Bank of Israel **Research Department**

The Heterogeneous Effect of the Exchange Rate on Firms in the Manufacturing Industries in Israel[1]

Arnon Barak* and Gilad Brand**

Discussion Paper 2022.12
June 2022

Bank of Israel - http://www.boi.org.il

[1] Thanks to Alon Eisenberg, Nadav Ben-Zev, Shai Tzur, Eyal Argov, Lior Gallo, Roni Frisch, Yoav Friedman, and Amit Friedman for their helpful comments. Thanks to Lifat Klopstock, Ronit Nissenboim, and Tali Nogarian from the CBS for their assistance in preparing the data file. Finally, our many thanks go to research assistant Gal Amedi for his meticulous and dedicated data work.

* Bank of Israel, Research Department, Email: bararnon@gmail.com
** Bank of Israel, Research Department, Ben-Gurion University
Email: Gilad.brand@boi.org.il

חטיבת המחקר, בנק ישראל ת"ד 780 ירושלים 91007
Research Department, Bank of Israel. POB 780, 91007 Jerusalem, Israel

ההשפעה ההטרוגנית של שער החליפין על החברות בענפי התעשייה בישראל

ארנון ברק וגלעד ברנד

תקציר

מחקר זה בוחן באמצעות שימוש במסד נתונים עשיר הכולל נתונים פרטניים ברמה של חברה, את ההשפעה שיש לשינויים בשער החליפין (שע״ח) הריאלי על פעילותן של חברות בתעשייה בישראל. השימוש בנתוני מיקרו כאלה מסייע לנו להתמודד עם אתגר הזיהוי, וכן להבחין בהשפעות הטרוגניות שונות.

תוצאות המחקר מעלות שייסוף של אחוז בשע״ח הריאלי מביא כעבור שנתיים לצמצום של כ-0.8% ביצוא של חברה בענפי התעשייה (ולהיפך לגבי פיחות). ההשפעה זו נמצאה חלשה יותר בחברות גדולות ובחברות בעלות פריון גבוה. מכיוון שהיצוא התעשייתי מרוכז ברובו בקבוצה מצומצמת של חברות אלו, ההשפעה המצרפית היא קטנה, לפחות בטווח הקצר.

כמו כן נמצא שייסוף מוביל לצמצום של המכירות המקומיות של חברות תעשייה, והשפעה זו חזקה יותר עבור חברות גדולות ובעלות פריון גבוה, עבורן החשיפה ליבוא מתחרה משמעותית יותר. היקף ההשקעות מושפע אף הוא מתנודות בשע״ח, כאשר חברות הנשענות על השקעות במכונות וציוד מושפעות באופן חיובי מייסוף, ואילו חברות העצימות במו״פ מושפעות באופן שלילי.

כתוצאה מכלל השפעות אלו, המחקר מוצא כי ייסוף ריאלי של אחוז בא לידי ביטוי כעבור שנתיים בירידה של כ-0.3% במספר המשרות בתעשייה.

The Heterogeneous Effect of the Exchange Rate on Firms in the Manufacturing Industries in Israel

Arnon Barak and Gilad Brand

Abstract

This study examines the effect of fluctuations in the real exchange rate (RER) on firms in manufacturing industries in Israel through the utilization of an extensive dataset containing granular firm-level data. The incorporation of such micro-level data serves to mitigate identification challenges and enables the differentiation of various heterogeneous effects.

The results of this study show that a one-percent appreciation of the shekel in real terms leads, within 2 years, to a decline of about 0.8 percent in the exports of an average manufacturing firm (and conversely for shekel depreciation). Notably, this effect was found to be weaker among larger firms and those with higher productivity levels. Given that Israel's industrial exports are predominantly driven by a select group of firms possessing these characteristics, the aggregate impact on exports appears to be small, at least in the short term.

Furthermore, the study finds that an appreciation of the shekel diminishes the domestic sales of manufacturing firms, with this effect being stronger among larger and more productive firms, for which the exposure to competitive imports is more significant.

Fluctuations in the exchange rate also influence investment decisions. Firms reliant on investments in machinery and equipment tend to experience a favorable impact from currency appreciation, while those strongly engaged in research and development (R&D) are adversely affected.

As a result of these effects, the study found that a one percent appreciation of the shekel is reflected within two years in a decline of about 0.3 percent in employment in the manufacturing industries.

1. Introduction

The effect of exchange rates on macroeconomic variables is a key issue in macroeconomic literature and has been the subject of extensive debate for many years. Various studies have proposed a range of channels through which exchange rate changes can potentially affect economic activity. In this study we utilize a rich database spanning the years 1997–2016 which includes granular firm level data.[1] These data facilitate dealing with the challenge of identification and allow us to identify various heterogeneous effects on a variety of manufacturing firms across industries. The research question at the core of this study is how changes in the real exchange rate affect the volume of a firm's exports, domestic sales, value added, investments, and the number of employee posts.

The way in which the exchange rate influences real economic activity is of great significance for policy makers. Intervention in the foreign currency market is one of the monetary policy tools employed by central banks, particularly in the aftermath of the Global Financial Crisis, which led to its widespread use for many years. Various fiscal measures may also affect the exchange rate. Therefore, identifying the heterogeneous effects of the exchange rate can shed light on the characteristics of firms that are influenced by these policy tools.

The exchange rate's effect on economic activity is not easily identifiable, as the exchange rate is determined by macroeconomic activity. Most of the empirical literature examines these issues by using aggregate variables, relying on various identification methods to overcome the problem of endogeneity. This literature has long recognized that real exchange rate fluctuations are weakly correlated with aggregate variables in the economy such as GDP, the extent of investment, and foreign trade. This result, anchored in the "exchange rate disconnect puzzle," triggered extensive discussion in the literature.

The past decade has seen a shift in the literature as it began to be based on firm-level data. These data facilitate dealing with the identification challenge, make it possible to track the activity of firms by means of panel data, and allow the identification of the exchange rate's heterogeneous effects on different firms. The most striking finding to emerge from this literature is that large exporters, characterized by high productivity, are less inclined to adjust their prices and sales volume in response to changes in the real exchange rate. Since exports in Israel are concentrated mainly in large firms characterized by high productivity,

[1] In the main analysis, we use a difference equation that includes lags such that the duration of the panel is shortened to 2000–2016.

this finding corresponds to some extent with the weak effect of the exchange rate observed in the aggregate data.

Berman et al. (2012) attribute this outcome to the structure of monopolistic competition, whereas Amiti et al. (2014) find that large exporters are also significant importers, leading to large firms being less sensitive to exchange rate changes.

Our research methodology is similar to that presented in the literature based on firm-level data. The use of such data, as mentioned, facilitates dealing with endogeneity issues, and allows us to rely on a relatively lenient assumption according to which the real exchange rate is exogenous for the individual firm.

The economic discussion usually revolves around the exchange rate's effect on exports. The findings of this study indicate that an appreciation of one percent in the domestic currency reduces a manufacturing firm's exports by approximately 0.8 percent over a two-year period (and vice-versa in the case of depreciation).[2] Similar to findings in the literature, we also observe that large firms and firms with high productivity are less sensitive than other firms to exchange rate fluctuations. Since manufacturing exports in Israel are concentrated among a small group of large firms that are characterized by high productivity, the aggregate effect of the exchange rate on manufacturing exports is negligible, at least in the short term. This finding contradicts previous studies that relied on aggregate data and found a relatively strong effect.[3]

The various tests conducted in this study are based on the assumption that the exchange rate is exogenous at the firm level. However, there are firms for which this assumption is not valid, and these firms account for a significant share of Israel's manufacturing exports. Therefore, the conclusion that the impact of the exchange rate on total manufacturing exports is negligible in the short term depends on the assumption that even these firms do not respond to exchange rate fluctuations, at least in the short term. This assumption is supported by findings in the literature from other countries, which show that the largest firms do not adjust price and sales volume in response to exchange rate fluctuations.

Furthermore, it was found that appreciation reduces domestic sales of an average manufacturing firm within one year with an elasticity of about 0.4. This decline is likely attributed to the erosion of domestic manufacturers' competitiveness when compared to rival imported goods. In contrast to the heterogeneous effect found on exports, the effect

[2] Simple averaging, each firm constituting one observation irrespective of its size.
[3] For example, the Bank of Israel (2020) found that elasticity of total manufacturing exports is 0.6 percent.

on domestic sales appears to be concentrated mainly among large firms characterized by high productivity. This is likely due to the fact that these firms are active within tradable sectors that are exposed to competing imports from abroad.

Investment is also affected by exchange rate fluctuations. Firms that rely on investment in machinery and equipment are positively affected by depreciation, whereas those intensive in R&D are negatively affected. This effect was found to be smaller in firms with high productivity.

As a result of these effects, we find that a 1 percent real appreciation is manifested in a 0.3 percent average decline in the number of employee posts in manufacturing.

However, it is crucial to bear in mind that this study calculates only the direct impact of the exchange rate on domestic manufacturing activity. Fluctuations in exchange rates are also expected to have indirect effects, for example, through private consumption and household incomes. Therefore, one cannot draw conclusions about the exchange rate's overall effect on employment and economic activity based solely on the aforementioned findings.

The study is divided into several main sections. In the next section, we review the relevant literature, followed by a description of the data and the empirical strategy, and then the results. We conclude with a discussion.

2. The literature

There is extensive literature addressing the question of the real exchange rate's impact on real economic activity in the economy. The classical approach posits that appreciation, measured in terms of the real exchange rate, reduces exports, allows imports to replace domestic output, and reduces real economic activity (and vice-versa in the event of depreciation). This approach, is described in Mundell's (1962) and Flemming's (1963) extension of the IS-LM model and is also a widely used basis for modern macroeconomic models.[4]

[4] This framework is based on the Marshall-Lerner condition, which states that real depreciation improves the trade balance provided that the shared elasticity of imports and exports relative to the exchange rate is greater than 1. Although strong support for this mechanism was found in earlier studies (Kose 1995, Mendoza 2002), more recent literature (Schmitt-Grohe and Uribe, 2013; Bahmani et al., 2018) indicates that the Marshall-Lerner condition does not hold in many countries. See also the discussion in Frisch (2016).

The literature that has emerged since has emphasized the complexity of the relationship between the exchange rate and real economic activity and indicates that the effect may even act in the reverse direction in certain cases. This possibility was first raised by Krugman and Taylor (1978), who argued that currency depreciation may also have a restraining effect on economic activity by raising import prices and, in turn, their negative impact on aggregate demand. Subsequent research has highlighted other mechanisms, such as the financial channel, wherein depreciation increases the value of firms' foreign-currency liabilities (Krugman, 1999)—a mechanism less relevant to advanced economies.[5]

The effect of exchange rate fluctuations on real economic activity may also depend on the type of shock that led to the exchange rate change. Blanchard et al. (2016) emphasize the heterogeneous effects of exchange rate shocks, and demonstrate that while appreciation originating in bond purchases by foreigners may have a restraining effect on exports, the entry of foreign currency into other investment channels has positive effects due to increased credit accessibility, partially offsetting some of the restraining effects of the appreciation.[6] Despite the expected interplay between exchange rate fluctuations and real economic activity through various channels, the literature struggles to document such a relationship. This outcome, first highlighted by Meese and Rogoff (1983a; 1983b) and further solidified by Obstfeld and Rogoff (2000) as the "exchange rate disconnect puzzle", has sparked extensive and ongoing debate in the literature.[7]

Another question discussed in the literature is whether a temporary deviation of the exchange rate from its equilibrium can have a long-term effect on the growth rate of the economy. The classical approach holds that an economy's long-term growth rate is determined by its underlying fundamentals, and a deviation of the exchange rate from its equilibrium may, at most, have a temporary effect. In contrast there is other literature that indicates several mechanisms in which temporary depreciation may also have a long-term

---

5 See, for example, Avdjiev et al. (2018).

6 This mechanism is found to be more relevant to emerging markets. Forbes et al. (2018) examine the pass-through from the exchange rate to domestic inflation by incorporating the nature of the shocks that led to the exchange rate fluctuations, and find that the pass-through varies according to the underlying factors driving these movements.

7 The classical approach to the "exchange rate disconnect puzzle" emphasizes the loose connection between floating exchange rates and aggregate variables such as the money supply, the output gap, and the current account. This weak connection clashes with the Keynesian approach, based on price elasticity, as presented *inter alia* by Frankel (1976), Dornbusch (1976), and Frankel (1979). More recent studies have found that exchange rates and the fundamentals of the economy tend to engage in a process of error correction (e.g., Tawadros 2017; Cerra and Saxena 2010; Bahmani et al. 2015). The literature also emphasizes the loose relation between the exchange rate and import prices (e.g., Gopinath and Rigobon, 2008).

effect. For example, temporary depreciation can assist nascent industries in establishing economies of scale.[8] A similar mechanism is based on the well-known phenomenon of "learning by exporting." According to this mechanism, firms active in the export market are exposed to advanced technologies, production methods, and intense competition from the global market, forcing them to improve efficiency and increase productivity. Therefore, temporary depreciation may help firms overcome the initial costs associated with exporting and attain a permanent improvement in productivity. In practice, evidence shows that the learning effect has a more significant impact in emerging markets than in advanced economies.[9]

The exchange rate may also affect the extent of investment and, in turn, future growth.[10] Brito et al. (2018) utilize individual firm-level data and find that in countries located near the cutting edge of technology, depreciation enhances the level of investment in the economy due to improved trade conditions and a quantitative increase in exports as a result. In contrast, in countries where investment relies primarily on importing physical capital, depreciation reduces investment due to import cost escalation.

In summary, the main findings in the literature point to two main directions. In the short term, the relationship between exchange rate changes and aggregate activity is relatively weak. In the long term, temporary depreciation may lead to a certain acceleration in growth (and the opposite for appreciation), but it is dependent on the impact that the exchange rate has on the level of investment.

To the best of our knowledge, no comprehensive research has been conducted thus far on the exchange rate's effects on the Israeli economy. Previous studies in Israel focused on estimating the elasticity of exports and imports to exchange rates (Sofer, 2005; Friedman and Lavy, 2006). They found a positive relationship between the exchange rate and exports and a negative relationship with imports.

---

[8] This mechanism was proposed, for example, by Krugman (1987) as a possible justification for imposing trade barriers.

[9] See, for example, Atkin et al. (2017) and De Loecker (2013), who provide evidence through randomized controlled trials (RCT) of learning effects in Egypt. Gallo (2011) found evidence of a learning-by-exporting effect in Israel and showed that after a firm begins to export, its efficiency rises by 12 percent over a five-year period.

[10] Another issue that arises in this context in the literature is the effect of exchange rate volatility on investment. Evidence in the literature shows that high currency volatility raises the risk premia and makes investment less worthwhile, but these effects are mostly limited to emerging markets. Caglayan and Demir (2019) demonstrate that investments in technology intensive and human capital-intensive products are less affected by real exchange rate volatility than labor intensive products. The authors attribute this finding to the fact that firms with advanced products have market power, making them less sensitive to price fluctuations.

The Bank of Israel (2018) found average elasticities of around 0.8 in manufacturing and 0.3 in business services, with the effect peaking after approximately two years. In an additional check by the Bank of Israel (2020), a slightly lower elasticity (0.4–0.6) was found in the manufacturing industries while no significant effect was found in the trade and services industries.[11]

A central reason for the lack of consensus in the literature regarding the intensity and direction of the real exchange rate's effect on aggregate economic variables is the endogeneity of the exchange rate. For example, an increase in global demand for exports from a particular country may lead to an expansion of exports and to currency appreciation. Consequently, it may create the impression that a deterioration in trade conditions (appreciation) widens export activities. Since an economy's aggregate variables and exchange rate mutually influence each other contemporaneously, the intensity and direction of the relation are not explicit. An appropriate approach to address this issue is an exogenous instrumental variable, although it is challenging to identify a suitable variable in this case.[12] Another alternative approach to address this issue is the use of micro data at the individual firm level. Such a database allows for a weaker assumption—that the real exchange rate is an exogenous variable at the individual firm level—and it also enables the identification of heterogeneous effects.[13] Over the past decade, literature predicated on this type of database has been emerging, leading to several key findings:

1. The relationship between a firm's exports and the real exchange rate is negatively dependent on the firm's size and its level of productivity (Berman et al., 2012).

[11] This finding contradicts those of Eichengreen and Gupta (2013), who find that the trade and services industries are more sensitive to exchange rate fluctuations, particularly in service industries that have high technological intensity. Eichengreen and Gupta assert that the high domestic value-added ratio, along with lower entry barriers to export markets, heightens these industries's sensitivity to relative price fluctuations.

[12] Previous studies relied on exchange rate lags as an instrumental variable and have demonstrated the robustness of these results. This approach is based on the claim, as suggested by Balassa-Samuelson, that posits that accelerated economic growth is expected to lead to currency appreciation. Therefore, the endogeneity of the exchange rate cannot be the determinant of the connection that has been found between depreciation and economic growth. However, there are mechanisms that weaken this claim. For example, domestic technological improvements that lower production costs may lead to a decline in prices, thus producing a bias that originates in a positive correlation between depreciation and economic growth. Rodrik (2009) discusses this. Habib et al. (2017), address these uncertainties by means of an instrumental variable, and corroborate the positive relationship between depreciation and growth that was found in earlier studies, albeit specifically for emerging markets.

[13] For example, it is unlikely that global demand for the products of all firms in the economy would rise uniformly, but rather that demand for the products of certain firms would rise independently. Therefore, for the other firms in the economy the resulting appreciation is exogenous.

2. Export elasticity relative to exchange rates decreases as import intensity increases, and large exporters are also large importers (Amiti et al., 2014).
3. Depreciation reduces productivity due to intermediate input cost escalation (Halpern et al., 2015).[14]

Berman et al. (2012) present the most comprehensive research based on disaggregated data directly addressing the issues examined in this study. The research demonstrates that firms with higher productivity levels tend to absorb exchange rate fluctuations and do not adjust the scale or prices of their exports in response to relative price changes. Furthermore, depreciation increases the likelihood of a firm starting to export. In the current study, we adopt a part of the research framework presented by Berman et al. (2012) and present results for Israel. The study also leverages the research method introduced by Brito et al. (2018), who investigated the effect of the exchange rate on firm investment volume.

3. The exchange rate and aggregate variables

The real exchange rate is defined as the ratio of the prices of an identical basket of goods between two countries when prices are measured in a common currency. A commonly used representation of the real exchange rate in Israel is through the effective exchange rate, which is defined as a weighted average of the shekel against Israel's 24 main trading partners — and in this study we use this definition. Nonetheless, it is possible that the NIS/USD exchange rate may represent the relevant rate more effectively because world trade prices are set largely in dollars (at least in the short term). For example, about 80% of the value of export transactions and approximately 65% of the value of import transactions in Israel are determined by the USD exchange rate.[15]

In addition to choosing the relevant currency, there are several ways to express the exchange rate in real terms. One commonly used approach is by deflating the difference between changes in the consumer price indices in Israel and abroad. Another approach is

[14] The main explanation provided by researchers for this finding is that imported inputs cannot substitute for domestically sourced inputs, thus reducing the firm's productivity when accessibility to a variety of intermediate inputs traded in global markets diminishes. Similarly, Gopinath and Neiman (2014) utilize firm-level data to examine Argentina's currency crisis in 2001, and found that the depreciation brought on a decrease in firms' imports of inputs, which in turn led to a decline in overall productivity.

[15] Data for 2018 from the Export Institute report (2019). The dominance of the dollar is well documented in Gopinath et al. (2020) and Ilzetzki et al. (2019), who show that the dollar's superiority in world trade intensified in the years following the 2008 crisis, after several years in which the importance of the euro currency increased.

to account for differences in changes in unit labor cost (ULC). The different currency rates used in this study are presented in Figure 1-A, and the correlation between the changes in these rates is shown in Figure 1-B. These charts indicate a strong correlation between the various definitions of the real exchange rate. Specifically, there is a strong correlation between the exchange rate deflated by labor-force cost and the exchange rate deflated by consumer prices. Therefore, this study focuses on the real exchange rate deflated by consumer prices, while distinguishing between the USD rate and the nominal effective exchange rate.

Years ago, the literature documented a weak relationship between the exchange rate and aggregate economic activity, and a similar picture emerges when examining the Israeli economy. This result is shown in Figure 2-A, which depicts the development of the real shekel-dollar exchange rate alongside the share in GDP of services exports, manufacturing exports, gross domestic investment, and investment in imported machinery and equipment. It is evident that the series are diverging. The weak correlation is also manifest in the short-term relationship among these variables. To examine this, we ran each variable with eight exchange rate lags and found a weak correlation between the exchange rate and manufacturing exports and investments, and no correlation between exchange rate development and service exports (Figure 2b). The weak correlation between the real exchange rate and various aggregate variables identified in this analysis, along with the concerns for endogeneity discussed above, highlight the importance of examining this issue by using disaggregated data.

4. The data

Our database includes microdata on manufacturing firms. We have detailed information about approximately 1,500 manufacturing enterprises from the Manufacturing Surveys of the Israeli Central Bureau of Statistics (hereinafter: CBS) spanning the years 1995–2016. The composition of the sample varies from year to year, making it an unbalanced panel. Furthermore, in 2004 and 2011 the CBS implemented substantial changes in the sample replacing half of the manufacturing firms each time. However, the database allows for individual tracking of firms from the short to the medium term as each firm in the dataset participated in the surveys for at least four consecutive years, and 90 percent of the observed firms in most years participated in the survey in the following year as well.

The main variables at the firm level are output, value added, number of employee posts, labor compensation, exports, domestic sales, and investments. (See definitions in the Appendix.) These data allow us to extract different definitions of labor productivity, whereby value added is divided by the number of employee posts and labor compensation. The results presented here are for defining productivity as labor compensation per employee post, and they are also consistent when defining labor productivity as value added per employee.

To examine heterogeneous effects across different industries, we augmented the database with indicators at the subindustry level, including share of exports and technological intensity. Similarly, in order to further control macroeconomic factors, the database includes variables such as unemployment rate, GDP growth, industry-specific global trade, and tourist arrivals, the latter as an indicator of the security situation in Israel. These tests focus exclusively on manufacturing industries. The results do not encompass the trade and service sectors due to limited data availability. Further details regarding this will be provided subsequently.

4.1 Descriptive statistics

Table 1 presents the characteristics of firms in selected industry groups in the years 2000 and 2016, clearly demonstrating the importance of exports in advanced manufacturing industries. The high-tech industries are also characterized by large firms that pay employees higher wages, as illustrated by the data on the average compensation per employee post. High-tech firms tend to invest more in software and R&D, whereas in more traditional sectors the focus of investment is on machinery and equipment.

A prominent characteristic of the manufacturing industries is the concentration of a significant portion of exports and, to a lesser extent, domestic sales and employment within a relatively small group of large firms. This characteristic is illustrated in Figure 3, which displays the share of large manufacturing firms in exports, domestic sales, and total employment. The comparison is presented for 2000 and 2016, and it is evident that concentration slightly increased during that study period.

Micro data on exports from CBS Manufacturing Surveys were obtained through direct reports by the firms regarding the volume of exports, and were validated by the CBS including, *inter alia*, the use of financial statements. The total exports in the sample, based on these data, evolved very similarly to the macro data on exports derived from CBS

publications on the balance of payments. Even though the CBS replaced half of the firms in the sample in 2004 and again in 2011, it is evident that these changes did not disrupt the continuity of the data. The aggregate exports of the manufacturing firms in our possession accounted for approximately 40 percent of total goods exports in 1996, and by 2016 its value had already reached 60 percent.

5. Empirical strategy

A firm can be affected by exchange rate shocks both through the relative price of exports and through changes in prices of inputs and in competing import prices. Since we do not have individual firm level import data, this study does not address the heterogeneous effects based on the extent of imports of inputs or exposure to import competition.

To examine the various effects of the exchange rate on firms by means of the different channels, we tested the connection between exchange rate shocks and the economic activity of the firm. The unique database in this research is predicated on firm level microdata. These data allow us to overcome the identification problem that arises in the relevant literature on this topic, since based on them we can rely on the relatively lenient assumption that the exchange rate is an exogenous variable for the individual firm. This is similar to the methodology presented by Berman et al. (2012). Based on this assumption, we are able to test the effect of changes in the real exchange rate on Outcome Variable Y in Firm j in Year t as follows:

$$(1) \qquad \Delta Y_{jt} = \alpha_0 + \sum_{i=0}^{n} \beta_i \Delta REER_{t-i} + \sum_{i=0}^{n} \delta_i WT_{t-i} + \sum_{i=0}^{n} \tau_i UN_{t-i} + \gamma_j + \mu_{jt},$$

where $REER_t$ is the real exchange rate (in various definitions) in Year t and n represents the number of lags. *WT* is a control variable for global trade in each subindustry. UN is the unemployment rate among the prime working ages (25–64), which represents the economy's position in the business cycle. γ is a firm specific variable. We tested several alternatives for Dependent Variable Y, including exports in USD, domestic sales, investment, number of employee posts in the firm, value added, and the probability of ceasing to export. The Manufacturing Survey includes weights that represent the prevalence of firms in the manufacturing industries. Using these weights, we estimate the effect on a firm in the manufacturing industries. To test the aggregate effect as well, we conducted separate estimations, in which we multiplied the weights of firms by their share in manufacturing exports. Similarly, we tested the aggregate effect on domestic sales by

multiplying the weights that represent the firms' share in manufacturing by their share in domestic sales, respectively for each of the outcome variables we analyzed.

Furthermore, although we have data available as early as 1995, we chose to focus on data starting from 1997 due to the development of Israel's exchange rate regime. Throughout most of the 1990s Israel operated under a diagonal-band regime, and it was only in 1997 that it implemented a floating exchange rate regime. We assume that the main effect of the exchange rate takes place over a two-year period. Therefore, the effect of exchange rate changes at a lag of up to two years under the floating exchange rate regime can only be examined starting from the year 2000.

This estimation is based on three main assumptions. The primary assumption, as stated, is that the exchange rate is exogenous for the individual firm. The second assumption, similar to the first, is that the unemployment rate is also unaffected by changes in the firm's employment level. The third assumption is that no significant macro variables were omitted after controlling for the business cycle. The sensitivity of the estimation outcomes to the exogeneity assumption can be examined by omitting the largest firms, as their activities can affect exchange rate fluctuations. A discussion on this issue is presented later. In contrast, it is challenging to address concerns about omitted variables, as there still may be relevant factors that were not taken into account. A commonly used approach to address this assumption is by adding time fixed effects. However, since the exchange rate in this study is a constant variable for all firms, we cannot combine fixed effects with an exchange rate variable.[16] To examine whether the results of our study are sensitive to these assumptions, we also estimated a specification that includes time fixed effects by adding an interaction term between the exchange rate and a variable representing different firm characteristics. Specifically, we estimate:

$$(2) \quad \Delta Y_{jt} = \alpha_0 + \sum_{i=0}^{n} \beta_i (\Delta REER_{t-i} \times \varphi) + \sum_{i=0}^{n} \delta_i WT_{t-i} + \gamma_j + \delta_t + \mu_{jt}$$

This estimation allows us to examine how the pass-through between the exchange rate and different outcome variables varies according to various firm characteristics. This is done by relying on the time dimension in the panel data to omit the fixed effects of all firms

[16] The databases on which Amiti et al. (2014) and Berman et al. (2012) relied also include information on export targets with a relevant exchange rate fitted to each target, such that different firms operate under different exchange rates. This added dimension allowed Amiti et al. and Berman et al. to add a vector of variables that reflects fixed effects for all firms each year. Israel does have data on export targets at the industry level, however we chose not to use them because they often reflect intermediate targets only, making it difficult to infer the relevant exchange rate for each industry from this data.

in each year. In this way, the estimation provides a better method to more effectively address concerns about an omitted variable.[17] However, this estimation does not allow us to distinguish the effect of the exchange rate on firm activities, but it does allow us to examine how this effect varies according to different firm characteristics. We discuss the results of this test later on.

An additional and important limitation of the research stems from the inability to distinguish between firms that exited the sample as part of the random sampling process and firms not participating because they ceased to operate. Various tests to assess the strength of the bias encountered difficulties.[18] It is reasonable to assume that the estimates in this study are underestimates, particularly among small firms.

Finally, we conducted additional tests (not presented) in which we attempted to examine whether there is a difference in the effect between appreciation and depreciation or between sharp fluctuations and moderate fluctuations in the exchange rate (nonlinear effects). These tests did not yield conclusive results, likely due to the fact that the available data in our sample cover a period of approximately twenty years, so there are insufficient observations of changes in the exchange rate. Our database, however, is rich in the cross-section—comprising a large number of firms—and therefore allows us to examine heterogeneous effects among the firms. Another direction of investigation is the effect of exchange rate volatility, but these tests also did not yield conclusive results.

6. Results

6.1 Manufacturing exports

Table 2 presents the estimation results of Equation (1) in different versions, indicating that a one percent appreciation is manifested a year later by a significant reduction of about 0.6 percent in a manufacturing firm's USD exports (and vice-versa in the case of depreciation). The effect reaches its peak at a two-year lag as the cumulative contraction stabilizes at 0.8 percent (fourth column in the table). The coefficients of the control

[17] The control variable in this estimation is global trade in each subindustry only, because tourist arrivals to Israel are constant for all firms and are therefore omitted from the estimation that includes fixed effects for the year.

[18] For example, we tried to estimate the probability of a firm exiting the sample due to characteristics that can be suspected as being correlated with the closure of businesses, such as a decrease in employment, a low rate of value added, and so on. These tests indicate that the ability to estimate the probability of exiting the sample is very weak.

variables are consistent with economic intuition: An improvement in global trade positively affects exports with the cumulative elasticity reaching unity within two years.[19]

In the main version of the equation, we chose to use the real NIS/USD exchange rate (adjusted for consumer price indices) because the USD is the main currency in which export transactions from Israel are denominated, making it crucial for exports in the short term. However, it is possible that in the medium term the real effective exchange rate is a more significant determinant for all exporters. Therefore, Column 5 presents the estimation results under the definition of the real effective exchange rate (also adjusted by consumer price indices) indicating that the aforementioned findings are not sensitive to the exchange rate definition (fifth column).[20]

The exchange rate's prolonged effect on exports aligns with economic intuition, as export volume does not immediately respond to changes in the exchange rate, and the effect of the exchange rate peaks with a lag of two years.[21] The reasons for this phenomenon are diverse. Many firms engage in hedging foreign currency, and contracts are often signed in advance for extended periods.

In 2011, the Central Bureau of Statistics (CBS) revised the classification of industries and conducted a significant update in its sample of firms. Therefore, many firms appear in the sample only before 2011 or from that year onwards.[22] Consequently there is concern that replacing a significant portion of the sampled firms may have caused a structural change in the relationship among the variables. To address this concern, we estimated the regression equation separately for firms sampled both before and after 2011. We found that the total effect of the exchange rate remains positive and significant but with a lower magnitude (0.5 percent), manifesting itself only two years later (Column 6).[23] This outcome indicates that firms sampled both before and after 2011 tend to be less sensitive to the

[19] We estimated various versions of the equation incorporating different control variables such as terms of trade, but they did not have a significant effect on the results.

[20] Use of the real effective exchange rate deflated by unit labor cost yielded a positive and significant coefficient, although with lower intensity.

[21] The coefficient of an exchange rate at a three-year lag is close to zero and not significant (see Appendix 2).

[22] Farther back, in 2004, the CBS made a major adjustment in the group of firms sampled (but without revising the classification of industries). Therefore, we conducted a similar check only for firms that were in the sample both before 2004 and after 2011. This check, too, revealed that the result remained stable.

[23] Although this estimation includes firms sampled before and after the crisis year, the panel is not totally balanced due to a relatively low turnover in the presence of these firms in the sample over the course of the years investigated.

exchange rate, apparently because, on average, they are larger and more productive (as found by Berman et al., 2012).

We conducted several robustness checks on these results (not presented). First, we tested the assumption that the unemployment rate is exogenous at the individual firm level. We ran Equation (1) while controlling for global trade volume, which reflects global developments (in addition to industry-level global trade), and the number of tourist arrivals to Israel, which captures the security situation. In this version, the assumption is that the security situation is the main differentiating factor between developments in Israel and the business cycle of the global economy.[24] The results were found to be stable and similar in this version as well, albeit with a lower level of significance. In another examination, we replaced the static equation with a dynamic version that includes lags of the dependent variable. We estimated this equation to control for the possibility that a firm's export activity in a given year is affected by its activity in the previous year, and even in this case the result remained stable. In yet another check, we ran Equation 1 for different lags, and this test confirmed the conclusion that the effect reaches its peak after one year and stabilizes over a two-year period. Adding additional lags does not contribute to the explanatory power of the equation.

Finally, the results in Table 2 only refer to rates of change of less than 100 percent (in absolute terms). This is due to concern that export growth at a rate of 100 percent or more may indicate data errors, values so small as to be insignificant for activity, or aberrant developments in a certain firm's activity that have no connection to the macroeconomic environment. The analysis above omits firms in the year in which they stopped exporting. A separate analysis will be dedicated to this phenomenon.

To check the sensitivity of the 100 percent limitation, we conducted several additional estimations. In some cases, we relaxed the limitation by excluding only observations with change rates exceeding a higher threshold, while in other cases we tightened the limitation by lowering the threshold. This check revealed that the results were relatively insensitive to the precise definition of the limitation, but it remained necessary to exclude change that

[24] Given Israel's small and open economy, along with the unique characteristics that are reflected in its security situation, it is easier to assume that through these two variables it is possible to monitor the business cycle in Israel. Eckstein and Tsiddon (2004) show, for example, that the security situation in Israel is a dominant variable that shapes Israel's business cycle, and that this variable contributed significantly to the worsening of the recession that the country endured in the early 2000s. Our test shows that approximately 40 percent of the variance in the growth of business output can be explained by global trade and tourist arrivals. Adding a variable for the unemployment rate does not improve the explanatory power and decreases the adjusted R-squared.

exceeds some threshold. Furthermore, we employed the robust regression method presented by Hamilton (1992), which includes a correction for aberrant observations. Using this approach, we found positive and significant coefficients for the lagged exchange rates.

6.1.1 Aggregate effect on exports

Thus far, we have discussed the exchange rate's effect on the exports of an average manufacturing firm and how this effect varies across different firms. We will now examine the exchange rate's effect on aggregate manufacturing exports. To do so, we estimated Equation (1) after weighting the firms in the sample according to their share in manufacturing exports.[25]

The results are presented in Column (7), which shows the estimate of the main specification (first column in the table) but now after weighting the firms according to their share of manufacturing exports. This estimation found that exchange rates had no effect whatsoever on aggregate manufacturing exports. As mentioned, a substantial portion of Israel's manufacturing exports derives from a small group of large firms. Therefore, this result may be due to these firms. To test this hypothesis, we excluded the top five manufacturing exporters from the sample (the third column in Appendix Table A-1) and, in the subsequent columns we excluded the ten and fifteen largest firms. This series of estimations reveals a significant effect (two years later) after excluding the top fifteen largest exporters. However, these firms were responsible for approximately 43 percent of manufacturing exports in 2016 (Appendix Table A-1). In other words, since a significant portion of the manufacturing exports come from the activity of a small number of firms, it appears that these firms do not adjust the volume of exports in accordance with exchange rate fluctuations. Therefore, it can be concluded that the exchange rate does not affect the volume of manufacturing exports, at least in the short term.

The findings should be qualified as it is possible that such an estimation violates the identification assumption. The estimation relies on the assumption that the exchange rate is exogenous at the individual firm level but may not be exogenous for large firms, which account for a significant portion of manufacturing exports.[26] That is, reliance on microdata does not allow us to extract the exchange rate's effect on aggregate manufacturing exports, due to the aforementioned identification limitation that was present in the background of

[25] As noted, the sample includes weights representing firms' share in the manufacturing industries. To estimate the aggregate effect, we multiplied the weights by each firm's share in manufacturing exports.

[26] Similarly, the unemployment rate may not be exogenous at the individual firm level.

the previous checks that we performed by means of aggregate data. Nevertheless, there is indeed a basis to assume that large firms do not respond to exchange rate changes by adjusting their volume of exports. For example, multinational firms' development centers tend to determine their revenues according to the cost of domestic inputs plus a margin (a cost+ method), where these services are not sold in the market and, therefore, their value is independent of the exchange rate.[27]

The lack of an exchange rate effect on large firms' exports is a relatively well-known phenomenon in the literature. This finding is evident, for example, in research conducted by Berman et al. (2012), who attributed this result to the structure of monopolistic competition, and by Amiti et al. (2014), who emphasized the significant role played by large exporters as importers as well. Insofar as these patterns also characterize Israel's largest exporters, which account for the vast majority of manufacturing exports (Figure 3), it is reasonable to assume that aggregate manufacturing exports are not significantly affected by exchange rate fluctuations, at least in the short term.

6.1.2 Heterogeneous effects on exports

After finding that there are significant differences between the exchange rate's effect on aggregate manufacturing exports and its effect on the average firm, we next examined the origin of the differences by conducting several different tests. First, we ran Equation (2), testing various alternatives for variable φ including labor productivity, firm size, and firm technological intensity. In this test, we found that the exchange rate's effect on a firm's exports is significantly dependent on firm productivity and the extent of firm output (Appendix Table A-2). Next, we ran Equation (1) by dividing the data into different subgroups (Table 3). The first column presents the baseline results for the entire sample (shown in Column 4 of Table 2), whereas Columns 2–3 show the same estimation divided into firms of low and high technological intensity, respectively.[28] As can be observed, the exchange rate's effect is significantly higher for firms with low technological intensity (1.3 elasticity two years later). In contrast, no significant effect was found for firms with high technological intensity.

[27] We should emphasize that while this argument is valid for the narrow time frame examined in this study, appreciation may have an adverse effect on the activity of development centers in the long run when multinational firms consider expanding or downsizing their domestic operations.

[28] High technological intensity is defined as industries involved in advanced technology and high-tech R&D, while low intensity refers to traditional industries and low-tech R&D.

Next, we examined the effect on the basis of firm size (in terms of output) and labor productivity.[29] This comparison revealed that the exports of small firms characterized by low labor productivity are significantly affected by fluctuations in the real exchange rate (Columns 4 and 6). In contrast, no effect was found among large firms with high labor productivity (Columns 5 and 7).[30] We next divided the firms between labor-intensive and capital-intensive (Columns 8 and 9). In this check, we found no significant differences.[31] Finally, we divided the sample by the industry's share of exports (Columns 10 and 11). This division allowed us to examine the differences according to the industry's degree of openness to international trade. In this analysis we found that the exports of firms that operate in tradable sectors are more affected by exchange rate fluctuations than are firms in less-tradable sectors.

To summarize, these series of tests reveal that the exchange rate's effect on firm exports is more significant for small firms characterized by low productivity, particularly those operating in highly tradable sectors. The most pronounced differences were found when the sample was divided based on productivity. This finding aligns with those of Berman et al. (2012).

In the last stage, we examined whether the heterogeneous effect that we found in the sample division based on labor productivity varies in a nonlinear manner. To do so, we ran Equation (1) in a rolling window for different levels of productivity (Figure 4a) by dividing the sample into productivity percentiles and performing the estimation in a rolling window at the width of half of the firms. For example, at the far-left side of the figure, the coefficient of the exchange rate is presented for firms in the 1–50 percentile range of productivity, while on the right the coefficient for firms in the 2–51 percentile range is shown. The shaded area in the figure presents a 95 percent confidence interval.

This comparison demonstrates that the exports of firms characterized by low productivity are significantly affected by exchange rate fluctuations, but the effect diminishes rapidly as the estimation window slants toward firms with higher levels of productivity (a rightward shift in the figure). The figure also depicts the distribution of

[29] For each observation, per-employee productivity was calculated in terms of standard deviation from the mean for that year. Per-employee productivity is defined as the average of this distance, and the median is defined based on the multiyear average.

[30] A division according to firm size in terms of employees indicates similar results.

[31] This division was conducted by measuring the ratio of total wage payments to value added. Firms with a rate of return on labor higher than the median were defined as labor-intensive, whereas those below the median were defined as capital-intensive.

employment (in blue) and exports (in gray) across various levels of productivity. For example, firms in the 1–50 percentile range of productivity account for only 8 percent of manufacturing exports and employ 30 percent of the workforce in manufacturing firms that export. For firms in the upper productivity segment (the right end of the figure), which employ the remaining 70 percent of workers and account for 92 percent of manufacturing exports, the exchange rate's effect on exports is not significantly different from zero. A comparison based on firm size (in terms of output) yields similar conclusions (Figure 4b).

This comparison illustrates that there are many firms that are affected by exchange rate fluctuations, but their contribution to aggregate exports is negligible. In contrast, their contribution to employment in small exporting firms is slightly more significant, and for these firms, exports constitute a substantial share of the firm's sales. Manufacturing firms below the productivity median, for example, generate only 8 percent of manufacturing exports and account for approximately 30 percent of wage employment. For these firms, the export-to-output ratio is relatively significant, at around 40 percent. That is, while exchange rate fluctuations are expected to have a relatively negligible effect in terms of scale of exports, they may have more significant implications for employment in the manufacturing industries, particularly among workers in low-productivity firms.

6.2 Cessation of exports

The exchange rate's effect on manufacturing exports can also be demonstrated in the number of firms choosing to export each year. Examining the proportion of manufacturing firms that started or ceased to export during the period investigated reveals that the rates of initiation and cessation appear to be trendless, both averaging around 3 percent per year.

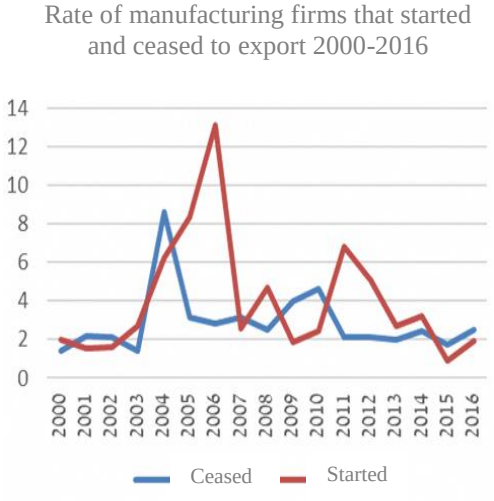


Table 4 presents the results regarding the exchange rate's effect on firms' decision to suspend exports. Columns 1–4 show that a 1 percent appreciation increases the likelihood that an average manufacturing firm will stop exporting by 0.3 percent within two years. A similar check for the probability of firms initiating exports did not yield significant results and is not presented.

A check based on various firm characteristics shows that the effect is more significant among small firms characterized by low productivity, and where labor input is a substantial component of value added (Table 5 and Figure 5).[32]

Since exports constitute a significant portion of these firms' activity (the green curve in the figure), ceasing to export reduces the firm's survival capability. It is also important to note that these findings, similar to others in the study, are underestimates, as they do not account for firms that ceased to operate or exited the sample. Therefore, it is reasonable to assume that the actual effect is even stronger, particularly among small firms.[33]

The findings regarding firm size and productivity are generally consistent because large firms tend to be, on average, highly productive ones—either because they have economies of scale or because initially strong productivity helps them to expand and grow. These results align with those of Berman et al. (2012), who reported that highly productive manufacturing firms are less sensitive to changes in the exchange rate on average due to their larger market power.[34] The results are also consistent with the research conducted by Amiti et al. (2014), who found similar results for firms that are large exporters, as they also tend to be large importers and also because they have market power. Another reason for the relatively weak (short-term) sensitivity of large firms in Israel, evidently, is the stronger inclination of large firms to hedge their foreign currency transactions.[35]

6.3 Domestic sales

Changes in the real exchange rate can affect manufacturing firms not only through their foreign sales, but also through domestic sales via the channel of competing imports. This test is presented in Table 6, which shows the estimation results of Equation (1) using different versions for domestic sales in manufacturing. The findings indicate that a 1 percent real appreciation of the shekel against the US dollar reduces domestic sales of a

[32] This result is contingent upon the definition of "export cessation." The results presented in Table 3 are based on the definition that we have chosen according to which a company is considered to have ceased to export only if its export value previously exceeded USD 500,000. The definition is intended to reduce the noise emanating in low value exports, which may or may not represent actual exports or random incidental activities. A robustness test that we conducted regarding the chosen threshold indeed indicates that this result is preserved for a higher threshold but diminishes for lower amounts. An additional condition is that export volume has declined by 95 percent.

[33] We have no information regarding the year of establishment or closure of firms.

[34] The market power of large firms enables them to influence the price and not accept it as a given.

[35] See the survey results in "Israeli Exports—Challenges and Solutions," Israel Export Institute, Manufacturers Association of Israel, and Foreign Trade Administration (2015). See also "Findings of a Survey on the Effect of Appreciation on Manufacturing Companies," Manufacturers Association of Israel (2008, 2009).

typical manufacturing firm by 0.4 percent annually. The effect is slightly higher—around 0.5 percent for the real effective exchange rate.

The last column in the table presents the aggregate effect obtained after weighting the firms in the sample according to their share in total domestic sales and manufacturing. This estimate shows lower aggregate elasticity, about 0.3 per year, and it appears that the effect dissipates after two years. The lower estimate apparently originates from a small group of particularly large firms that are responsible for a significant portion of domestic sales. For example, excluding the top five, ten, and fifteen largest firms from the sample increases the estimated elasticity (Appendix Table A-3). It also appears that the domestic sales of the group of particularly large firms are less sensitive to exchange rate volatility (Appendix Table A-2).

Examination of the heterogeneous effect finds that large firms with high productivity and characterized by high technological intensity are more sensitive to exchange rate fluctuations (Table 7). That is, the heterogeneity found in this test differs from that obtained with regard to exports. This is probably due to the fact that large high-productivity firms operate in more tradable sectors and are therefore more exposed to imports from foreign competitors. Evidence of this can be found in the last column of the table, which presents the estimation results divided by share of exports in the industry as an indicator of the extent of openness to international trade. Domestic sales of firms in the tradable sectors are found to be more sensitive to exchange rate fluctuations, in terms of both the intensity and speed with which the effect is expressed.

These results are also shown in the rolling window for different levels of productivity and output, similar to the previous explanation (Figure 6a and 6b). This comparison demonstrates that elasticity rises with productivity and output. Additionally, the figure presents the export share of firms in their sales (green curve) as a measure for openness to international trade. As evident, large firms and those noted for high productivity operate in more tradable sectors, and are therefore probably more sensitive to competing imports.

In conclusion, it appears that exchange rate changes are reflected in the domestic sales of highly productive large firms. This is likely due to the fact that these firms operate in sectors exposed to imports from foreign competitors. Among this group of particularly large firms, it is evident that their elasticity is smaller and the effect dissipates over time.

6.4 Employment

Next, we examine how the contrasting heterogeneous effects of exports and domestic sales are manifested in employment. The results of this analysis, shown in Table 8, indicate that the employment elasticity of manufacturing firms relative to the exchange rate is 0.3 at 10 percent significance (fourth column). This is similar to the aggregate elasticity obtained from weighting the firms in the sample by their job count (last column).

A more detailed analysis using a rolling window based on productivity, shows how the contrasting effects of the exchange rate on domestic sales and exports are reflected (Figure 7a). According to these results, exchange rate fluctuations are not reflected in low-productivity firms, as those firms do not export and are not exposed to competing imports. In contrast, the effect peaks among firms around the center of the productivity distribution, for which the effect is observed both through exports and as a result of exposure to competing imports.

For firms characterized by high productivity, the effect is lower because their exports are less affected by changes in exchange rates. For these firms, the main influence is domestic sales, which are exposed to competing imports. In another test, we examined the heterogeneous effect in a rolling window based on firm size (in terms of output). This comparison more clearly illustrates that the effect of exchange rates peaks (unit elasticity) in firms around the center of the firm size distribution (Figure 7b).

6.5 Value added

Another series of tests we conducted was designed to examine how exchange rate fluctuations affect the value added (in domestic currency) of a firm. Value added is defined as output minus the sum of inputs at current prices, representing gross profit before labor costs. Although these tests found a low elasticity of about 0.4 (which is not significant) for an average firm, the aggregate effect was found to be strong (Table 10).[36] For example, aggregate elasticity was measured at 0.7 percent for the contemporaneous period and slightly higher than unit elasticity a year later. The cumulative elasticity over two years eventually stabilizes at approximately 0.7. These elasticities are apparently the outcome of

[36] Similar to previous comparisons, the aggregate effect is calculated by weighting the firms in the sample, where the firm's value added as a share of the total value added in the manufacturing industries serves as the weighting factor.

the immediate effect that the exchange rate has on export value (in domestic currency) alongside an effect on sales volume, particularly in the domestic market.

The reason for the differences between the aggregate effect and the lower effect measured for the average firm stems from the concentration of exports and domestic sales in the hands of a small number of large manufacturing firms. These firms are exposed to exchange rate fluctuations both due to the erosion of export value and because they tend to operate in sectors exposed to import competition, which in turn affects the volume of domestic sales. As evidence, the value added of large firms with high productivity was found to be more sensitive to exchange rate changes (Table 11). Finally, a check of the heterogeneous effect using a rolling window finds that the effect stabilizes at unit elasticity among large firms with high productivity (Figure 8). In other words, although it was found that large firms are primarily affected through domestic sales and do not adjust their export volume in response to exchange rate changes, these changes strongly affect the value added of the firms.

This conclusion is further sharpened by focusing on manufacturing firms in high-tech sectors only (Column 3 in Table 11), for which it was found that the exchange rate's effect on value added is particularly high (1.7 elasticity two years later). Therefore, it is possible that significant and prolonged changes in the exchange rate will be reflected in employment on a more substantial scale than estimated in this study.

6.6 Investment

So far, we have examined the short-term effect of the exchange rate on firm activities up to a two-year horizon. This is due to database limitations and research methodology, which are limited in identifying long-term effects. However, some indication of long-term effects can be obtained by examining the effect on firms' investment volume.

The direction of the exchange rate's effect on the volume of a firm's investment is not self-evident. On the one hand, appreciation reduces import cost and therefore incentivizes firms to increase import-intensive investments. On the other hand, appreciation erodes the firm's competitiveness relative to foreign competitors. Brito et al. (2018) show that appreciation contributes to investments in countries where manufacturing is characterized by a low level of sophistication in terms of product variety and uniqueness as well as in terms of distance from the technological frontier. In contrast, the reverse effect is observed in countries where production is advanced, as investment tends to be less import-intensive

and more research and development oriented. The reason is that in these cases, depreciation's contribution to export profitability is greater than the cost savings from imported machinery, since a significant portion of investment is not import-intensive (R&D, infrastructure, etc.).

Our examination of the exchange rate's effect on investment does not yield a clear result (Table 13). However, an examination of the heterogeneous effects based on different firm characteristics sheds light on contrasting channels of influence. For example, we found that appreciation increases investments in high-tech-intensive and capital-intensive firms (Columns 3 and 4, 8 and 9), apparently because appreciation reduces the cost of investment in imported capital, and this channel seems to outweigh the erosion of competitiveness vis-à-vis foreign competitors. Conversely, no significant differences were found when examining the effect based on firm productivity and size.

These results likely reflect the unique channel of influence on investment: Appreciation negatively impacts investments of firms whose level of activity is sensitive to the exchange rate, but this effect may be offset if the value of the imported investment is significant. Therefore, it is reasonable to assume that firms with high worker productivity were found to be more sensitive to the exchange rate because they tend to invest more in software and R&D. Consequently, the composition of investments in these firms tends to be less import intensive.

To examine whether the composition of investment is indeed a significant determinant of investment sensitivity to the exchange rate, we also checked sensitivity across different groups based on the rate of their investment in domestically oriented products (software and R&D) versus typically import-intensive products (machinery and equipment, automobiles, computers, and furniture). The division was made based on the ratio of R&D investment to capital investment with the median serving as the cutoff point. In this comparison, it was found that the firms inclined to invest in R&D tend to reduce their investment volume as a result of appreciation, evidently due to erosion in competitiveness vis-à-vis foreign firms. In contrast, capital and machinery intensive firms tend to increase their investments as a result of appreciation mainly due to the lower cost of investment (Columns 10 and 11).

This result is consistent with a rolling window analysis, where the division is determined by the ratio between R&D investments (the domestic component) and capital-and-equipment investment (imported products). It clearly demonstrates that the direction

of the effect varies according to the investment profile of the firm. For R&D-intensive firms, the exchange rate is found to have a positive effect on investment volume, indicating that appreciation reduces the firm's investments. In contrast, for firms with import-intensive investment, a negative effect is observed (though not statistically significant).

Finally, we examined whether these effects are sensitive to the firm's productivity level. To do so, we ran this test in a rolling window where the cutoff was determined based on the level of productivity. We separately analyzed the group of R&D-intensive firms and the group of firms that are machinery and equipment intensive (according to the division presented in Columns 10 and 11 in Table 13). This test reveals that the positive effect (for R&D-intensive firms) and the negative effect (for those whose investments are concentrated on capital and machinery) dissipate as the firm's productivity increases. These findings regarding the composition of investment reinforce the conclusion presented above that as firms engage in more advanced activities, their investment becomes more dependent on expanding exports, and are less affected by the cost of imported investments.

In conclusion, depreciation has a positive effect on firms that tend to invest in domestic products such as R&D, while they have a negative effect on the investments of firms that tend to invest in imported products. These effects are less significant for highly productive firms.

7. Conclusion

This study examined the effect of the real exchange rate on the activity of Israeli firms in manufacturing industries. The research focuses on the question of how fluctuations in the real exchange rate affects a firm's volume of exports, domestic sales, investments, value added, and the number of employee posts. The study was based on a unique database that contains individual firm-level data spanning the years 1997–2016. This database address the challenge of identification by utilizing an extensive dataset containing granular firm-level data. The incorporation of such micro-level data serves to mitigate identification challenges by relying on a relatively lenient assumption that exchange rates are exogenous for the individual firm.

The study finds that a real appreciation of 1 percent in the shekel reduces the average exports of manufacturing firms by 0.8 percent within two years—slightly higher elasticity

than that observed in the literature.[37] Furthermore, it was found that appreciation increases the likelihood of a firm to exit the export market. Appreciation also negatively affects domestic market sales in the following year, with an elasticity of 0.4 for an average manufacturing firm. Apparently, this is because appreciation erodes the competitiveness of domestic manufacturers against competing imports.

Similar to findings in the literature, the exchange rate's effect on exports was found to be more significant for small firms with low productivity. Given that manufacturing exports in Israel tend to be concentrated among a small number of large firms characterized by high productivity, and since the findings in the literature and in this study indicate that these firms' sensitivity to the exchange rate is relatively weak, the exchange rate's effect on aggregate manufacturing exports is small, at least in the short term.

In contrast, the effect on the volume of domestic sales was found to be more significant for large and highly productive firms, as these firms tend to operate in tradable sectors, and are therefore more exposed to competing foreign imports. As a result of the combination of these two channels of impact, exchange rate fluctuations are more significantly reflected in employment among firms positioned in the center of the productivity and size distribution.

Checking the exchange rate's effect on firms' value added, we found a more meaningful effect on large firms typified by high productivity due to the impact on the value of their exports (in domestic currency) and their domestic sales. For these firms, the elasticity of value added to the exchange rate verges on unity. It seems, however, that large and highly productive firms absorb some of the effect of exchange rate fluctuations on their value added, making the impact on these firms' employment relatively small.

All these effects relate to the short term of up to two years. In the long term, there may be additional effects that cannot be captured by this research method. Indications of longer-term effects can be inferred by testing the exchange rate's effect on the volume of investments. The results show that appreciation reduces investments in firms in which investment is concentrated on products that are domestically sourced (R&D) due to erosion of competitiveness against foreign firms. In contrast, firms that concentrate their investments in import-intensive products (machinery and equipment, automobiles, computers, and furniture) tend to increase their investment as a result of lower investment

[37] Berman et al. (2012), show a division of the sample into deciles according to firm size, and show that elasticity oscillates in a range of about 0.4–0.6 for the eight lowest deciles, commensurate with firm size. This elasticity decreases significantly in the two highest deciles.

costs (in domestic currency). These overall effects diminish the higher the firm's productivity.

The research does not focus on the services sector due to various data limitations. However, the conclusions derived from the test relating to manufacturing industries suggest that the effect of exchange rate fluctuations on service industries is probably limited. This is due to the concentration of service exports in high-tech fields characterized by high levels of productivity. It can be assumed that exports are less affected by exchange rate fluctuations, at least in the short term. Although it was found that highly productive firms are affected in terms of domestic sales, the extent of domestic sales in the service sectors exposed to foreign competition is relatively limited (except for tourism services).

Looking forward, the share of manufacturing exports, particularly those of low technological intensity firms, is steadily declining alongside an increase in services exports. Consequently, it is reasonable to assume that the short-term effect of exchange rate fluctuations on the activity of Israeli firms has declined since the completion of the research period.

In this study, we focused on the impact of the rate of exchange rate change on the firm without considering the effect of the extent of exchange rate volatility, even though this factor may also affect the same variables being examined. While appreciation has a direct negative effect on profitability, exchange rate volatility may lead to indirect costs for firms attempting to mitigate uncertainty such as engaging in hedging activities in foreign currency transactions. Although we did not find that volatility has a direct effect on the variables in the different tests we conducted, this result may be primarily attributed to a negative correlation between the rate of exchange rate changes and its volatility. That is, in the survey period, years of currency appreciation usually coincided with higher exchange rate volatility. In our understanding, the correlation between these two variables makes it challenging to separate the effect of exchange rate change from the effect of exchange rate volatility. Therefore, it is possible that part of the firms' response reported above reflects a reaction to higher exchange rate volatility and not only to appreciation itself.

Furthermore, the database used in this study, consisting of annual data and a relatively short research period, does not allow for examining the exchange rate's nonlinear effects, i.e., whether the effect intensifies (or diminishes) for large changes in exchange rates. Tests conducted around years in which there were sharp fluctuations in exchange rates (2007–2008 and 2014) did not yield clear results.

It is important to remember that the current study only estimated the exchange rate's direct contribution to domestic manufacturing activity. However, exchange rate changes are also expected to have indirect effects, for example through private consumption and household income. Therefore, it is not possible to draw conclusions from the aforementioned results regarding the exchange rate's overall effect on domestic employment and economic activity.

The exchange rate's heterogeneous effect on firms highlights the need for policymakers to consider the policies' effects on exchange rates. As an example, grants and benefits provided to large exporting firms may, through the exchange rate mechanism, displace small, low productivity, and low-technological-intensity firms from the export market and from manufacturing for the domestic market due to the entry of competing imports.

An interesting question is to what extent exchange rate shocks are reflected in the distribution of human capital across economic sectors. We leave these issues for future research.

Figure 1a
Real Exchange Rate According to Various Definitions
(index: 2000=100)

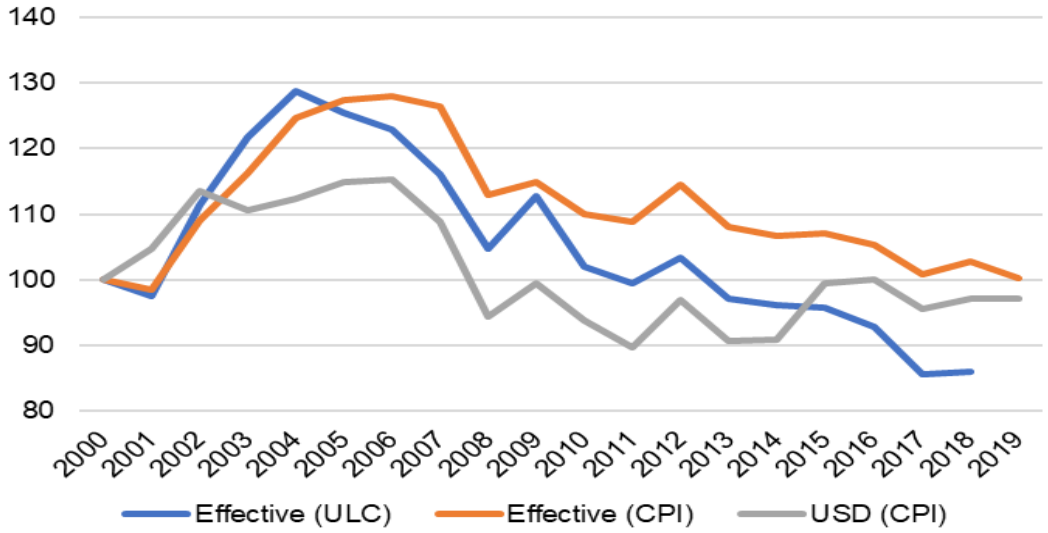
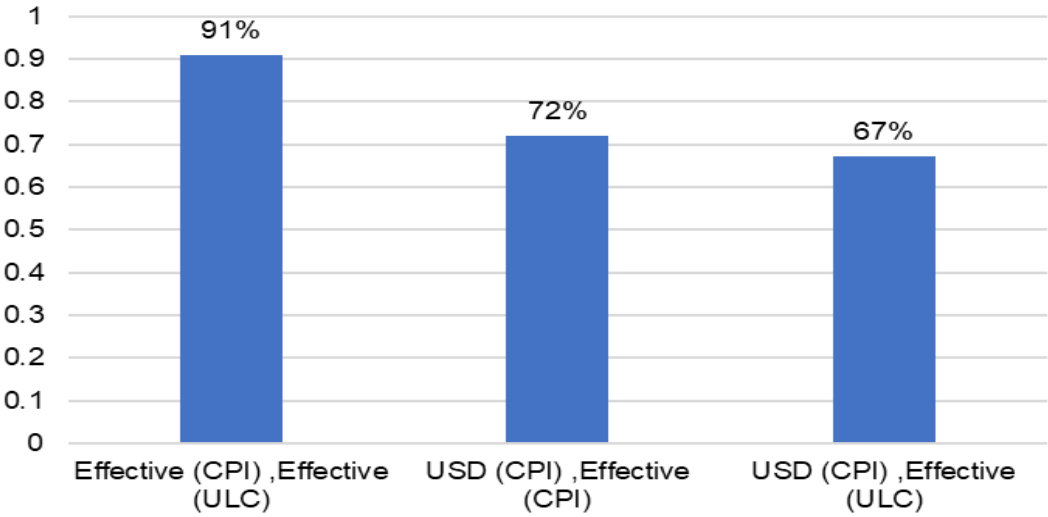
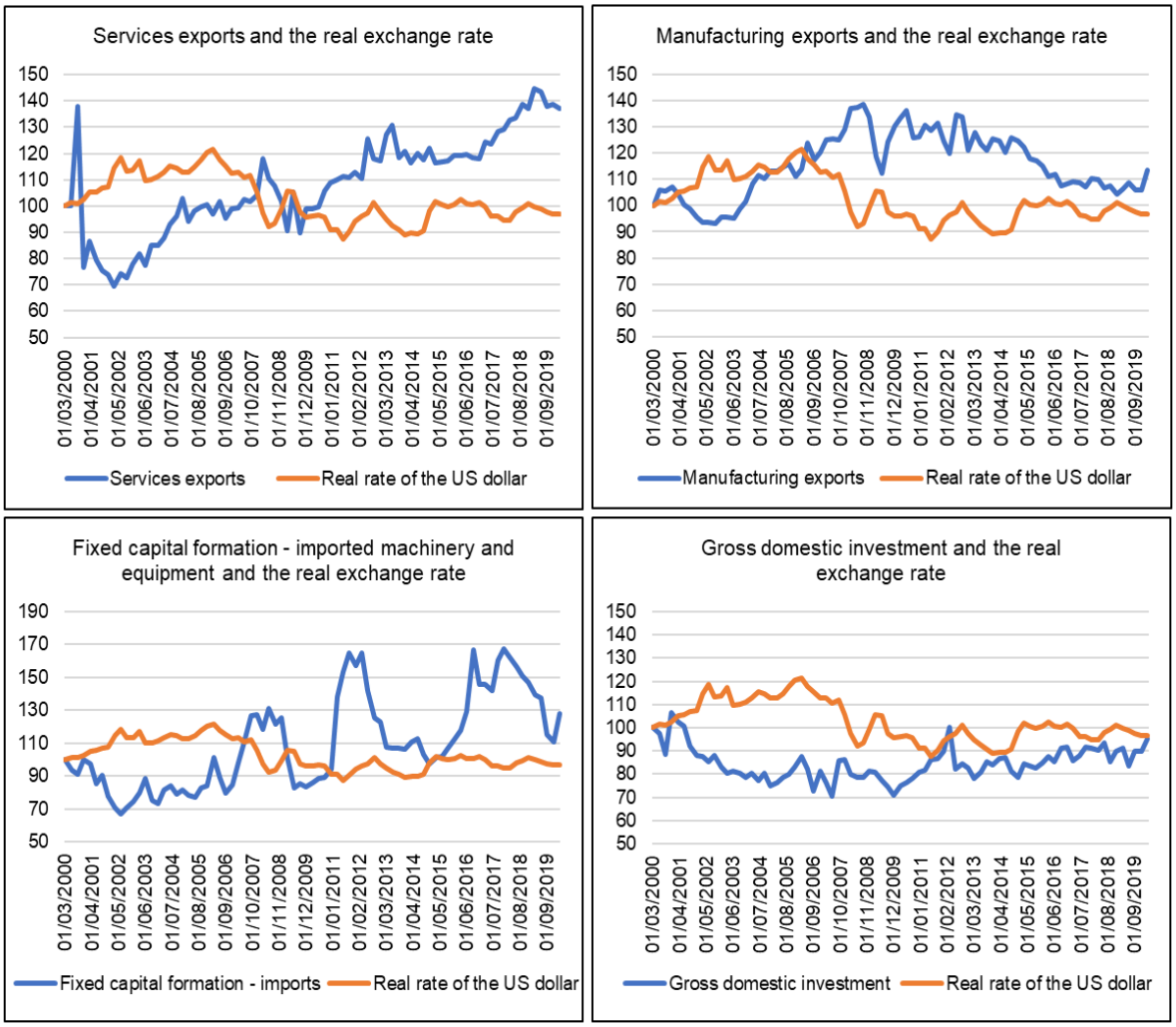


Figure 1b
Pearson Correlation for Changes in the Real Exchange Rate According to Various Definitions



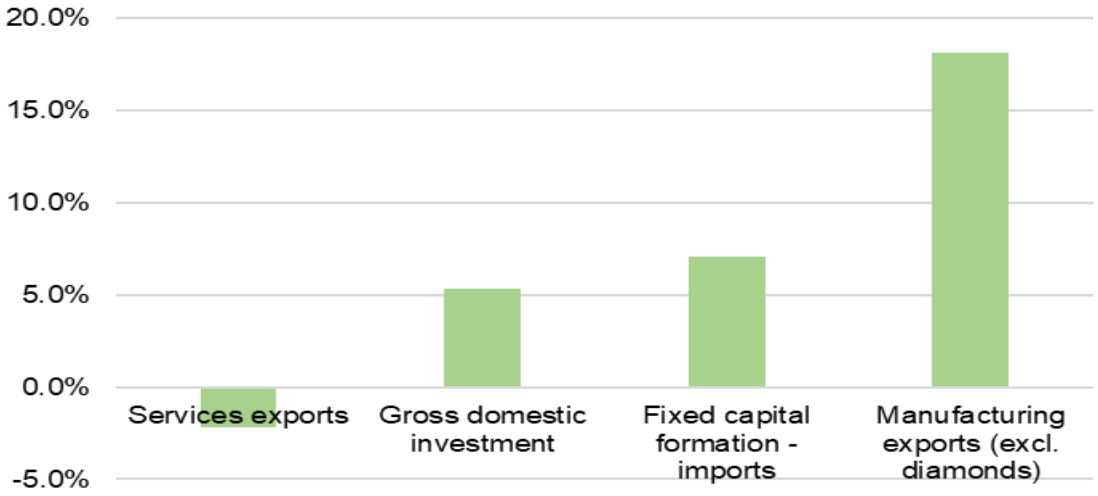
* Annual data, 2000–2019.
SOURCE: Based on Bank of Israel data.

Figure 2a
Real Exchange Rate and Various Aggregate Variables (index: 2000=100)



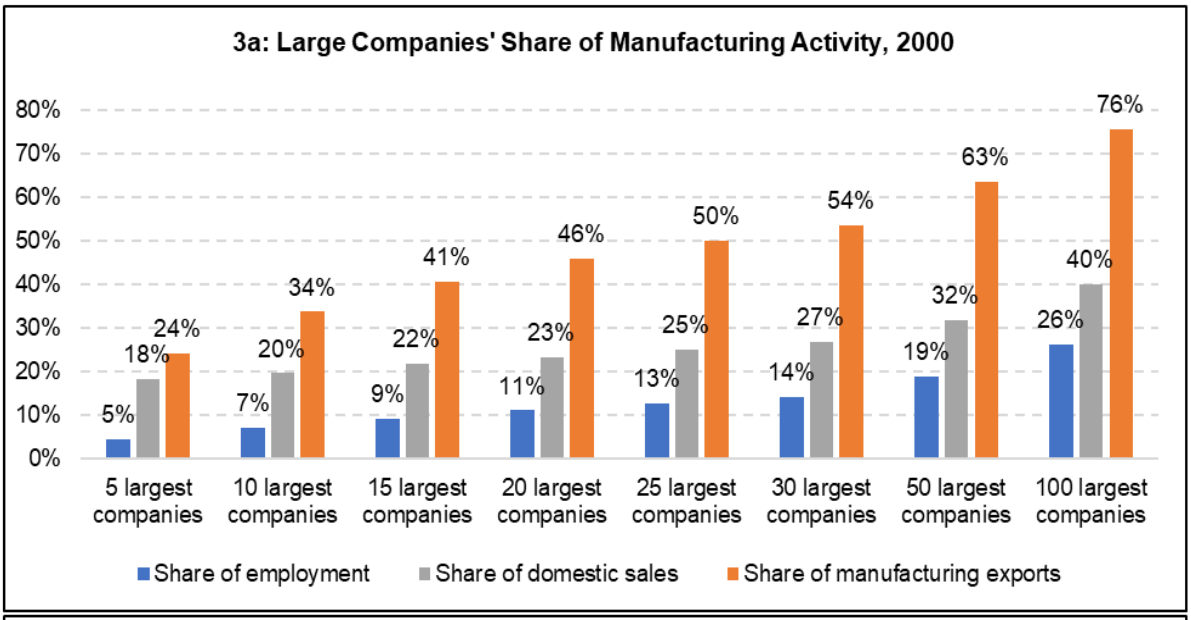
SOURCE: Based on Central Bureau of Statistics and Bank of Israel data.

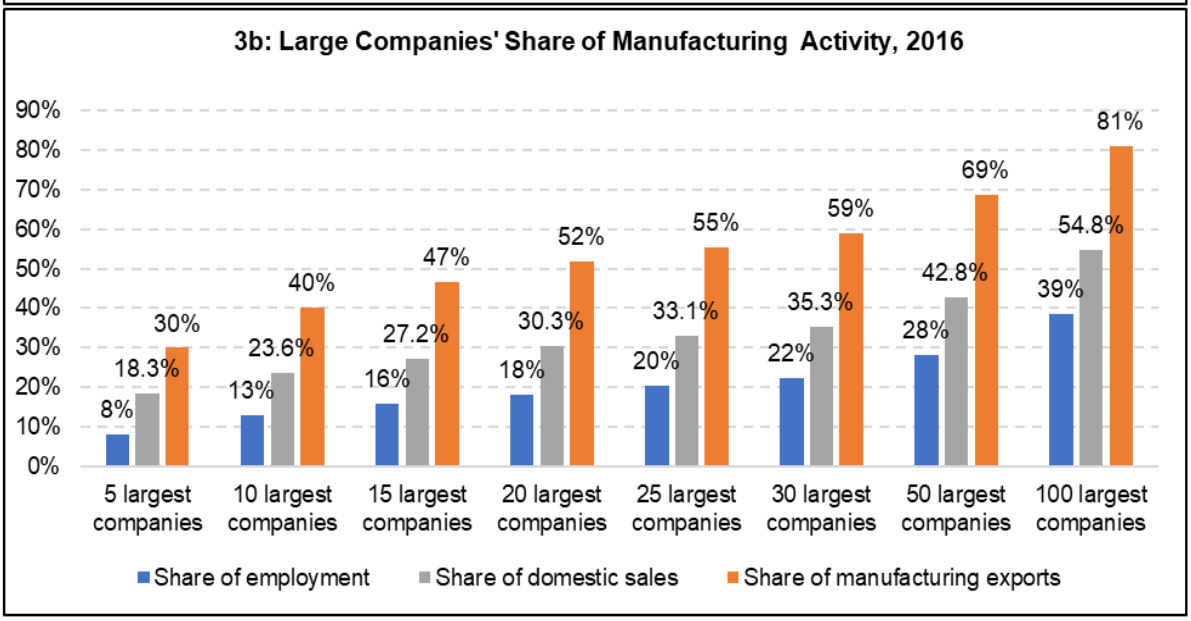
Figure 2b
Short-Term Link Between the Real Effective Exchange Rate and Aggregate Variables, 2000–2019*



* The adjusted partial R^2 between various variables and the lagged quarters of the real effective exchange rate, seasonally adjusted quarterly data.
SOURCE: Based on Central Bureau of Statistics and Bank of Israel data.

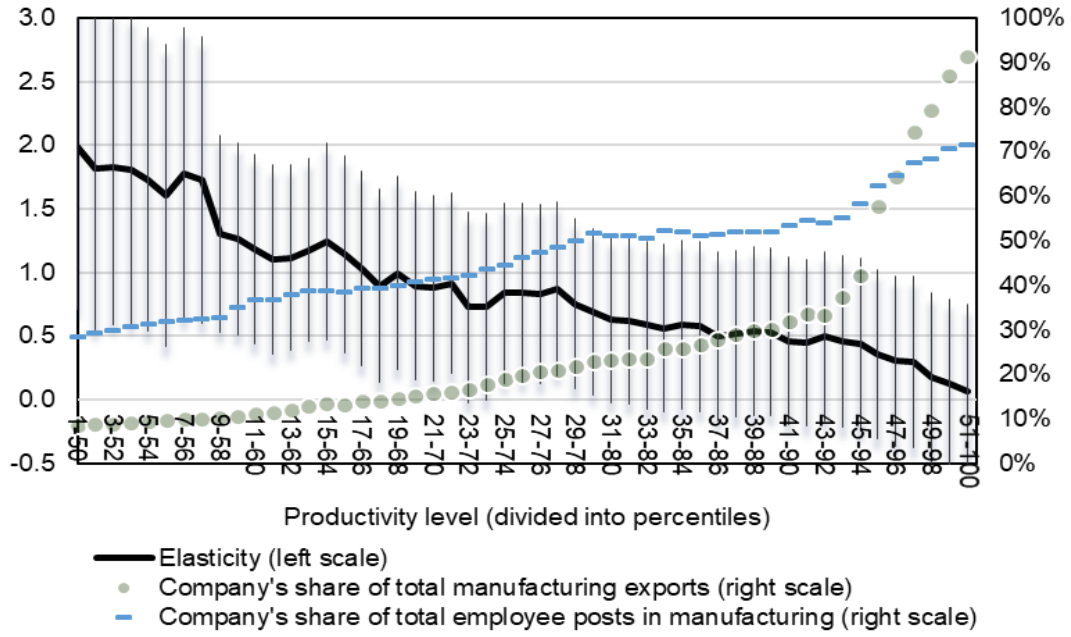
Figure 3
Large Companies' Share of Exports, Domestic Sales, and Employment in Manufacturing Industries





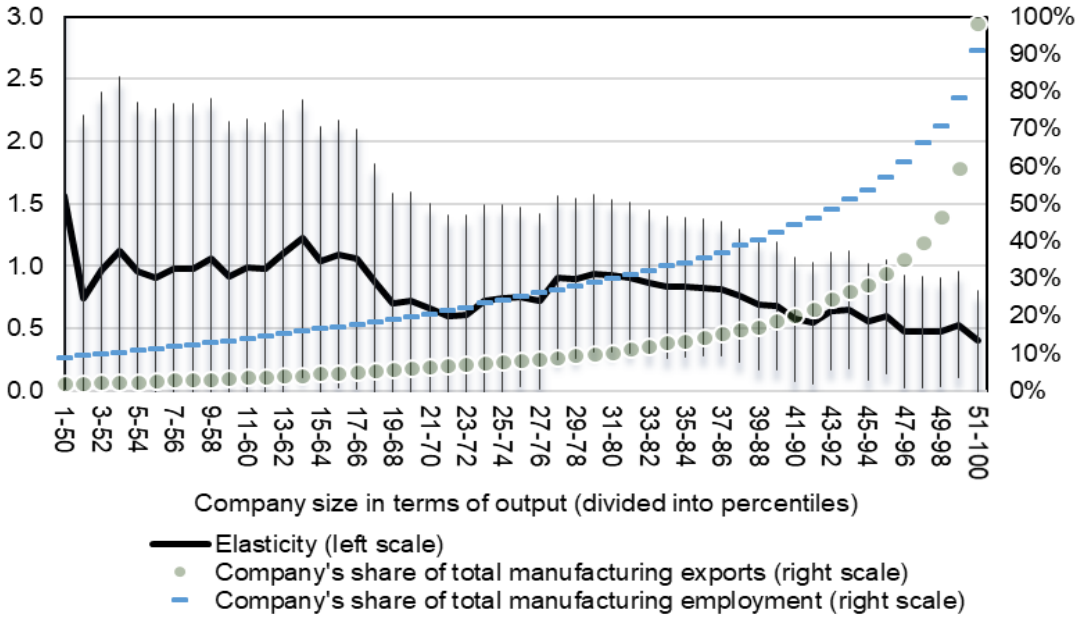
SOURCE: Based on Central Bureau of Statistics data.

Figure 4a: Real Exchange Rate's Effect on the Exports of Manufacturing Firms, Various Productivity Levels*



* Cumulative after two years, rolling window by productivity level.

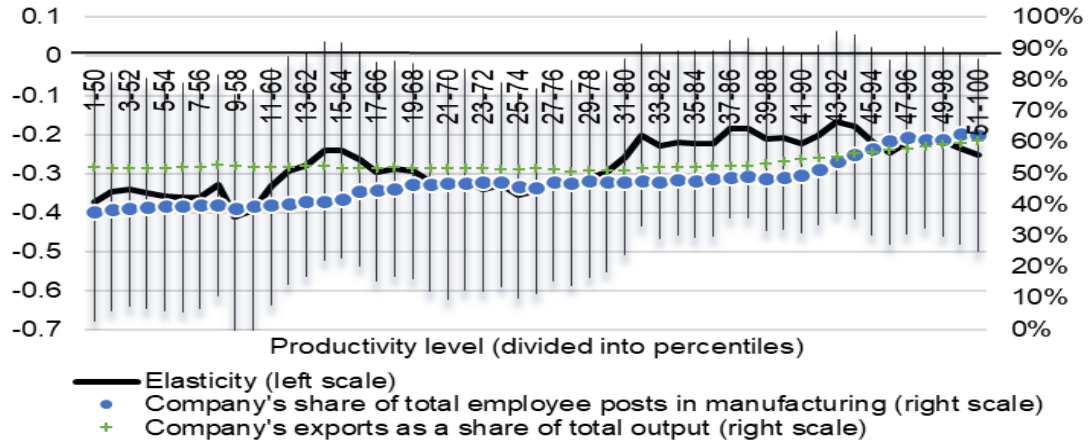
Figure 4b: Real Exchange Rate's Effect on the Exports of Manufacturing Firms, Various Output Volumes*



* Cumulative after two years, rolling window by output volume.

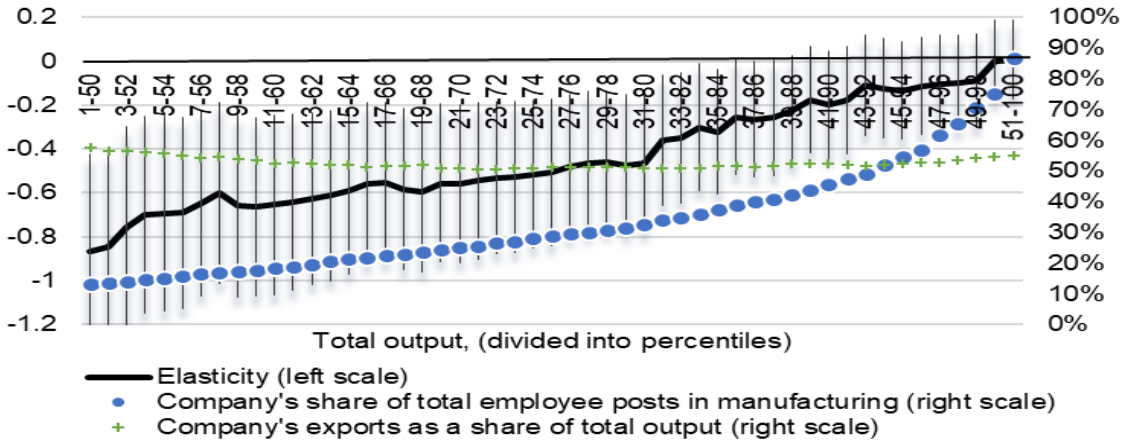
SOURCE: Central Bureau of Statistics.

Figure 5a
Exchange Rate's Effect on the Probability of a Manufacturing Company Stopping Exports, Various Productivity Levels*



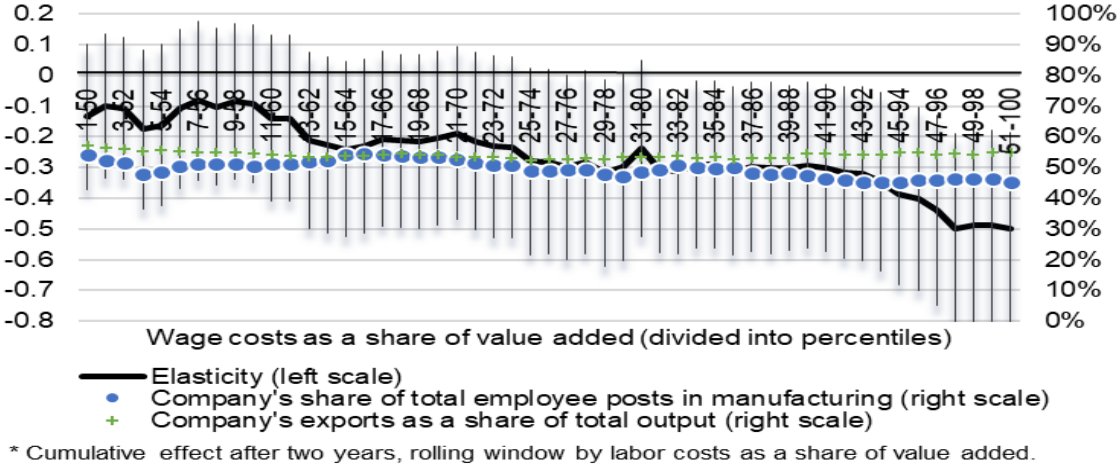
* Cumulative effect after two years, rolling window by productivity level.

Figure 5b
Exchange Rate's Effect on the Probability of a Manufacturing Company Stopping Exports, Various Output Volumes*



* Cumulative effect after two years, rolling window by output volume.

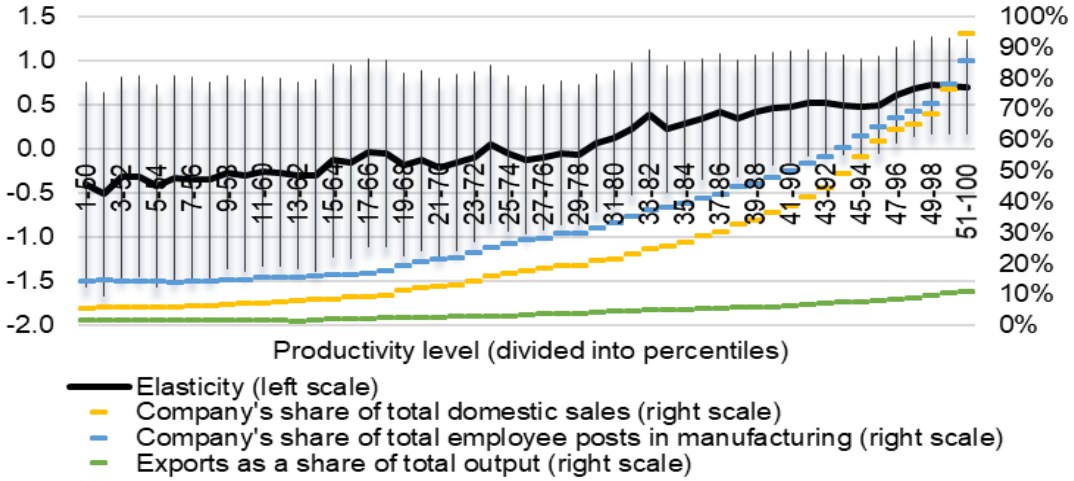
Figure 5c
Exchange Rate's Effect on the Probability of a Manufacturing Company Stopping Exports, by Labor Intensity*



* Cumulative effect after two years, rolling window by labor costs as a share of value added.

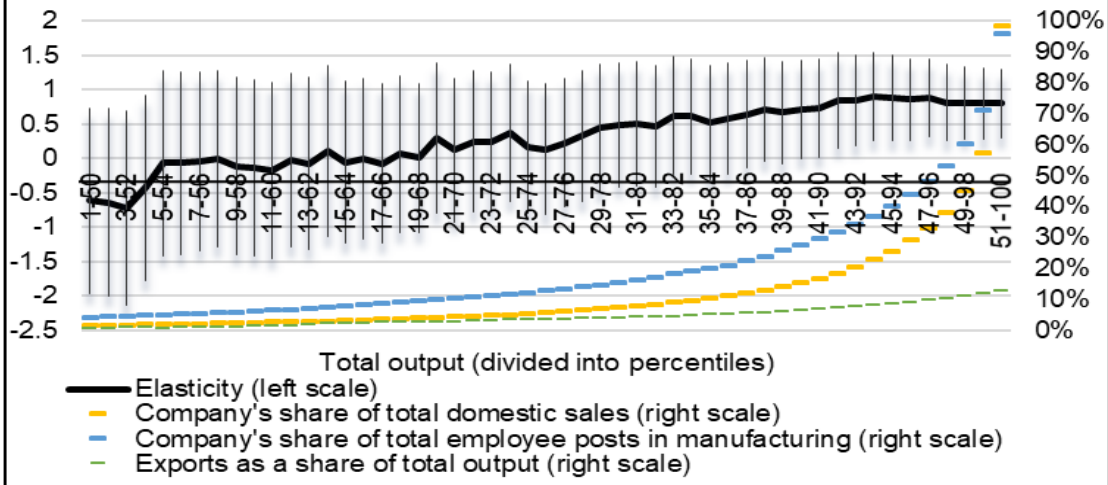
SOURCE: Based on Central Bureau of Statistics data.

Figure 6a
Real Exchange Rate's Effect on Manufacturing Companies' Domestic Sales, Various Productivity Levels*



* Elasticity between the exchange rate and domestic sales, cumulative effect after two years, rolling window by productivity level.

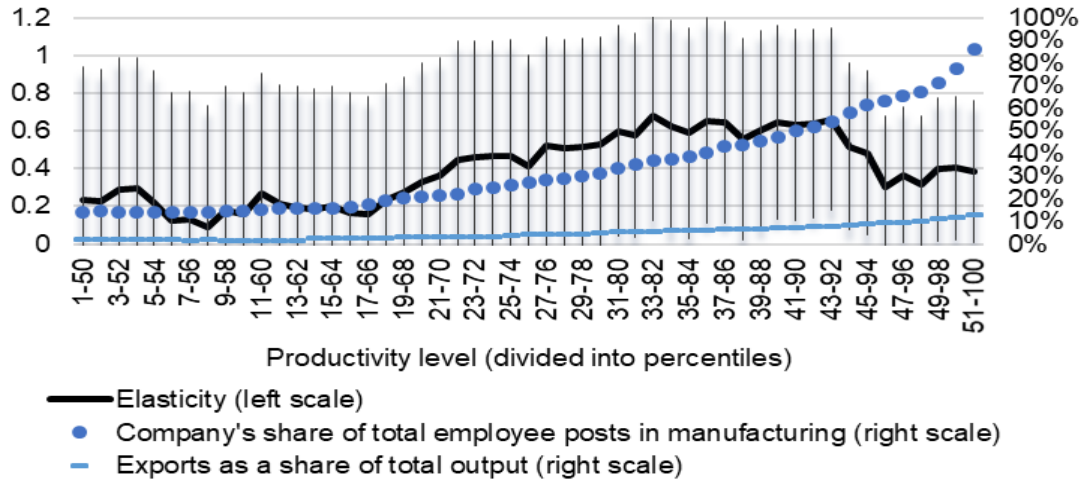
Figure 6b
Real Exchange Rate's Effect on Manufacturing Companies' Domestic Sales, Various Output Volumes*



* Elasticity between the exchange rate and domestic sales, cumulative effect after two years, rolling window by output volume.

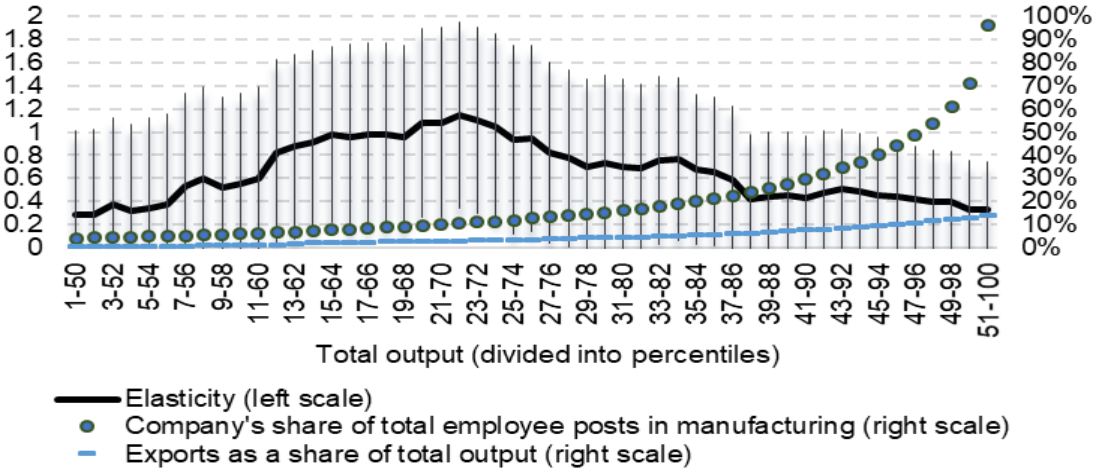
SOURCE: Based on Central Bureau of Statistics data.

Figure 7a
Real Exchange Rate's Effect on Employment in Manufacturing Companies, Various Productivity Levels*



* Elasticity between the exchange rate and employment, cumulative effect after two years, rolling window by productivity level.

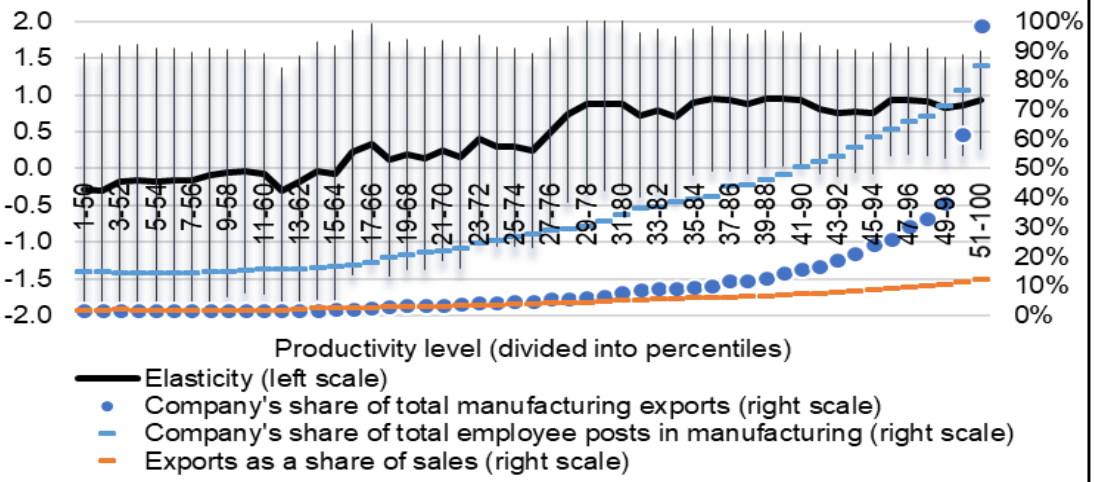
Figure 7b
Real Exchange Rate's Effect on Employment in Manufacturing Companies, by Output Volume*



* Elasticity between the exchange rate and employment, cumulative effect after two years, rolling window by output volume.

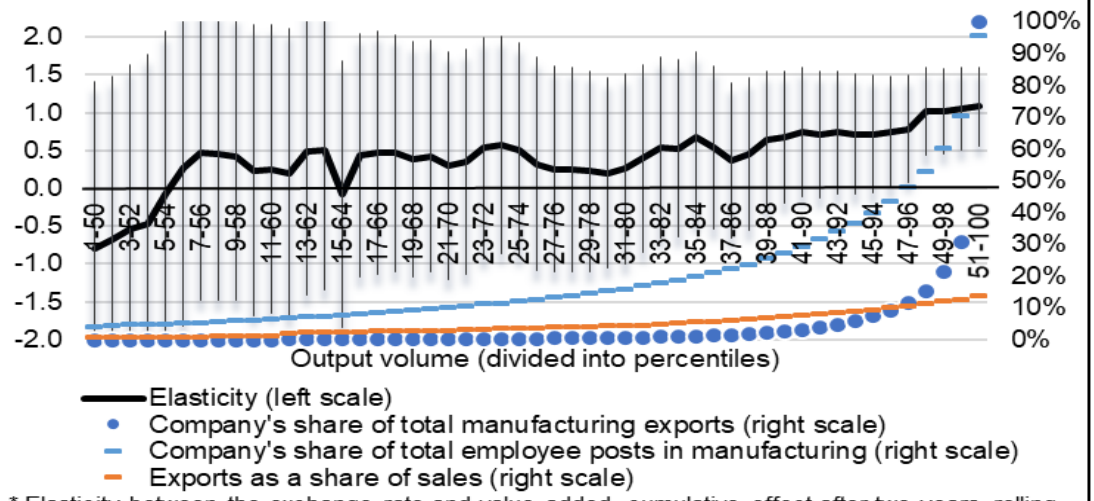
SOURCE: Based on Central Bureau of Statistics data.

Figure 8a
Real Exchange Rate's Effect on Manufacturing Companies' Value Added, by Productivity Level*



* Elasticity between the exchange rate and value added, cumulative effect after two years, rolling window by productivity level.

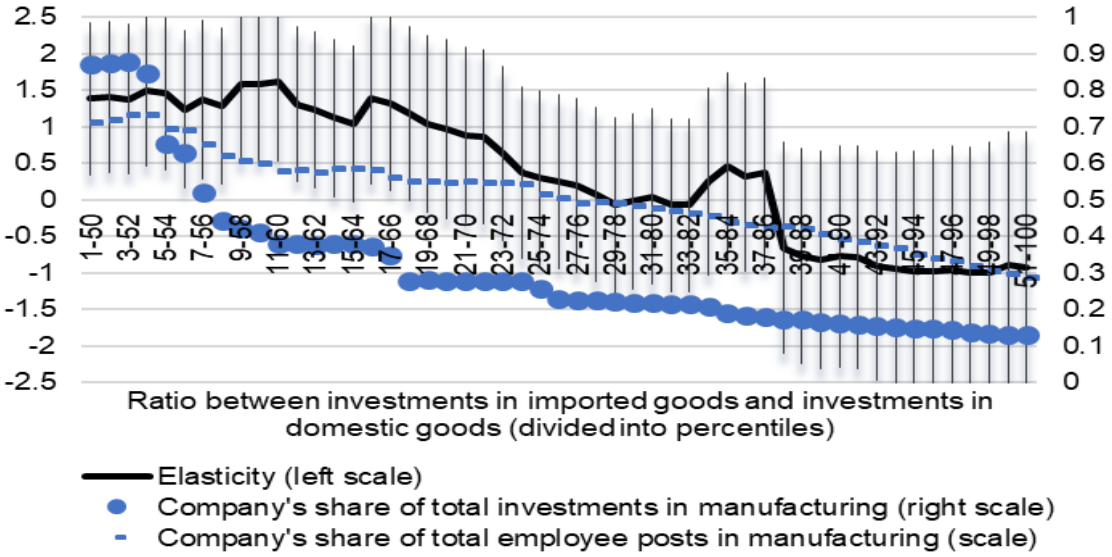
Figure 8b
Real Exchange Rate's Effect on Manufacturing Companies' Value Added, by Output Volume*



* Elasticity between the exchange rate and value added, cumulative effect after two years, rolling window by output volume.

SOURCE: Based on Central Bureau of Statistics data.

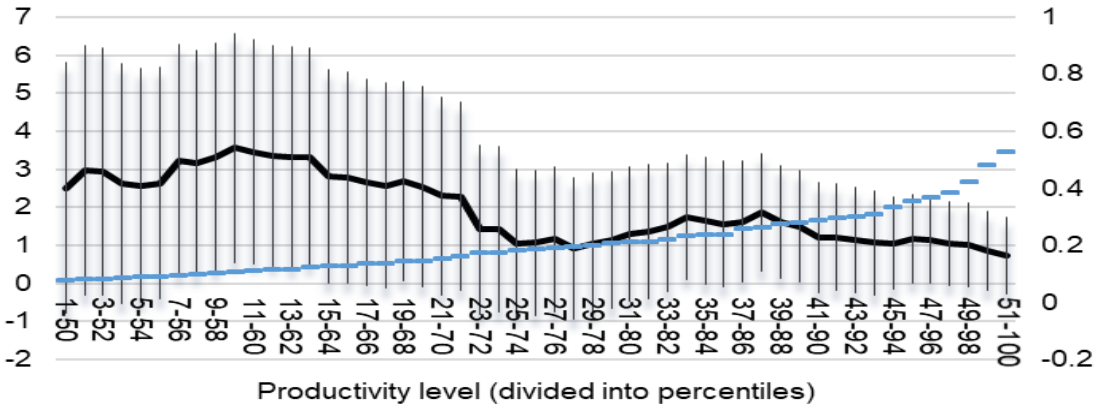
Figure 9
Real Exchange Rate's Effect on Manufacturing Companies' Volume of Investments, by Investment Profile*



* Elasticity between the exchange rate and the company's investments, cumulative effect after two years.

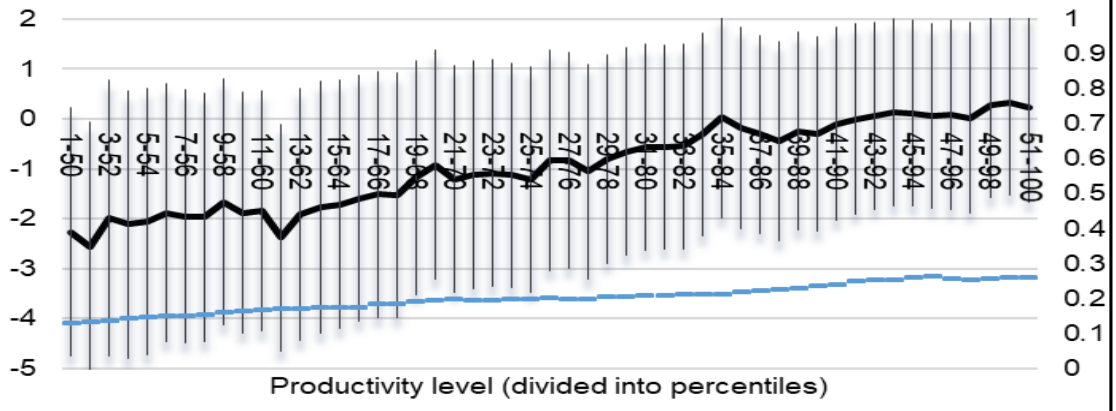
SOURCE: Based on Central Bureau of Statistics data.

Figure 10a
Real Exchange Rate's Effect on Manufacturing Companies' Volume of Investments, for Companies Whose Investments are Based on Domestic Input



* Elasticity between the exchange rate and the company's investments, cumulative effect after two years, rolling window by productivity level.
SOURCE: Based on Central Bureau of Statistics data.

Figure 10b
Real Exchange Rate's Effect on Manufacturing Companies' Volume of Investments, for Companies Whose Investments are Based on Imported Input



* Elasticity between the exchange rate and the company's investments, cumulative effect after two years, rolling window by productivity level.
SOURCE: Based on Central Bureau of Statistics data.

Table 1

Descriptive statistics, industries by technological intensity

Table 1a: Year 2000 (2019 prices)

Technological intensity	Traditional	Mixed traditional	Mixed High	High
Export rate	5%	6%	11%	14%
Number of employee posts (thousands)	33.8	29.3	50.1	121.0
Compensation per employee (thousands, NIS)	89.9	110.8	136.3	197.4
Value added from Gross Output (%)	0.43	0.45	0.41	0.49
Investment in machinery and equipment (%)	0.62	0.20	0.05	0.02
Investment in R&D and software (%)	0.30	0.73	0.72	0.79
Investment in buildings, etc. (%)	0.09	0.07	0.23	0.19
Average years in the sample	11.10	11.10	12.90	13.50
Number of firms in the sample	3,673	2,496	915	418

Table 1b: 2016 (2019 prices)

Technological intensity	Traditional	Mixed traditional	Mixed High	High
Export rate	4.1%	6.0%	27.7%	39.0%
Number of employee posts (thousands)	24.5	24.9	63.4	189.3
Compensation per employee (thousands, NIS)	77.5	100.7	140.4	188.6
Value added from Gross Output (%)	0.40	0.45	0.41	0.47
Investment in machinery and equipment (%)	0.71	0.29	0.15	0.09
Investment in R&D and software (%)	0.12	0.54	0.69	0.66
Investment in buildings, etc. (%)	0.17	0.17	0.16	0.25
Average years in the sample	6.8	6.8	8.2	11.2
Number of firms in the sample	3,343	2,008	731	304

Table 2

The real exchange rate's effect on manufacturing exports (2000–2016)

Y=ΔExport	(1) NIS/USD	(2) NIS/USD	(3) NIS/USD	(4) NIS/USD	(5) Effective	(6) NIS/USD Balanced*	(7) NIS/USD Aggregate
ΔRER	-0.535**	-0.106	-0.224	-0.105	-0.238	-0.030	-0.064
	(0.236)	(0.260)	(0.231)	(0.238)	(0.274)	(0.132)	(0.304)
ΔRER (t-1)	0.847***	0.766***	0.443***	0.587***	0.692***	0.054	0.074
	(0.148)	(0.164)	(0.138)	(0.165)	(0.256)	(0.134)	(0.109)
ΔRER (t-2)	0.480***	0.196	0.451**	0.303	0.291	0.514***	0.152
	(0.162)	(0.182)	(0.217)	(0.216)	(0.268)	(0.145)	(0.315)
Δworld trade		0.523***		0.399***	0.426***	0.423***	0.688***
		(0.091)		(0.107)	(0.110)	(0.096)	(0.154)
Δworld trade(t-1)		0.298***		0.329***	0.192**	0.185**	0.376*
		(0.097)		(0.105)	(0.090)	(0.081)	(0.213)
Δworld trade(t-2)		0.060		0.162	0.058	0.125*	-0.033
		(0.081)		(0.110)	(0.108)	(0.071)	(0.110)
Δunemployment			-0.047***	-0.016	-0.006	-0.031*	-0.052*
			(0.012)	(0.013)	(0.016)	(0.016)	(0.028)
Δunemployment(t-1)			0.019	0.027	0.019	0.052**	0.057**
			(0.016)	(0.018)	(0.020)	(0.020)	(0.025)
Δunemployment(t-2)			0.011	0.012	0.007	0.001	-0.023
			(0.015)	(0.018)	(0.016)	(0.012)	(0.023)
Constant	-0.033***	-0.086***	-0.035***	-0.082***	-0.069***	-0.039***	-0.056***
	(0.001)	(0.009)	(0.006)	(0.009)	(0.008)	(0.006)	(0.013)
Cumulative ΔRER (t-1)	0.312	0.661	0.219	0.482	0.454	0.024	0.010
	(0.328)	(0.341)	(0.278)	(0.299)	(0.303)	(0.167)	(0.297)
Cumulative ΔRER (t-2)	0.792**	0.857**	0.669**	0.785**	0.745	0.538**	0.162
	(0.365)	(0.361)	(0.323)	(0.331)	(0.431)	(0.228)	(0.473)
R-squared	0.371	0.386	0.378	0.388	0.387	0.283	0.333
R-Squared (within)	0.041	0.062	0.050	0.065	0.064	0.077	0.219
Adj R2 (within)	0.040	0.062	0.050	0.065	0.064	0.076	0.219
Cluster	1,545	1,545	1,545	1,545	1,545	616	1,652
Observations	18,886	18,886	18,886	9,584	9,584	5,914	9,691
Firm FE	V	V	V	V	V	V	V

*P<0.1 **P<0.05 ***P<0.01

*In 2011, the group of sampled firms was revised. This column presents the estimation results for firms sampled both before and after 2011. This group includes a higher proportion of large firms than in the general sample.

**Columns 1–6 show the real exchange rate's effect for the average firm in the sample. The aggregate effect is calculated by weighting the firms in the sample, where the firm's share of manufacturing exports serves as a weight.

Table 3
The real exchange rate's effect on manufacturing exports, by various characteristics (2000–2016)

Y=ΔExports	(1) Full sample	(2) Low-tech firms	(3) Med&High-tech firms	(4) Small firms	(5) Large firms	(6) Low productivity	(7) High productivity	(8) Labor intensive	(9) Capital intensive	(10) Low Industry export rate	(11) High Industry export rate
ΔRER	-0.105	0.147	-0.558**	0.080	-0.213*	0.206	-0.375*	-0.182	0.002	-0.267	0.069
	(0.238)	(0.367)	(0.272)	(0.551)	(0.111)	(0.445)	(0.203)	(0.257)	(0.395)	(0.206)	(0.433)
ΔRER (t-1)	0.587***	0.754***	0.385**	1.126***	0.250*	1.221***	0.154	0.438	0.704***	0.500**	0.666***
	(0.165)	(0.268)	(0.195)	(0.375)	(0.129)	(0.285)	(0.178)	(0.281)	(0.192)	(0.238)	(0.231)
ΔRER (t-1)	0.303	0.354	0.096	0.358	0.364**	0.566	0.290	0.547	0.140	0.403	0.224
	(0.216)	(0.267)	(0.320)	(0.511)	(0.164)	(0.385)	(0.230)	(0.406)	(0.232)	(0.281)	(0.297)
Cumulative ΔRER (t-1)	0.482	0.901*	-0.172	1.206	0.038	1.426**	-0.221	0.256	0.706	0.234	0.735
	(0.299	(0.473)	(0.361)	(0.733)	(0.154)	(0.554)	(0.251)	(0.362)	(0.463)	(0.282)	(0.522)
Cumulative ΔRER (t-2)	0.785**	1.255**	-0.076	1.564	0.402*	1.993***	0.069	0.803*	0.846**	0.637	0.959*
	(0.331	(0.519)	(0.403)	(0.989)	(0.206)	(0.651)	(0.347)	(0.480)	(0.420)	(0.414)	(0.567)
Adj R2 (within)	0.065	0.052	0.098	0.068	0.069	0.049	0.099	0.059	0.068	0.074	0.063
N. of Firms	1545	985	594	542	1003	681	860	729	790	969	667
N. of Obs.	18,886	11,351	7,529	9,450	9,436	9,445	9,431	9,191	9,263	10,143	8,733
Share in total employment (%)	1.000	0.468	0.532	0.090	0.910	0.284	0.716	0.399	0.595	0.498	0.502
Share in total output (%)	1.000	0.297	0.703	0.028	0.972	0.119	0.881	0.213	0.784	0.445	0.555
Share in total exports (%)	1.000	0.200	0.800	0.020	0.980	0.086	0.914	0.200	0.796	0.312	0.688
Avg export share (%)	0.448	0.365	0.573	0.403	0.493	0.392	0.504	0.414	0.479	0.355	0.556

*P<0.1 **P<0.05 ***P<0.01

(2-3) Low technological intensity was defined as firms classified as traditional and traditional-mixed technology. High technological intensity was defined as firms classified as high and mixed-high technology.
(4-5) Firms above and below the median production, and Column 5 above the median.
(6-7) Firms above and below the median worker productivity.
(8-9) The division into firms according to labor and capital intensity is determined by measuring the return on labor according to added value. Firms below the median were defined as labor intensive and firms above it were defined as capital intensive.
(10-11) For each industry, the export rate within that industry (at the two-digit level) is calculated, and the distribution is determined accordingly. This measurement approximates the firms' exposure to international trade. The median is determined based on the median level across the entire sample, in terms of standard deviations.

Table 4
The real exchange rate's effect on the probability of cessation of exports (2000–2016)

Y=P(exit market)	(1) NIS/USD	(2) NIS/USD	(3) NIS/USD	(4) NIS/USD	(5) Effective	(6) NIS/USD Balanced*
ΔRER	-0.069*	-0.010	-0.047	-0.023	0.103**	0.012
	(0.037)	(0.037)	(0.039)	(0.041)	(0.050)	(0.044)
ΔRER (t-1)	-0.029	-0.122***	-0.105**	-0.129***	-0.137***	-0.076
	(0.041)	(0.043)	(0.043)	(0.046)	(0.052)	(0.047)
ΔRER (t-1)	-0.135***	-0.144***	-0.113*	-0.148**	0.049	-0.053
	(0.046)	(0.053)	(0.058)	(0.061)	(0.062)	(0.060)
Δworld trade		0.072***		0.067**	0.042*	0.076**
		(0.027)		(0.026)	(0.025)	(0.032)
Δworld trade(t-1)		-0.054**		-0.049*	-0.030	0.024
		(0.024)		(0.027)	(0.025)	(0.019)
Δworld trade(t-2)		-0.022		-0.012	0.003	-0.025
		(0.026)		(0.029)	(0.028)	(0.028)
Δunemployment			-0.003	0.001	-0.006	0.001
			(0.004)	(0.004)	(0.005)	(0.004)
Δunemployment(t-1)			0.009*	0.002	0.008*	0.005
			(0.004)	(0.004)	(0.005)	(0.004)
Δunemployment(t-2)			0.001	0.002	-0.006	-0.005
			(0.004)	(0.004)	(0.004)	(0.004)
Constant	0.034***	0.035***	0.036***	0.036***	0.032***	0.025***
	(0.000)	(0.003)	(0.002)	(0.003)	(0.002)	(0.002)
Cumulative ΔRER (t-1)	-0.098*	-0.132**	-0.152**	-0.152**	-0.034	-0.064
	(0.056)	(0.060)	(0.059)	(0.061)	(0.070)	(0.069)
Cumulative ΔRER (t-2)	-0.233***	-0.275***	-0.266***	-0.301***	0.016**	-0.118
	(0.081)	(0.089)	(0.095)	(0.098)	(0.098)	(0.098)
R-squared	0.470	0.471	0.471	0.471	0.471	0.387
R-Squared (within)	0.003	0.006	0.005	0.006	0.005	0.004
Adj R2 (within)	0.003	0.006	0.004	0.005	0.004	0.003
Cluster	1,227	1,227	1,227	1,227	1,227	548
Observations	8,679	8,679	8,679	8,679	8,679	5,688
Firm FE	V	V	V	V	V	V

*P<0.1 **P<0.05 ***P<0.01

* In 2011, there was an update in the group of sampled firms. This column shows the estimation results for firms sampled before and after 2011. This group includes a higher proportion of large firms than in the general sample.

Table 5

The effect of the real exchange rate on the probability of cessation of exports, by characteristics (2000–2016)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Y=P(exit market)	Full sample	Low-tech firms	Med&High-tech firms	Small firms	Large firms	Low productivity	High productivity	Labor intensive	Capital intensive	Low Industry export rate	High Industry export rate
ΔRER	-0.023	0.009	-0.038	-0.164**	0.049	-0.049	-0.006	-0.053	0.015	0.015	-0.098*
	(0.041)	(0.070)	(0.038)	(0.077)	(0.046)	(0.074)	(0.042)	(0.055)	(0.062)	(0.062)	(0.051)
ΔRER (t-1)	-0.129***	-0.173**	-0.110*	-0.227***	-0.086	-0.096	-0.160**	-0.147**	-0.150***	-0.094	-0.147**
	(0.046)	(0.079)	(0.058)	(0.081)	(0.057)	(0.059)	(0.070)	(0.072)	(0.056)	(0.061)	(0.069)
ΔRER (t-1)	-0.148**	-0.153	-0.154**	-0.476***	0.045	-0.229**	-0.086	-0.303***	0.003	-0.156*	-0.131
	(0.061)	(0.101)	(0.074)	(0.139)	(0.054)	(0.097)	(0.077)	(0.093)	(0.079)	(0.083)	(0.085)
Cumulative ΔRER (t-1)	-0.152**	-0.164	-0.148**	-0.391***	-0.037	-0.145	-0.166**	-0.2**	-0.135	-0.079	-0.245***
	(0.061)	(0.101)	(0.071)	(0.118)	(0.075)	(0.099)	(0.079)	(0.096)	(0.083)	(0.090)	(0.086)
Cumulative ΔRER (t-2)	-0.3***	-0.317*	-0.302***	-0.867***	0.008	-0.374**	-0.252**	-0.502***	-0.132	-0.235*	-0.376***
	(0.098)	(0.163)	(0.113)	(0.227)	(0.093)	(0.158)	(0.126)	(0.161)	(0.121)	(0.138)	(0.140)
Adj R2 (within)	0.005	0.011	0.004	0.020	0.002	0.007	0.005	0.010	0.006	0.008	0.006
N. of Firms	1,227	734	526	555	672	651	573	607	604	789	510
N. of Obs.	13,725	7,219	6,502	6,867	6,858	6,852	6,863	6,729	6,769	7,855	5,859
Share in total employment (%)	1.000	0.442	0.558	0.133	0.867	0.375	0.625	0.450	0.544	0.526	0.473
Share in total output (%)	1.000	0.277	0.723	0.049	0.951	0.169	0.830	0.252	0.746	0.474	0.526
Share in total exports (%)	1.000	0.194	0.806	0.042	0.958	0.120	0.879	0.235	0.761	0.363	0.637
Avg export share (%)	0.561	0.487	0.644	0.575	0.425	0.519	0.603	0.550	0.569	0.492	0.655

(2-3) Low technological intensity was defined as firms classified as traditional and traditional mixed technology. High technological intensity was defined as firms classified as high and mixed-high technology.

(4-5) Firms above and below the median production, and Column 5 above the median.

(6-7) Firms above and below the median worker productivity.

(8-9) The division into firms according to labor and capital intensity is determined by measuring the return on labor according to added value. Firms below the median were defined as labor intensive and firms above it were defined as capital intensive.

(10-11) For each industry, the export rate within that industry (at the two-digit level) is calculated, and the distribution is determined accordingly. This measurement approximates the companies' exposure to international trade. The median is determined based on the median level across the entire sample, in terms of standard deviations.

Table 6
The real exchange rate's effect on domestic sales in manufacturing industries (2000–2016)

Y=ΔLocal sales	(1) NIS/USD	(2) NIS/USD	(3) NIS/USD	(4) NIS/USD	(5) Effective	(6) NIS/USD Balanced*	(7) NIS/USD Aggregate
ΔRER	-0.102	0.105	0.197	0.211	0.153	0.222*	0.422**
	(0.119)	(0.124)	(0.130)	(0.129)	(0.138)	(0.129)	(0.177)
ΔRER (t-1)	0.515***	0.324**	0.238*	0.225*	0.356**	-0.065	-0.128
	(0.113)	(0.126)	(0.127)	(0.129)	(0.163)	(0.118)	(0.160)
ΔRER (t-1)	0.127	-0.125	0.068	-0.129	-0.006	-0.074	-0.464*
	(0.126)	(0.158)	(0.166)	(0.178)	(0.185)	(0.123)	(0.240)
Δworld trade		0.311***		0.204**	0.093	0.320***	0.836***
		(0.082)		(0.089)	(0.088)	(0.098)	(0.246)
Δworld trade(t-1)		0.129*		0.047	-0.044	0.002	0.049
		(0.072)		(0.083)	(0.083)	(0.078)	(0.060)
Δworld trade(t-2)		-0.035		-0.061	-0.073	0.012	0.055
		(0.091)		(0.097)	(0.095)	(0.069)	(0.052)
Δunemployment			-0.045***	-0.029***	-0.030***	-0.023**	0.010
			(0.010)	(0.011)	(0.012)	(0.010)	(0.006)
Δunemployment(t-1)			-0.004	-0.010	-0.013	0.018	-0.014
			(0.011)	(0.013)	(0.014)	(0.014)	(0.010)
Δunemployment(t-2)			-0.019	-0.012	-0.016	-0.015	0.030
			(0.014)	(0.014)	(0.015)	(0.012)	(0.021)
Constant	0.002	-0.021**	-0.022***	-0.025***	-0.015*	-0.003	-0.052***
	(0.001)	(0.008)	(0.006)	(0.008)	(0.008)	(0.007)	(0.009)
Cumulative ΔRER (t-1)	0.413**	0.429**	0.435**	0.436**	0.509**	0.157	0.294**
	(0.179)	(0.183)	(0.176)	(0.172)	(0.199)	(0.150)	(0.133)
Cumulative ΔRER (t-2)	0.54**	0.305	0.503*	0.307	0.503	0.084	-0.170
	(0.252)	(0.272)	(0.279)	(0.275)	(0.313)	(0.206)	(0.242)
R-squared	0.33	0.336	0.336	0.338	0.338	0.215	0.342
R-Squared (within)	0.0156	0.0244	0.0252	0.0274	0.0268	0.0346	0.137
Adj R2 (within)	0.0156	0.0243	0.0252	0.0274	0.0267	0.034	0.137
Cluster	3,384	3,384	3,384	3,384	3,384	863	3,425
Observations	20,224	20,224	20,224	20,224	20,224	9,369	20,265
Firm FE	V	V	V	V	V	V	V

*P<0.1 **P<0.05 ***P<0.01

* In 2011, the group of sampled firms was revised. This column shows the estimation results for firms sampled before and after 2011. This group includes a higher proportion of large firms than in the general sample.

**Columns 1–6 show the real exchange rate's effect for the average company in the sample. The aggregate effect is calculated by weighting the firms in the sample, with the company's share of industrial exports used as a weight.

Table 7
The real exchange rate's effect on domestic sales in manufacturing industries, by characteristics (2000–2016)

Y=ΔLocal sales	(1) Full sample	(2) Low-tech firms	(3) Med&High-tech firms	(4) Small firms	(5) Large firms	(6) Low productivity	(7) High productivity	(8) Labor intensive	(9) Capital intensive	(10) Low Industry export rate	(11) High Industry export rate
ΔRER	0.211	0.173	0.477**	-0.054	0.404***	-0.030	0.405***	0.218	0.275	-0.006	0.406**
	(0.129)	(0.145)	(0.234)	(0.252)	(0.118)	(0.236)	(0.124)	(0.159)	(0.201)	(0.202)	(0.163)
ΔRER (t-1)	0.225*	0.238	0.264	0.165	0.195*	0.145	0.173	0.402***	0.087	0.321	0.107
	(0.129)	(0.155)	(0.192)	(0.285)	(0.118)	(0.241)	(0.131)	(0.147)	(0.212)	(0.210)	(0.160)
ΔRER (t-1)	-0.129	-0.170	0.084	-0.725*	0.204	-0.516	0.126	-0.011	-0.223	0.169	-0.251
	(0.178)	(0.215)	(0.312)	(0.432)	(0.150)	(0.377)	(0.170)	(0.220)	(0.279)	(0.284)	(0.216)
Cumulative ΔRER (t-1)	0.436**	0.411**	0.741**	0.111	0.598***	0.115	0.577***	0.621***	0.362	0.315	0.514**
	(0.172)	(0.200)	(0.309)	(0.378)	(0.180)	(0.345)	(0.169)	(0.228)	(0.260)	(0.278)	(0.211)
Cumulative ΔRER (t-2)	0.307	0.241	0.825	-0.614	0.803***	-0.401	0.703**	0.609*	0.139	0.484	0.263
	(0.275)	(0.325)	(0.526)	(0.689)	(0.254)	(0.594)	(0.271)	(0.350)	(0.429)	(0.441)	(0.345)
Adj R2 (within)	0.027	0.028	0.027	0.038	0.023	0.030	0.037	0.036	0.032	0.021	0.046
N. of Firms	3,384	2,530	917	446	2,938	948	2,414	1,905	1,413	1,254	2,159
N. of Obs.	125,952	108,073	17,868	63,018	62,934	62,896	62,892	61,595	62,153	58,925	67,024
Share in total employment (%)	1.000	0.641	0.359	0.042	0.958	0.142	0.858	0.552	0.443	0.373	0.627
Share in total output (%)	1.000	0.453	0.547	0.009	0.991	0.040	0.960	0.313	0.685	0.298	0.702
Share in total local sales (%)	1.000	0.608	0.392	0.015	0.985	0.057	0.943	0.349	0.650	0.441	0.559
Avg local sales share (%)	0.065	0.961	0.777	0.994	0.936	0.981	0.888	0.934	0.936	0.985	0.890

*P<0.1 **P<0.05 ***P<0.01

(2-3) Low technological intensity was defined as firms classified as traditional and traditional mixed technology. High technological intensity was defined as firms classified as high and mixed-high technology.

(4-5) Firms above and below the median production, and Column 5 above the median.

(6-7) Firms above and below the median worker productivity.

(8-9) The division into firms according to labor intensity and capital is determined by measuring the return on labor according to added value. Firms below the median were defined as labor intensive and firms above it were defined as capital intensive.

(10-11) For each industry, the export rate within that industry (at the two-digit level) is calculated, and the distribution is determined accordingly. This measurement approximates the firms' exposure to international trade. The median is determined based on the median level across the entire sample, in terms of standard deviations.

Table 8

The real exchange rate's effect on employment in manufacturing industries, (2000–2016)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Y=ΔJobs	NIS/USD	NIS/USD	NIS/USD	NIS/USD	Effective	NIS/USD Balanced*	NIS/USD Aggregate
ΔRER	-0.109*	-0.090	-0.017	-0.014	-0.117	0.016	0.028
	(0.064)	(0.073)	(0.080)	(0.081)	(0.090)	(0.069)	(0.061)
ΔRER (t-1)	0.135	0.135	0.175**	0.188**	0.126	0.075	0.163***
	(0.086)	(0.096)	(0.087)	(0.089)	(0.101)	(0.073)	(0.050)
ΔRER (t-2)	0.131*	0.101	0.155	0.138	0.017	-0.004	0.075
	(0.076)	(0.095)	(0.113)	(0.115)	(0.115)	(0.092)	(0.058)
Δworld trade		0.039		0.018	0.067	0.064	0.064*
		(0.049)		(0.052)	(0.056)	(0.042)	(0.038)
Δworld trade(t-1)		0.039		0.026	-0.014	0.122***	0.168***
		(0.050)		(0.056)	(0.054)	(0.042)	(0.032)
Δworld trade(t-2)		0.046		-0.008	-0.026	0.048	0.030
		(0.058)		(0.061)	(0.060)	(0.033)	(0.042)
Δunemployment			-0.007	-0.005	-0.002	-0.014**	-0.011***
			(0.007)	(0.007)	(0.008)	(0.006)	(0.004)
Δunemployment(t-1)			-0.007	-0.006	-0.011	0.000	0.006
			(0.006)	(0.008)	(0.009)	(0.006)	(0.004)
Δunemployment(t-2)			-0.017*	-0.017**	-0.013	-0.001	0.000
			(0.009)	(0.009)	(0.009)	(0.006)	(0.008)
Constant	-0.013***	-0.022***	-0.025***	-0.026***	-0.024***	-0.001	-0.022***
	(0.001)	(0.006)	(0.004)	(0.006)	(0.006)	(0.004)	(0.003)
Cumulative ΔRER (t-1)	0.027	0.046	0.158	0.174	0.009	0.091	0.191**
	(0.125)	(0.137)	(0.114)	(0.118)	(0.134)	(0.103)	(0.089)
Cumulative ΔRER (t-2)	0.158	0.146	0.312*	0.312*	0.026	0.087	0.266**
	(0.176)	(00.17)	(0.186)	(0.176)	(0.192)	(0.146)	(0.114)
R-squared	0.294	0.295	0.297	0.297	0.296	0.237	0.261
R-Squared (within)	0.00559	0.00645	0.00905	0.00918	0.00827	0.0189	0.021
Adj R2 (within)	0.00557	0.00641	0.009	0.00911	0.00821	0.0183	0.021
Cluster	3,411	3,411	3,411	3,411	3,411	870	3,447
Observations	132,476	132,476	132,476	21,381	21,381	9,980	21,417
Firm FE	V	V	V	V	V	V	V

*P<0.1 **P<0.05 ***P<0.01

*In 2011, the group of sampled firms was revised. This column shows the estimation results for firms sampled before and after 2011. This group includes a higher proportion of large firms than in the general sample.

**Columns 1–6 show the real exchange rate's effect for the average company in the sample. The aggregate effect is calculated by weighting the firms in the sample, with the company's share of industrial exports used as a weight.

Table 9
The real exchange rate's effect on employment in manufacturing industries, by characteristics (2000–2016)

Y=ΔJobs	(1) Full sample	(2) Low-tech firms	(3) Med&High-tech firms	(4) Small firms	(5) Large firms	(6) Low productivity	(7) High productivity	(8) Labor intensive	(9) Capital intensive	(10) Low Industry export rate	(11) High Industry export rate
ΔRER	-0.014	-0.016	-0.035	-0.059	0.136	-0.095	0.067	0.030	-0.053	0.160	-0.127
	(0.081)	(0.090)	(0.148)	(0.133)	(0.095)	(0.130)	(0.102)	(0.123)	(0.111)	(0.129)	(0.102)
ΔRER (t-1)	0.188**	0.189*	0.172	0.174	0.173*	0.105	0.241**	0.256*	0.132	0.126	0.193*
	(0.089)	(0.107)	(0.174)	(0.188)	(0.101)	(0.160)	(0.109)	(0.152)	(0.105)	(0.139)	(0.116)
ΔRER (t-1)	0.138	0.200	-0.154	0.174	0.029	0.226	0.074	0.097	0.159	0.225	0.009
	(0.115)	(0.136)	(0.248)	(0.236)	(0.130)	(0.216)	(0.131)	(0.179)	(0.149)	(0.169)	(0.131)
Cumulative ΔRER (t-1)	0.174	0.173	0.137	0.115	0.308**	0.009	0.308**	0.286	0.079	0.287	0.066
	(0.118)	(0.140)	(0.179)	(0.222)	(0.150)	(0.211)	(0.149)	(0.175)	(0.173)	(0.197)	(0.144)
Cumulative ΔRER (t-2)	0.312*	0.373*	-0.017	0.289	0.337	0.235	0.383**	0.382*	0.238	0.512*	0.075
	(0.176)	(0.208)	(0.317)	(0.367)	(0.208)	(0.361)	(0.192)	(0.231)	(0.275)	(0.292)	(0.193)
Adj R2 (within)	0.009	0.010	0.030	0.039	0.017	0.031	0.025	0.010	0.020	0.024	0.010
N. of Firms	3411	2546	935	448	2963	959	2452	1922	1438	1251	2192
N. of Obs.	132,476	112,490	19,980	66,255	66,221	66,254	66,222	64,925	65,438	60,746	71,727
Share in total employment (%)	1.000	0.608	0.392	0.041	0.959	0.140	0.860	0.533	0.461	0.345	0.654
Share in total output (%)	1.000	0.417	0.583	0.008	0.992	0.039	0.961	0.300	0.697	0.269	0.731

*P<0.1 **P<0.05 ***P<0.01

(2-3) Low technological intensity was defined as firms classified as traditional and traditional mixed technology. High technological intensity was defined as firms classified as high and mixed-high technology.

(4-5) Firms above and below the median production, and Column 5 above the median.

(6-7) Firms above and below the median worker productivity.

(8-9) The division into firms according to labor intensity and capital is determined by measuring the return on labor according to added value. Firms below the median were defined as labor intensive and firms above it were defined as capital intensive.

(10-11) For each industry, the export rate within that industry (at the two-digit level) is calculated, and the distribution is determined accordingly. This measurement approximates the firms' exposure to international trade. The median is determined based on the median level across the entire sample, in terms of standard deviations.

Table 10
The real exchange rate's effect on value added in manufacturing industries (2000–2016)

Y=ΔProfits	(1) NIS/USD	(2) NIS/USD	(3) NIS/USD	(4) NIS/USD	(5) Effective	(6) NIS/USD Balanced*	(7) NIS/USD Aggregate
ΔRER	-0.029	0.094	0.054	0.080	-0.020	0.055	0.705**
	(0.176)	(0.192)	(0.212)	(0.214)	(0.228)	(0.189)	(0.287)
ΔRER (t-1)	0.242	0.203	0.049	0.083	0.137	0.013	0.420
	(0.167)	(0.196)	(0.179)	(0.200)	(0.218)	(0.152)	(0.324)
ΔRER (t-2)	0.310*	0.116	0.116	0.067	0.153	-0.030	-0.388
	(0.167)	(0.178)	(0.241)	(0.230)	(0.281)	(0.143)	(0.520)
Δworld trade		0.178		0.131	0.103	0.147	0.017
		(0.116)		(0.122)	(0.135)	(0.127)	(0.165)
Δworld trade(t-1)		0.156		0.128	0.098	-0.044	0.464*
		(0.124)		(0.141)	(0.124)	(0.099)	(0.280)
Δworld trade(t-2)		0.008		0.058	0.032	0.197**	-0.162
		(0.113)		(0.123)	(0.135)	(0.087)	(0.161)
Δunemployment			-0.024*	-0.012	-0.009	-0.004	-0.052**
			(0.014)	(0.013)	(0.016)	(0.019)	(0.022)
Δunemployment(t-1)			-0.006	0.002	0.002	0.006	0.015
			(0.015)	(0.017)	(0.018)	(0.013)	(0.022)
Δunemployment(t-2)			0.011	0.014	0.010	0.020*	0.025
			(0.021)	(0.021)	(0.022)	(0.012)	(0.029)
Constant	-0.006***	-0.027**	-0.011	-0.024**	-0.020*	0.030***	-0.017
	-0.002	-0.012	-0.008	-0.011	-0.012	-0.008	-0.012
Cumulative ΔRER (t-1)	0.213	0.297	0.102	0.162	0.118	0.068	1.126**
	(0.283)	(0.304)	(0.278)	(0.301)	(0.300)	(0.162)	(0.507)
Cumulative ΔRER (t-2)	0.522	0.413	0.219	0.229	0.271	0.039	0.737**
	(0.384)	(0.381)	(0.434)	(0.440)	(0.505)	(0.205)	(0.338)
R-squared	0.309	0.311	0.311	0.312	0.312	0.159	0.14
R-Squared (within)	0.00349	0.00653	0.00614	0.0075	0.00759	0.00766	0.0465
Adj R2 (within)	0.00346	0.00647	0.00608	0.00742	0.00751	0.00708	0.0465
Cluster	3,399	3,399	3,399	3,399	3,399	868	3,439
Observations	116,163	116,163	116,163	20,329	20,329	9,578	20,368
Firm FE	V	V	V	V	V	V	V

*P<0.1 **P<0.05 ***P<0.01

*In 2011, the group of sampled firms was revised. This column shows the estimation results for firms sampled before and after 2011. This group includes a higher proportion of large firms than in the general sample.

**Columns 1–6 show the real exchange rate's effect for the average company in the sample. The aggregate effect is calculated by weighting the firms in the sample, with the company's share of industrial exports used as a weight.

Table 11
The real exchange rate's effect on value added in manufacturing industries, by characteristics (2000–2016)

Y=Δ(Added value)	(1) Full sample	(2) Low-med-tech firms	(3) High-tech firms	(4) Small firms	(5) Large firms	(6) Low productivity	(7) High productivity	(8) Labor intensive	(9) Capital intensive	(10) Low Industry export rate	(11) High Industry export rate
ΔRER	0.292	0.256	0.923**	-0.041	0.414***	0.026	0.479***	0.476*	0.158	0.041	0.493**
	(0.182)	(0.190)	(0.364)	(0.388)	(0.132)	(0.353)	(0.170)	(0.254)	(0.266)	(0.299)	(0.217)
ΔRER (t-1)	0.163	0.172	0.169	0.099	0.284**	0.071	0.298*	0.159	0.105	0.280	0.065
	(0.167)	(0.178)	(0.374)	(0.417)	(0.131)	(0.332)	(0.169)	(0.229)	(0.244)	(0.238)	(0.220)
ΔRER (t-1)	-0.058	-0.107	0.553	-0.855	0.384**	-0.379	0.155	-0.132	0.061	0.165	0.043
	(0.213)	(0.227)	(0.344)	(0.582)	(0.150)	(0.492)	(0.176)	(0.277)	(0.324)	(0.334)	(0.252)
Cumulative ΔRER (t-1)	0.455*	0.428	1.092**	0.058	0.698***	0.096	0.777***	0.635	0.264	0.321	0.558
	(0.274)	(0.289)	(0.445)	(0.663)	(0.205)	(0.571)	(0.249)	(0.388)	(0.402)	(0.400)	(0.344)
Cumulative ΔRER (t-2)	0.397	0.32	1.645***	-0.798	1.082***	-0.283	0.932***	0.503	0.325	0.486	0.601
	(0.411)	(0.437)	(0.522)	(0.130)	(0.268)	(0.943)	(0.338)	(0.541)	(0.641)	(0.611)	(0.503)
Adj R2 (within)	0.021	0.020	0.068	0.026	0.026	0.017	0.036	0.041	0.014	0.013	0.043
N. of Firms	3,426	3,145	307	484	2,942	1,002	2,401	1,916	1,446	1,263	2,193
N. of Obs.	125,787	120,812	4,971	62,915	62,872	63,604	62,028	62,121	62,141	57,090	68,694
Share in total employment (%)	1.000	0.797	0.203	0.042	0.959	0.150	0.850	0.537	0.459	0.352	0.648
Share in total output (%)	1.000	0.746	0.254	0.009	0.991	0.043	0.957	0.306	0.692	0.280	0.720
Share in total value added(%)	1.000	0.651	0.349	0.012	0.988	0.048	0.951	0.333	0.668	0.275	0.725

*P<0.1 **P<0.05 ***P<0.01

(2-3) Low technological intensity was defined as firms classified as traditional and traditional mixed technology. High technological intensity was defined as firms classified as high and mixed-high technology.

(4-5) Firms above and below the median production, and Column 5 above the median.

(6-7) Firms above and below the median worker productivity.

(8-9) The division into firms according to labor intensity and capital is determined by measuring the return on labor according to added value. Firms below the median were defined as labor intensive and firms above it were defined as capital intensive.

(10-11) For each industry, the export rate within that industry (at the two-digit level) is calculated, and the distribution is determined accordingly. This measurement approximates the firms' exposure to international trade. The median is determined based on the median level across the entire sample, in terms of standard deviations.

Table 12
The real exchange rate's effect on investments in manufacturing industries, (2000–2016)

Y=ΔInvestments	(1) NIS/USD	(2) NIS/USD	(3) NIS/USD	(4) NIS/USD	(5) Effective	(6) NIS/USD Balanced*	(7) NIS/USD Aggregate
ΔRER	-0.382	-0.112	0.332	0.311	0.134	0.009	-0.061
	(0.236)	(0.270)	(0.289)	(0.292)	(0.309)	(0.214)	(0.336)
ΔRER (t-1)	0.011	-0.432*	-0.764***	-0.809***	-0.687**	0.118	-0.333*
	(0.197)	(0.242)	(0.274)	(0.280)	(0.340)	(0.170)	(0.201)
ΔRER (t-2)	0.229	0.027	0.621*	0.545	0.057	0.058	-0.086
	(0.247)	(0.282)	(0.339)	(0.338)	(0.372)	(0.224)	(0.464)
Δworld trade		0.409***		-0.019	0.027	0.086	0.279**
		(0.138)		(0.150)	(0.131)	(0.122)	(0.131)
Δworld trade(t-1)		-0.122		-0.129	0.068	-0.091	-0.103
		(0.132)		(0.141)	(0.148)	(0.122)	(0.160)
Δworld trade(t-2)		-0.230		-0.132	-0.170	0.007	-0.143
		(0.145)		(0.153)	(0.148)	(0.118)	(0.201)
Δunemployment			-0.093***	-0.095***	-0.082***	-0.040**	-0.098***
			(0.018)	(0.019)	(0.020)	(0.017)	(0.028)
Δunemployment(t-1)			0.055**	0.042*	0.029	-0.034*	-0.063**
			(0.022)	(0.023)	(0.025)	(0.019)	(0.029)
Δunemployment(t-2)			-0.031	-0.031	-0.007	-0.022	-0.028
			(0.021)	(0.022)	(0.022)	(0.018)	(0.018)
Constant	-0.300***	-0.293***	-0.313***	-0.298***	-0.303***	-0.220***	-0.242***
	(0.001)	(0.013)	(0.009)	(0.013)	(0.011)	(0.010)	(0.015)
Cumulative ΔRER (t-1)	-0.372	-0.544	-0.432	-0.499	-0.553	0.127	-0.393
	(0.345)	(0.369)	(0.392)	(0.394)	(0.416)	(0.260)	(0.251)
Cumulative ΔRER (t-2)	-0.143	-0.517	0.189	0.046	-0.495	0.185	-0.48
	(0.490)	(0.520)	(0.586)	(0.546)	(0.623)	(0.328)	(0.651)
R-squared	0.386	0.389	0.395	0.396	0.393	0.206	0.367
R-Squared (within)	0.003	0.010	0.019	0.020	0.016	0.011	0.073
Adj R2 (within)	0.003	0.010	0.019	0.020	0.016	0.010	0.073
Cluster	3,002	3,002	3,002	3,002	3,002	847	3,104
Observations	54,025	54,025	54,025	14,280	14,280	7,304	14,372
Firm FE	V	V	V	V	V	V	V

*P<0.1 **P<0.05 ***P<0.01

*In 2011, the group of sampled firms was revised. This column shows the estimation results for firms sampled before and after 2011. This group includes a higher proportion of large firms than in the general sample.

**Columns 1–6 show the real exchange rate's effect for the average company in the sample. The aggregate effect is calculated by weighting the firms in the sample, with the company's share of industrial exports used as a weight.

Table 13
The real exchange rate's effect on investments in manufacturing industries, by characteristics (2000–2016)

Y=ΔInvestments	(1) Full sample	(2) Low-tech firms	(3) Med&High-tech firms	(4) Small firms	(5) Large firms	(6) Low productivity	(7) High productivity	(8) Labor intensive	(9) Capital intensive	(10) Low Industry export rate	(11) High Industry export rate
ΔRER	0.310	0.601*	-0.492	0.696	-0.069	0.489	0.104	0.637	-0.056	1.185***	-0.893**
	(0.292)	(0.326)	(0.608)	(0.579)	(0.228)	(0.519)	(0.283)	(0.472)	(0.346)	(0.343)	(0.437)
ΔRER (t-1)	-0.816***	-0.442	-1.262**	-1.292**	-0.358	-1.229**	-0.436	-0.617	-1.088***	-0.520	-0.568
	(0.280)	(0.293)	(0.626)	(0.571)	(0.266)	(0.504)	(0.298)	(0.430)	(0.366)	(0.336)	(0.353)
ΔRER (t-1)	0.542	0.701*	-0.019	0.844	0.234	0.817	0.330	0.885	0.316	0.787**	0.587
	(0.337)	(0.405)	(0.675)	(0.852)	(0.303)	(0.681)	(0.371)	(0.562)	(0.402)	(0.398)	(0.524)
Cumulative ΔRER (t-1)	-0.506	0.16	-1.754**	-0.595	-0.426	-0.741	-0.332	0.02	-1.144**	0.666*	-1.461**
	(0.393)	(0.421)	(0.817)	(0.882)	(0.377)	(0.733)	(0.422)	(0.630)	(0.485)	(0.402)	(0.602)
Cumulative ΔRER (t-2)	0.036	0.86	-1.773*	0.249	-0.193	0.077	-0.003	0.905	-0.828	1.453**	-0.873
	(0.545)	(0.631)	(01.03)	(0.429)	(0.505)	(0.083)	(0.598)	(0.885)	(0.667)	(0.562)	(0.861)
Adj R2 (within)	0.020	0.017	0.048	0.039	0.014	0.026	0.022	0.026	0.022	0.038	0.042
N. of Firms	3002	2196	853	677	2325	1142	1845	1368	1584	1274	969
N. of Obs.	54,029	41,913	12,099	27,050	26,979	26,921	27,059	26,534	26,562	21,909	21,880
Share in total employment (%)	1.000	0.577	0.422	0.069	0.931	0.215	0.785	0.363	0.631	0.637	0.277
Share in total output (%)	1.000	0.391	0.609	0.016	0.984	0.078	0.922	0.165	0.832	0.634	0.336
Share in total Investments (%)	1.000	0.216	0.784	0.009	0.991	0.036	0.964	0.150	0.835	0.839	0.147

*P<0.1 **P<0.05 ***P<0.01

(2-3) Low technological intensity was defined as firms classified as traditional and traditional-mixed technology. High technological intensity was defined as firms classified as high and mixed-high technology.

(4-5) Firms above and below the median production, and Column 5 above the median.

(6-7) Firms above and below the median worker productivity.

(8-9) The division into firms according to labor intensity and capital is determined by measuring the return on labor according to added value. Firms below the median were defined as labor intensive and firms above it were defined as capital intensive.

(10-11) For each industry, the export rate within that industry (at the two-digit level) is calculated, and the distribution is determined accordingly. This measurement approximates the firms' exposure to international trade. The median is determined based on the median level across the entire sample, in terms of standard deviations.

References

Aghion, P., P. Bacchetta, R. Ranciere, and K. Rogoff (2019). "Exchange Rate Volatility and Productivity Growth: The Role of Financial Development". *Journal of Monetary Economics*, 56: 494–513.

Amiti, M., O. Itskhoki, and J. Konings (2014). "Importers, Exporters, and Exchange Rate Disconnect. "*American Economic Review*", 104(7): 1942–1978.

Atkin, D., A.K. Khandelwal, and A. Osman (2017). "Exporting and Firm Performance: Evidence from a Randomized Experiment". *The Quarterly Journal of Economics*, 132(2): 551–615.

Avdjiev, S., V. Bruno, C. Koch, and H.S. Shin (2018). "The Dollar Exchange Rate as a Global Risk Factor: Evidence from Investment". *BIS Working Papers No 695*, Bank for International Settlements.

Bahmani, M., H. Harvey, and W.S. Hegerty (2013). "Empirical Tests of the Marshall-Lerner Condition: A Literature Review" *Journal of Economic Studies*, 40(3).

Bahmani-Oskooee, M., A. Hosny, and N.K. Kishor (2015). "The Exchange Rate Disconnect Puzzle Revisited". *International Journal of Financial Economics*, 20: 126–137.

Bank of Israel (2017). *Annual Report* for 2016.

Bank of Israel (2020). *Annual Report* for 2019.

Berman, N., P. Martin, and T. Mayer (2012). "How Do Different Exporters React to Exchange Rate Changes?". *Quarterly Journal of Economics*, 127: 437–492.

Blanchard, O., J.D. Ostry, A.R. Ghosh, and M. Chamon (2016). "Capital Flows: Expansionary or Contractionary?", *American Economic Review*, 106(5): 565–569.

Brito, S., N.E. Magud, and S. Sebastian (2018). "Real Exchange Rates, Economic Complexity, and Investment". *IMF Working Paper*, 18/107.

Caglayan, M. and F. Demir (2019). "Exchange Rate Movements, Export Sophistication and Direction of Trade: The Development Channel and North–South Trade Flows". *Cambridge Journal of Economics*, 43(6): 1623–1652

Cerra, V. S.C. and Saxena (2010). "The Monetary Model Strikes Back: Evidence from the World". *Journal of International Economics*, 81(2): 184–196.

De Loecker, J., (2013). "Detecting Learning by Exporting". *American Economic Journal: Microeconomics*, 5(3): 1–21.

Dornbusch, R., (1976). "Expectations and Exchange Rate Dynamics". *Journal of Political Economy*, 84: 1161–1176.

Eichengreen, B. and P. Gupta (2013). "The Real Exchange Rate and Export Growth: Are Services Different?". *Munich Personal RePEc Archive*, November 2012.

Flemming, J.M. (1962). "Domestic Financial Policies under Fixed and Floating Exchange Rates". *IMF Staff Papers*, 9, 369–379. doi:10.2307/3866091.

Forbes, K. (2018). "Has Globalization Changed the Inflation Process?". Paper presented at the 17th Bank for International Settlements Annual Research Conference, Zurich, June 22.

Frankel, J.A (1979). "On the Mark: A Theory of Floating Exchange Rates Based on Real Interest Differentials". *American Economic Review*, 69: 610–622.

Frenkel, J.A. (1976). "A Monetary Approach to the Exchange Rate: Doctrinal Aspects and Empirical Evidence". *Scandinavian Journal of Economics*, 78: 200–224.

Friedman, A. and Y. Lavi (2007). "Israel's Real Exchange Rate and Foreign Trade", *Bank of Israel Review* Vol. 79, 37–86.

Frisch R. (2016). "Currency Crises and Real Exchange Rate Depreciation", Discussion Paper Series 2016.01 (in Hebrew), Bank of Israel Research Department.

Gallo, Lior (2011). "Export and Productivity – Evidence from Israel", Discussion Paper Series 2011.08, Bank of Israel Research Department.

Gopinath, G., E. Boz, C. Casas, F.G. Díez,, P.O. Gourinchas, and M. Plagborg-Møller (2020). "Dominant Currency Paradigm", *American Economic Review*, 110(3): 677–719.

Gopinath, G. and B. Neiman (2014). "Trade Adjustment and Productivity in Large Crises", *American Economic Review*, 104(3): 793–831.

Gopinath, G. and R. Rigobon (2008). "Sticky Borders". *Quarterly Journal of Economics*, 123: 531–575.

Habib, M.M., E. Mileva, and L. Stracca (2017). "The Real Exchange Rate and Economic Growth: Revisiting the Case Using External Instruments", *Journal of International Money and Finance*, 73: 386–398.

Haddad, M., and C. Pancaro (2010). "Can Real Exchange Rate Undervaluation Boost Exports and Growth in Developing Countries? Yes, but Not for Long", *World Bank Public Disclosure* No. 20.

Halpern, L., M. Koren, and A. Szeidl (2015). "Imported Inputs and Productivity", *American Economic Review*, 105(12): 3660–3703.

Hamilton, L.C. (1992). "How Robust is Robust Regression?". *Stata Technical Bulletin, StataCorp LP*, 1(2).

Hausmann, R. and C.A. Hidalgo (2011). "The Network Structure of Economic Output", *Journal of Economic Growth*, 16(4): 309–342.

Ilzetzki, E., M.R. Carmen, and K. Rogoff (2019). "Exchange Rate Arrangements in the 21st Century: Which Anchor Will Hold?", *The Quarterly Journal of Economics*, 34(2): 599–646.

Israel Export Institute (2019): Summary of the First Half of 2019.

Kose, M.A. (2002). "Explaining Business Cycles in Small Open Economies: How Much Do World Prices Matter", *Journal of International Economics*, 56(2): 299–327.

Krugman, P. (1999). "Balance Sheets, the Transfer Problem, and Financial Crises". In: P. Isard, A. Razin, and A.K. Rose (eds): *International Finance and Financial Crises*. Springer: Dordrecht.

Krugman, P. and L. Taylor (1978). "Contractionary Effects of Devaluation", *Journal of International Economies*, 8(14): 45–56.

Mendoza, E.G. (1995). "The Terms of Trade, the Real Exchange Rate, and Economic Fluctuations", *International Economic Review*, 36(1): 101–137.

Meese, R. and K. Rogoff (1983a). "Empirical Exchange Rate Models of the Seventies: Do They Fit Out of Sample?", *Journal of International Economics*, 14(1–2), 3–24.

Meese, R. and K. Rogoff (1983b). "The Out of Sample Failure of Empirical Exchange Models," In: Jacob A. Frenkel (ed): *Exchange Rates and International Macroeconomics*. Univ. Chicago Press: Chicago. (for NBER).

Mundell, R. A. (1963). "Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates", *Canadian Journal of Economic and Political Science*, 29(4): 475–485.

Obstfeld, M., and K. Rogoff (2001). "The Six Major Puzzles in International Macroeconomics: Is There a Common Cause?". *NBER Macroeconomics Annual*, 2000(15): 339–390.

Rodrik, D. (2009). "The Real Exchange Rate and Economic Growth", *Brookings Papers on Economic Activity*, 1: 365–412.

Schmitt-Grohe, S. and M. Uribe (2018). "How Important Are Terms Of Trade Shocks?", *International Economic Review*, 59(1): 85–111.

Servén, L. (2003). "Real Exchange Rate Uncertainty and Private Investment in LDCs", *The Review of Economics and Statistics*, 85: 212–218.

Sofer Y. (2005). “Measuring the Real Exchange Rate in Israel and its Effects on Exports and Imports”, *Issues in Foreign Currency* (in Hebrew).

Tawadros, G.B. (2017), "Revisiting the Exchange Rate Disconnect Puzzle", *Applied Economics*, 49: 3645–3668.

Appendices

Table A- 1

The real exchange rate's effect on aggregate manufacturing exports (2000–2016)

Y=ΔExport	(1) Average effect	(2) Aggregate: Full sample	(3) Excluding top 5	4) Excluding top 10	(5) Excluding top 15	(6) Including only top 50	(7) Including only top 100
ΔRER	-0.105	-0.064	-0.022	-0.015	-0.054	-0.014	-0.004
	(0.238)	(0.304)	(0.145)	(0.148)	(0.160)	(0.468)	(0.392)
ΔRER (t-1)	0.587***	0.074	-0.021	-0.004	-0.016	0.068	0.018
	(0.165)	(0.109)	(0.123)	(0.134)	(0.135)	(0.144)	(0.134)
ΔRER (t-2)	0.303	0.152	0.218	0.257	0.338**	0.108	0.089
	(0.216)	(0.315)	(0.154)	(0.171)	(0.172)	(0.497)	(0.411)
Δworld trade	0.399***	0.688***	0.634***	0.574***	0.541***	0.762***	0.753***
	(0.107)	(0.154)	(0.100)	(0.102)	(0.094)	(0.181)	(0.172)
Δworld trade(t-1)	0.329***	0.376*	0.104	0.155	0.053	0.535**	0.448*
	(0.105)	(0.213)	(0.111)	(0.116)	(0.093)	(0.242)	(0.239)
Δworld trade(t-2)	0.162	-0.033	0.013	0.008	0.078	-0.153	-0.096
	(0.110)	(0.110)	(0.086)	(0.089)	(0.085)	(0.148)	(0.134)
Δunemployment	-0.016	-0.052*	-0.035***	-0.035***	-0.030***	-0.071*	-0.065*
	(0.013)	(0.028)	(0.012)	(0.012)	(0.011)	(0.038)	(0.034)
Δunemployment(t-1)	0.027	0.057**	0.029**	0.038***	0.033***	0.078***	0.068**
	(0.018)	(0.025)	(0.014)	(0.014)	(0.013)	(0.028)	(0.028)
Δunemployment(t-2)	0.012	-0.023	0.008	0.005	0.009	-0.049*	-0.036
	(0.018)	(0.023)	(0.014)	(0.015)	(0.015)	(0.025)	(0.025)
Constant	-0.08***	-0.056***	-0.035***	-0.039***	-0.036***	-0.063***	-0.056***
	(0.009)	(0.013)	(0.008)	(0.008)	(0.009)	(0.019)	(0.017)
Cumulative ΔRER (t-1)	0.482	0.010	-0.044	-0.019	-0.07	0.054	0.014
	(0.299)	(0.297)	(0.192)	(0.195)	(0.210)	(0.436)	(0.378)
Cumulative ΔRER (t-2)	0.785**	0.162	0.174	0.238	0.268	0.162	0.102
	(0.331)	(0.473)	(0.267)	(0.274)	(0.303)	(0.724)	(0.611)
R-squared	0.388	0.333	0.312	0.291	0.284	0.370	0.340
R-Squared (within)	0.0650	0.219	0.170	0.150	0.129	0.304	0.270
Adj R2 (within)	0.0645	0.219	0.170	0.150	0.129	0.304	0.270
Cluster	1545	1652	1647	1642	1637	50	100
Observations	9584	9691	9624	9562	9492	630	1159
Share in exports	-	1	0.720	0.640	0.571	0.634	0.754
Firm FE	V	V	V	V	V	V	V

*P<0.1 **P<0.05 ***P<0.01

* Column 1 presents the real exchange rate's effect for the average company in the sample. The other columns show the aggregate effect calculated by weighting the firms in the sample, with the company's share of manufacturing exports used as a weight.

Table A-2

The real exchange rate's effect on manufacturing exports, adding time fixed effects (2000–2016)

Y = ΔExports	NIS-dollar	NIS-dollar	NIS-dollar	NIS-dollar	NIS-dollar	NIS-dollar
ΔRERXFirm_Output	-0.103**	-0.113***	-0.124***			
	(0.042)	(0.039)	(0.031)			
ΔRER(t-1)XFirm_Output		-0.051	-0.071			
		(0.040)	(0.043)			
ΔRER(t-2)XFirm_Output			-0.051			
			(0.056)			
ΔRERXProductivity				-0.006	-0.006*	-0.007*
				(0.003)	(0.003)	(0.003)
ΔRER(t-1)XProductivity					-0.002	-0.002
					(0.002)	(0.002)
ΔRER(t-2)XProductivity						-0.002
						(0.002)
Δworld trade	0.417**	0.417**	0.417**	0.422**	0.433**	0.430**
	(0.171)	(0.171)	(0.170)	(0.173)	(0.170)	(0.168)
Δworld trade(t-1)	0.137	0.136	0.136	0.137	0.141	0.151
	(0.143)	(0.143)	(0.143)	(0.143)	(0.141)	(0.149)
Δworld trade(t-2)	0.250*	0.251*	0.250*	0.289*	0.291*	0.296*
	(0.142)	(0.142)	(0.142)	(0.141)	(0.141)	(0.143)
Constant	-0.082***	-0.082***	-0.082***	-0.084***	-0.084***	-0.086***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.017)
Observations	18886	18886	18886	18876	18876	18876
N. of Firms	1545	1545	1545	1541	1541	1541
R-squared	0.39	0.39	0.39	0.40	0.40	0.40
r2 within	0.00	0.00	0.01	0.01	0.01	0.01
r2 adj within	0.00	0.00	0.00	0.01	0.01	0.01
Firm FE	V	V	V	V	V	V
Year FE	V	V	V	V	V	V

Table A-3

The real exchange rate's effect on aggregate domestic sales in manufacturing, (2000–2016)

Y=ΔLocal sales	(1) Full sample Average	(2) Full Sample Aggregate	(3) Excluding top 5	4) Excluding top 10	(5) Excluding top 15	(6) Including only top 50	(7) Including only top 100
ΔRER	0.211	0.422**	0.232***	0.224***	0.209***	0.792**	0.690**
	(0.129)	(0.177)	(0.083)	(0.086)	(0.061)	(0.321)	(0.298)
ΔRER (t-1)	0.225*	-0.128	0.101	0.154*	0.194***	-0.518**	-0.374
	(0.129)	(0.160)	(0.083)	(0.081)	(0.070)	(0.247)	(0.230)
ΔRER (t-2)	-0.129	-0.464*	-0.177**	-0.209**	-0.260***	-0.704	-0.646*
	(0.178)	(0.240)	(0.082)	(0.085)	(0.078)	(0.460)	(0.387)
Δworld trade	0.204**	0.836***	0.378***	0.366***	0.379***	1.286***	1.170***
	(0.089)	(0.246)	(0.055)	(0.057)	(0.051)	(0.272)	(0.281)
Δworld trade(t-1)	0.047	0.049	0.130***	0.142***	0.127***	-0.034	-0.004
	(0.083)	(0.060)	(0.050)	(0.052)	(0.039)	(0.115)	(0.101)
Δworld trade(t-2)	-0.061	0.055	0.039	0.019	0.003	0.045	0.032
	(0.097)	(0.052)	(0.051)	(0.049)	(0.042)	(0.128)	(0.103)
Δunemployment	-0.029***	0.010	-0.000	0.001	0.004	0.009	0.012
	(0.011)	(0.006)	(0.006)	(0.006)	(0.005)	(0.012)	(0.009)
Δunemployment(t-1)	-0.010	-0.014	0.001	-0.001	-0.006	-0.012	-0.014
	(0.013)	(0.010)	(0.007)	(0.007)	(0.006)	(0.019)	(0.015)
Δunemployment(t-2)	-0.012	0.030	0.008	0.007	0.010	0.040	0.036
	(0.014)	(0.021)	(0.009)	(0.009)	(0.006)	(0.041)	(0.033)
Constant	-0.025***	-0.052***	-0.040***	-0.042***	-0.037***	-0.050***	-0.047***
	(0.008)	(0.009)	(0.004)	(0.004)	(0.004)	(0.011)	(0.011)
Cumulative ΔRER (t-1)	0.436**	0.294**	0.332**	0.378***	0.403***	0.274	0.316
	(0.172)	(0.133)	(0.130)	(0.132)	(0.090)	(0.311)	(0.255)
Cumulative ΔRER (t-2)	0.307	-0.170	0.155	0.169	0.144	-0.430	-0.330
	(0.275)	(0.242)	(0.169)	(0.178)	(0.133)	(0.441)	(0.361)
R-squared	0.338	0.342	0.319	0.319	0.322	0.44	0.387
R-Squared (within)	0.0274	0.137	0.033	0.0299	0.032	0.394	0.327
Adj R2 (within)	0.0274	0.137	0.033	0.0299	0.032	0.394	0.327
Cluster	3,384	3,425	3,420	3,415	3,410	50	100
Observations	20,224	20,265	20,198	20,125	20,063	630	1,210
Share in local sales	-	1	0.788	0.746	0.726	0.387	0.479
Firm FE	V	V	V	V	V	V	V

*P<0.1 **P<0.05 ***P<0.01

* Column 1 presents the real exchange rate's effect for the average company in the sample. The other columns show the aggregate effect calculated by weighting the firms in the sample, with the company's share of domestic sales used as a weight.

Table A-4

The real exchange rate's effect on aggregate employment in manufacturing industries, (2000–2016)

Y=ΔJobs	(1) Full sample Average	(2) Full sample Aggregate	(3) Excluding top 5	4) Excluding top 10	(5) Excluding top 15	(6) Including only top 50	(7) Including only top 100
ΔRER	-0.014	0.028	-0.024	-0.018	-0.020	0.174	0.017
	(0.081)	(0.061)	(0.045)	(0.043)	(0.043)	(0.237)	(0.182)
ΔRER (t-1)	0.188**	0.163***	0.148***	0.150***	0.140***	0.347**	0.233*
	(0.089)	(0.050)	(0.047)	(0.046)	(0.046)	(0.162)	(0.124)
ΔRER (t-2)	0.138	0.075	0.078	0.094	0.091	0.018	0.111
	(0.115)	(0.058)	(0.062)	(0.063)	(0.061)	(0.125)	(0.109)
Δworld trade	0.018	0.064*	0.041	0.029	0.010	0.281*	0.200*
	(0.052)	(0.038)	(0.034)	(0.033)	(0.030)	(0.167)	(0.120)
Δworld trade(t-1)	0.026	0.168***	0.132***	0.125***	0.125***	0.319***	0.254***
	(0.056)	(0.032)	(0.026)	(0.026)	(0.025)	(0.115)	(0.087)
Δworld trade(t-2)	-0.008	0.030	0.055	0.066*	0.077**	-0.205	-0.101
	(0.061)	(0.042)	(0.038)	(0.038)	(0.035)	(0.146)	(0.112)
Δunemployment	-0.005	-0.011***	-0.013***	-0.014***	-0.016***	0.018	0.013
	(0.007)	(0.004)	(0.004)	(0.004)	(0.004)	(0.011)	(0.008)
Δunemployment(t-1)	-0.006	0.006	0.004	0.005	0.006	-0.001	0.005
	(0.008)	(0.004)	(0.004)	(0.004)	(0.004)	(0.011)	(0.009)
Δunemployment(t-2)	-0.017**	0.000	0.007	0.006	0.007	-0.031	-0.020
	(0.009)	(0.008)	(0.006)	(0.006)	(0.006)	(0.024)	(0.018)
Constant	-0.026***	-0.022***	-0.022***	-0.022***	-0.022***	-0.026*	-0.023**
	(0.006)	(0.003)	(0.003)	(0.003)	(0.003)	(0.013)	(0.010)
Cumulative ΔRER (t-1)	0.174	0.191**	0.124*	0.132**	0.12*	0.521	0.249
	(0.118)	(0.089)	(0.073)	(0.067)	(0.067)	(0.338)	(0.257)
Cumulative ΔRER (t-2)	0.312*	0.266**	0.202*	0.225**	0.211**	0.539	0.360
	(0.176)	(0.114)	(0.108)	(0.101)	(0.098)	(0.354)	(0.271)
R-squared	0.297	0.261	0.268	0.271	0.279	0.211	0.184
R-Squared (within)	0.00918	0.021	0.0227	0.0222	0.0223	0.0474	0.0323
Adj R2 (within)	0.00911	0.021	0.0227	0.0222	0.0223	0.0474	0.0323
Cluster	3,411	3,447	3,442	3,437	3,432	50	100
Observations	21,381	21,417	21,348	21,288	21,221	603	1,176
Share in employment	-	1	0.946	0.918	0.894	0.201	0.283
Firm FE	V	V	V	V	V	V	V

*P<0.1 **P<0.05 ***P<0.01

* Column 1 presents the real exchange rate's effect for the average company in the sample. The other columns show the aggregate effect calculated by weighting the firms in the sample, with the company's share of employment used as a weight.

Table A-5
The real exchange rate's effect on aggregate value added in manufacturing industries
(2000–2016)

Y=Δ(Added value)	(1) Base	(2) All	(3) Excluding top 5	(4) Excluding top 10	(5) Excluding top 15	(6) Including only top 50	(7) Including only top 100
ΔRER	0.292	0.710**	0.583***	0.531***	0.532***	1.147*	1.053*
	(0.182)	(0.286)	(0.145)	(0.147)	(0.142)	(0.666)	(0.543)
ΔRER (t-1)	0.163	0.424	0.146	0.196*	0.185*	0.616	0.537
	(0.167)	(0.323)	(0.115)	(0.114)	(0.109)	(0.659)	(0.563)
ΔRER (t-2)	-0.058	-0.384	0.221	0.271	0.225	-0.842	-0.703
	(0.213)	(0.519)	(0.167)	(0.179)	(0.175)	(0.967)	(0.833)
Δworld trade	0.203*	0.018	0.219**	0.150	0.197**	-0.222	-0.164
	(0.109)	(0.164)	(0.106)	(0.094)	(0.080)	(0.321)	(0.272)
Δworld trade(t-1)	0.286**	0.467*	0.006	0.023	0.010	0.906**	0.762**
	(0.124)	(0.279)	(0.072)	(0.073)	(0.072)	(0.396)	(0.381)
Δworld trade(t-2)	-0.022	-0.163	0.038	0.075	0.064	-0.330	-0.273
	(0.118)	(0.161)	(0.071)	(0.073)	(0.075)	(0.261)	(0.238)
Δunemployment	-0.022*	-0.052**	-0.031***	-0.023**	-0.014	-0.126***	-0.106***
	(0.012)	(0.021)	(0.011)	(0.010)	(0.009)	(0.035)	(0.033)
Δunemployment(t-1)	0.009	0.015	-0.001	-0.002	-0.009	0.064	0.049
	(0.015)	(0.022)	(0.011)	(0.011)	(0.010)	(0.041)	(0.036)
Δunemployment(t-2)	0.013	0.025	0.001	-0.002	-0.002	0.046	0.038
	(0.018)	(0.029)	(0.013)	(0.014)	(0.014)	(0.059)	(0.049)
Constant	-0.020*	-0.018	-0.014*	-0.014	-0.011	-0.035	-0.030
	(0.011)	(0.012)	(0.008)	(0.009)	(0.008)	(0.027)	(0.022)
Cumulative ΔRER (t-1)	0.455*	1.133**	0.729***	0.726***	0.717***	1.764	1.589
	(0.274)	(0.505)	(0.154)	(0.162)	(0.149)	(0.067)	(0.902)
Cumulative ΔRER (t-2)	0.397	0.749**	0.95***	0.997***	0.942***	0.922	0.887
	(0.411)	(0.338)	(0.273)	(0(.29)	(0.278)	(0.832)	(0.672)
R-squared	0.297	0.141	0.159	0.157	0.160	0.164	0.145
R-Squared (within)	0.021	0.047	0.021	0.013	0.012	0.127	0.098
Adj R2 (within)	0.021	0.047	0.021	0.013	0.012	0.127	0.098
Cluster	3,426	3,426	3,421	3,416	3,411	50	100
Observations	20,629	20,629	20,569	20,511	20,440	627	1,181
Share in total added value	-	1	0.846	0.765	0.731	0.409	0.493
Firm FE	V	V	V	V	V	V	V

*P<0.1 **P<0.05 ***P<0.01

* Column 1 presents the real exchange rate's effect for the average company in the sample. The following columns show the aggregate effect calculated by weighting the firms in the sample, with the company's share of the total value added of the industries serving as a weight.

Table A-6
The real exchange rate's effect on aggregate investments in manufacturing industries
(2000–2016)

Y=ΔInvestments	(1) Full sample Average	(2) Full sample Aggregate	(3) Excluding top 5	4) Excluding top 10	(5) Excluding top 15	(6) Including only top 50	(7) Including only top 100
ΔRER	0.311	-0.061	0.127	0.271	0.324	-0.119	-0.072
	(0.292)	(0.336)	(0.218)	(0.193)	(0.216)	(0.479)	(0.438)
ΔRER (t-1)	-0.809***	-0.333*	-0.343*	-0.520***	-0.476**	-0.280	-0.426*
	(0.280)	(0.201)	(0.192)	(0.187)	(0.207)	(0.298)	(0.254)
ΔRER (t-1)	0.545	-0.086	0.151	0.058	0.047	-0.329	-0.276
	(0.338)	(0.464)	(0.273)	(0.235)	(0.257)	(0.690)	(0.602)
Δworld trade	-0.019	0.279**	0.173	0.265**	0.183	0.585***	0.426**
	(0.150)	(0.131)	(0.128)	(0.117)	(0.119)	(0.207)	(0.189)
Δworld trade(t-1)	-0.129	-0.103	-0.100	-0.162	-0.045	0.009	-0.022
	(0.141)	(0.160)	(0.116)	(0.118)	(0.113)	(0.243)	(0.204)
Δworld trade(t-2)	-0.132	-0.143	-0.121	-0.260**	-0.304**	-0.214	-0.216
	(0.153)	(0.201)	(0.155)	(0.130)	(0.135)	(0.288)	(0.257)
Δunemployment	-0.095***	-0.098***	-0.092***	-0.101***	-0.107***	-0.091**	-0.109***
	(0.019)	(0.028)	(0.016)	(0.015)	(0.017)	(0.041)	(0.036)
Δunemployment(t-1)	0.042*	-0.063**	-0.051**	-0.044*	-0.030	-0.085*	-0.076*
	(0.023)	(0.029)	(0.023)	(0.023)	(0.024)	(0.045)	(0.039)
Δunemployment(t-2)	-0.031	-0.028	-0.051**	-0.065***	-0.077***	-0.028	-0.033
	(0.022)	(0.018)	(0.022)	(0.022)	(0.025)	(0.026)	(0.023)
Constant	-0.298***	-0.242***	-0.229***	-0.230***	-0.252***	-0.219***	-0.215***
	(0.013)	(0.015)	(0.012)	(0.010)	(0.010)	(0.025)	(0.022)
Cumulative ΔRER (t-1)	-0.499	-0.393	-0.216	-0.250	-0.152	-0.399	-0.498
	(0.394)	(0.251)	(0.258)	(0.247)	(0.267)	(0.339)	(0.337)
Cumulative ΔRER (t-2)	0.046	-0.48	-0.065	-0.192	-0.105	-0.728	-0.774
	(0.546)	(0.651)	(0.435)	(0.355)	(0.394)	(0.936)	(0.855)
R-squared	0.396	0.367	0.329	0.34	0.33	0.383	0.363
R-Squared (within)	0.0199	0.0733	0.0476	0.0531	0.0492	0.127	0.114
Adj R2 (within)	0.0198	0.0733	0.0476	0.0531	0.0492	0.127	0.114
Cluster	3,002	3,104	3,099	3,094	3,089	50	100
Observations	14,280	14,372	14,306	14,253	14,183	578	1,078
Share in investments	-	1	0.725	0.656	0.567	0.632	0.737
Firm FE	V	V	V	V	V	V	V

*P<0.1 **P<0.05 ***P<0.01

* Column 1 presents the real exchange rate's effect for the average company in the sample. The other columns show the aggregate effect calculated by weighting the firms in the sample where the company's share of investments serves as a weight.

Appendix: Definitions

Employee post: Including a post held by an owner, an employee, or an unpaid family member.

Return on employee post and employee productivity: The return on an employee post is composed of total wage and related payments and the enterprise's expenses associated with employment of persons who hold posts. We define labor productivity as the return on an employee post.

Sales to the domestic market: Turnover from sales to the domestic market and the return on exports to the Palestinian Authority, net of purchase tax and agents' commissions in Israel, plus participation of the Chief Scientist in R&D expenditure and the value of assets produced for self-use.

Export sales: Turnover from sales of the enterprise's output for export, net of export commissions.

Output: Turnover from activity including export subsidies and benefits.

Gross value added: Value of output net of total inputs.

Technological intensity: High technological intensity is defined as industries involved in advanced technology and high-tech R&D, while low intensity refers to traditional industries and lowtech R&D.

Firms of high technological intensity are those in industries that are classified as high technology and mixed-high technology. Those of low intensity are in industries classified as traditional and mixed-traditional technology.[38]

[38] The definitions correspond to those in the introduction to the Manufacturing Survey. For a detailed presentation, see https://www.cbs.gov.il/he/publications/doclib/2019/1775/intro_b_h.pdf . Industrial classification by technology intensity is according to the accepted international classification. For details, see https://www.cbs.gov.il/he/publications/doclib/2019/1775/app_h.pdf