of sales to a given region was found
to have no significant effect on the sensitivity of the stock return to the regional index—
possibly because the composition of the regional indices poorly reflects the distribution of
Israeli firms' activity in these regions.

Subjecting the results to robustness tests, we found that they are due neither to non-orthogonality of the global index relative to the domestic index nor to the omission of relevant factors that affect stocks' returns. Similarly, the results are not sensitive to the expansion of the sample that occurred when we added companies that did not furnish data about the geographic classification of their sales. Furthermore, downsizing the sample by omitting firms that do not sell abroad actually strengthened the effect that was found and slightly improved the explanatory power of the model.

The results of the estimation imply that the main factor of influence on the returns of publicly traded firms in Israel is the domestic stock index. However, this index, and to a greater extent the global stock index, do not affect the firms the same way: The more active a company is in foreign markets, the more its stocks are affected by foreign developments. As a result, while investors in the domestic market are exposed to volatilities in foreign financial markets mainly due to their effect on the domestic stock index, they face an additional exposure through the effect of these volatilities on the stocks of the multinational firms that are traded on the Tel Aviv Stock Exchange.

We hope this study will yield a better understanding of the relations between real developments and financial ones. In the aftermath of the global financial crisis, it was more keenly realized in Israel and abroad that there is a need for a macroprudential policy that examines the interlocking relations in the financial system and the systemic risks originating from them, including relations between real and financial activities. In a small and open economy such as Israel's, in which exports of goods and services account for much of economic activity, it is important to conduct such an examination both within the economy and in consideration of its relations with the rest of the world. One path of potential effect is exporters generally and, particularly, publicly held firms that derive much of their sales from exports. An increase or decrease in demand for goods and services in a given region of activity may find expression not only in the impairment of firms' business activity but also in the prices of their stocks and their ability to service their debts—processes that are harmful to the value of the public's portfolio of assets. Therefore, it is important for the maintenance of financial stability to analyze the foreign exposure of publicly held firms, especially leveraged companies and those in industries where a potential systemic risk is liable to be realized.

The examination reported in this study shows that when one adds Israeli investors' indirect equity exposure to the rest of the world to their direct exposure, their total foreign equity exposure rises by some 40 percent. Furthermore, institutional investors have been

increasing their direct foreign exposure rapidly in recent years by building up their investments in foreign assets.[25] The findings of this study show that, to estimate the institutional investors' total foreign exposure, examining their direct exposure to the securities of the foreign firms that operate abroad does not suffice. Their indirect foreign exposure, via the activities of Israeli firms abroad, and the geographic dispersion of this activity, must be examined as well. An initial check that we performed in this study shows that when the institutional investors' indirect equity exposure to the rest of the world is added to their direct exposure, their total foreign equity exposure grows by some 15 percent. Future research should investigate more thoroughly the indirect international exposure of different institutional investors and the relation between it and their direct international exposure.

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[25] For elaboration on this topic, see Bank of Israel (2014), *Annual Report* for 2013, Chapter 4.

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Appendix: Data on the yields of public company stocks on the Tel Aviv Stock Exchange, yields of the global indices, and the correlations between them

Table A-1

Data on monthly yields, in dollar terms, of all public companies on the Tel Aviv Stock Exchange and of companies in the sampe, 2006–12

	Monthly yield data	2006	2007	2008	2009	2010	2011	2012	2006-2012
All public companies	Number of companies	578	630	613	601	592	586	556	694
	Mean	2.80%	0.50%	-8.30%	5.10%	1.40%	-3.90%	-1.00%	-0.50%
	Median	1.40%	0.50%	-5.00%	2.60%	1.00%	-2.80%	-0.30%	-0.20%
	Standard deviation	14.00%	13.10%	19.80%	20.30%	18.20%	16.20%	17.40%	17.70%
Companies in the sample[a]	Number of companies	110	122	122	120	118	122	116	130
	Mean	2.80%	1.30%	-9.10%	7.50%	2.10%	-3.80%	-0.40%	-0.10%
	Median	1.90%	1.50%	-6.30%	5.20%	1.80%	-2.90%	0.70%	0.40%
	Standard deviation	10.60%	10.20%	19.40%	15.90%	13.00%	13.00%	16.10%	15.20%

[a] Nonfinancial companies included in the Tel Aviv 100 index at least once between 2006 and 2012.

Table A-2

Data on the monthly yield, in dollar terms, of the FTSE World, FTSE regional indices, and Tel Aviv 100

Stock index		2006	2007	2008	2009	2010	2011	2012	2006-2012
FTSE world	Mean	1.60%	1.00%	-4.50%	2.60%	1.00%	-0.60%	1.40%	0.30%
	Median	2.60%	0.20%	-2.90%	3.40%	0.20%	-0.90%	1.70%	1.30%
	Standard Deviation	2.40%	3.20%	9.20%	6.20%	6.10%	4.40%	4.10%	5.70%
FTSE North America	Mean	1.20%	0.50%	-3.50%	2.00%	1.10%	0.00%	1.40%	0.40%
	Median	1.20%	0.00%	-2.10%	2.50%	3.10%	0.90%	3.10%	1.40%
	Standard Deviation	1.40%	3.00%	8.90%	9.10%	5.50%	3.90%	4.30%	5.90%
FTSE Europe	Mean	2.40%	1.20%	-5.30%	2.70%	0.40%	-1.10%	1.70%	0.30%
	Median	3.40%	0.10%	-4.00%	3.20%	-1.50%	-2.40%	3.10%	0.90%
	Standard Deviation	2.90%	3.40%	11.00%	7.60%	8.10%	6.00%	5.50%	7.10%
FTSE Asia Pacific	Mean	1.40%	1.20%	-4.40%	2.90%	1.20%	-1.40%	1.50%	0.40%
	Median	2.70%	0.80%	-4.30%	2.80%	1.90%	-0.20%	1.20%	0.80%
	Standard Deviation	3.40%	3.00%	8.80%	8.40%	5.60%	4.50%	5.70%	6.20%
FTSE Latin America	Mean	3.20%	3.20%	-5.10%	5.50%	1.00%	-1.80%	0.90%	1.00%
	Median	4.60%	1.70%	-2.50%	5.50%	1.60%	-2.30%	0.50%	0.70%
	Standard Deviation	6.10%	5.90%	14.80%	11.00%	6.70%	6.20%	7.80%	9.20%
FTSE Africa	Mean	2.20%	3.40%	-5.10%	1.90%	1.70%	-2.20%	2.20%	0.60%
	Median	1.50%	3.60%	-3.80%	2.60%	2.00%	-2.70%	2.50%	1.50%
	Standard Deviation	7.50%	4.30%	10.50%	8.40%	5.30%	4.10%	4.80%	7.10%
Tel Aviv 100	Mean	1.70%	2.60%	-5.80%	5.30%	1.70%	-2.50%	0.70%	0.50%
	Median	1.70%	2.30%	-7.50%	4.70%	1.60%	-2.30%	2.00%	1.20%
	Standard Deviation	4.70%	5.00%	11.40%	5.10%	7.00%	6.10%	5.30%	7.30%

Table A-3

The average correlation between the yields on the stocks of companies with sales in a certain geographic area ,the yields on that regional index, and the Tel Aviv 100

| Stock index | Tel Aviv 100 | Sales to the region | No sales to the region | Rate of companies' sales to the region with which the correlation is examined | | | |
				0–25%	25%–50%	50%–75%	75%–100%
FTSE World	**0.85**	0.5	0.48	0.52	0.53	0.46	0.49
Tel Aviv 100		0.58	0.59	0.67	0.66	0.6	0.54
Number of companies		90	29	11	15	11	53
FTSE North America	**0.64**	0.35	0.34	0.38	0.34	0.3	0.3
Tel Aviv 100		0.57	0.61	0.61	0.53	0.6	0.36
Number of companies		62	40	32	17	9	4
FTSE Europe	**0.82**	0.47	0.47	0.48	0.46	0.46	0.5
Tel Aviv 100		0.59	0.59	0.59	0.57	0.59	0.62
Number of companies		75	30	42	22	7	4
FTSE Asia Pacific	**0.75**	0.38	0.44	0.38	0.38	0.5	0.32
Tel Aviv 100		0.53	0.62	0.54	0.5	0.55	0.51
Number of companies		35	51	26	6	1	2
FTSE Latin America	**0.72**	0.37	0.4	0.36	0.44		
Tel Aviv 100		0.59	0.61	0.58	0.67		
Number of companies		14	58	13	1	0	0
FTSE Africa	**0.72**	0.37	0.41	0.37	0.36		
Tel Aviv 100		0.58	0.61	0.57	0.68		
Number of companies		10	59	9	1	0	0
Tel Aviv 100	**1**	0.59	0.59	0.28	0.6	0.53	0.61
Number of companies		101	1	3	9	17	72