Selected Research and Policy Analysis Notes

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This publication replaces the “Recent Economic Developments” series.
This publication will also be published semiannually, and will include research analyses on various economic issues.

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LONG-TERM IPO PERFORMANCE[1]

- In 2021, there were an anomalous number of offerings on the Tel Aviv Stock Exchange (TASE) (part of the 2020–22 wave of offerings). This phenomenon raised renewed interest in the question of the long-run performance of equities bought in IPOs. This paper presents evidence for the existence of "long-term underperformance" of equities initially issued to the public on the Israeli market: For investors who purchase shares in an IPO, the return over a 3–5 year period is lower than for alternative investments.
- Underperformance of shares in IPOs was measured relative to 3 benchmarks: the Tel Aviv 125 Index, a sample of companies similar in size to the companies examined, and a sample of companies similar to them in the book value to market value ratio. Equities purchased 1 day after the IPO underperformed all the benchmarks over 3–5 years.
- In contrast to findings in other countries, in which "long-term underperformance" is not unequivocal, the results regarding the phenomenon in Israel are statistically significant.
- A possible explanation for the "long-term underperformance" phenomenon is investors' overoptimism and the timing of the offering by companies. Thus, if investors' assessment of the company's growth opportunities are overly positive, because of information gaps between them and the company, they may pay a "premium" for purchasing equities immediately after their issue.

1. Introduction

In 2021, there were an anomalous number of IPOs on the Tel Aviv Stock Exchange (TASE)—93 equity IPOs. To compare, over 2016–20 there were, on average, 13 IPOs per year, and in 2010–11 there were 82 new equities offered to the public. The rejuvenation of IPO activity renews the relevance of analyzing the phenomena related to IPOs. In this regard, one of the main phenomena is the underperformance of IPOs over the long term. It is interesting to examine the phenomenon based on Israeli capital market data, which could add to knowledge of Israel's economy.

The "long-term underperformance" phenomenon of equities in IPOs is documented in the research literature (Lowry, et al. 2017b). It has been found that investors who purchase equities in an IPO earn, over the long term (3–5 years), less than in other investment strategies, such as investing in the general stock market index, or investing in shares of older companies that have already traded for some time on the equity market and are similar to the companies being discussed (such as in their size, and in their growth potential as measured by the ratio of book value to market value). If this is a persistent phenomenon, it is liable to reflect structural problems with negative ramifications on the economy: first, the existence of such a phenomenon contradicts the Efficient Markets Hypothesis, which claims that all public information available is incorporated in equity prices, and therefore excess profits cannot be attained via an investment strategy based on public information. According to this theory, underperformance cannot be maintained over time, as investors are expected to identify that investment in equities issued in IPOs underperform compared to alternative investments, and to stop buying such equities. Second, the existence of long-term underperformance indicates potential distortions in capital allocation, as the capital is liable to be allocated

[1] Author: Michael Gurkov.

at a price that is too high, meaning according to overly optimistic assessments of the company's future performance, and these assessments will be proven wrong in the long term.

One of the explanations given in the literature for the long-term underperformance is over-optimism by investors that is particularly reflected in periods of rising markets (Ritter and Welch, 2002). According to Alti, 2005, the issue of companies in a rising market (at high prices) signals to other firms regarding investors' valuation and this serves as an incentive for additional companies to issue. Investors assessing the growth opportunities of the company in too optimistic a manner are prepared to pay a "premium" to purchase the shares. The willingness to pay the premium is liable to lead to market timing—companies that issue shares arrange the timing of the issue in accordance with market expectations. Therefore, if the company is of the view that the market assessment of its valuation is higher than the company's assessment, it will exploit the "window of opportunity" and issue shares in order to receive the market price for them.

The overpriced issuance of companies is liable to cause, in the long term, "destruction of value" for investors instead of maximization of value. Kashefi, Pour, and Lasfer (2013), who analyzed voluntary delistings of UK stock market companies, showed that these are companies that did not invest the capital they raised toward developing the company, but rather used it to finance their undertakings (to rebalance the equity and debt components). According to that research, the firms displayed, during their trading on the stock market, a decline in performance—their profits, growth potential, and trading volume declined, while the share of parties at interest and leverage remained high. The researchers concluded that these firms had "destroyed value" for their shareholders, and their issuance to the public should have been avoided. The stock market sets thresholds for issues, so that in actuality, in a preliminary stage before the issuance, there is some filtering of the offering companies. Among other things, the stock exchange sets criteria with which the offering companies need to comply in terms of size, age, and minimum value of the public's holdings in it.[2] A comprehensive examination of the nature of the filtering process is not the focus of this paper, but identifying the "long-term underperformance" phenomenon will make it possible to receive some indication of the quality of the preliminary filtering.

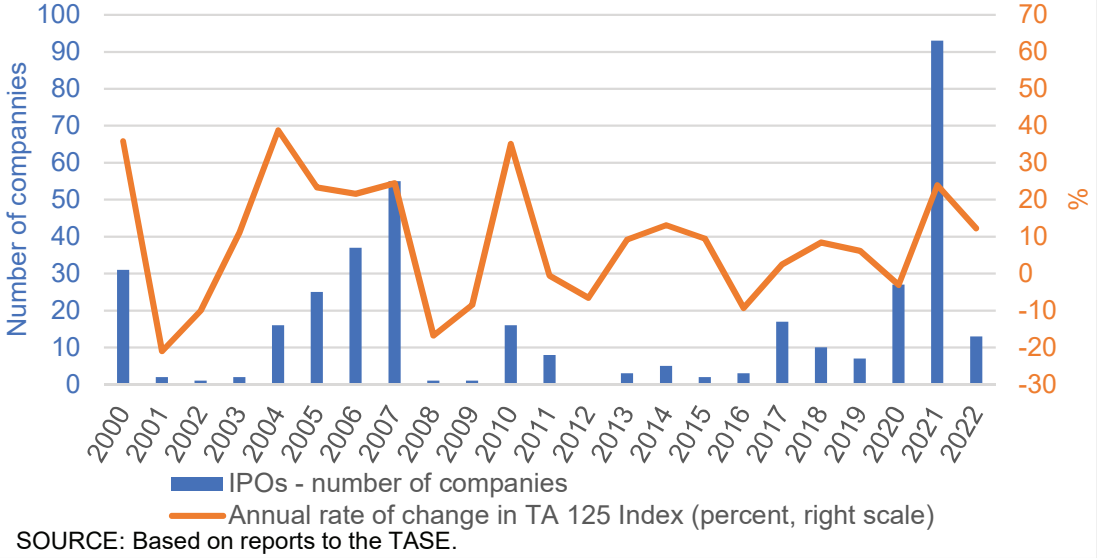
A historical examination of initial offerings on the Israeli stock market shows that the number is not uniform over time, but is characterized by "waves" (see Box 4.1 of the 2022 Bank of Israel Annual Report):[3] after a period of vigorous offering activity, comes a period of low activity, reaching a point of lack of offerings (Figure 1). In addition, it appears that the offering activity is correlated with market conditions—in a rising market there is vigorous offering activity, while in a declining market, offering activity is low. In periods of accelerating economic activity, forecasts of firm performance become more optimistic, which provides an incentive to inferior firms to try to issue together with the better firms (Yung, et al. 2008). This phenomenon is in line with the market timing hypothesis: the companies that issue exploit the "window of opportunity" and choose to issue in the period in which the market assessment of their value is at its high (and it likely exceeds their own self-assessment of their value). If this hypothesis is correct, it could explain the long-term underperformance phenomenon and the "premium" paid by investors. With the disproving

[2] The terms that an issuing company must meet are: Alternative A requires (post-issue) capital exceeding NIS 25 million, public holdings exceeding NIS 20 million, at least 12 months of activity in respect of which financial statements were prepared, and financing profit exceeding NIS 4 million. Alternative B requires (post-issue) capital exceeding NIS 35 million, public holdings exceeding NIS 30 million, at least 12 months of activity in respect of which financial statements were prepared, without a requirement regarding the company's profit.

[3] Bank of Israel (2023). In a box published in the Annual Report, the issue was presented and an initial review was carried out, mainly based on theoretical statistics. In the present analysis, the empirical examinations were examined and deepened with the goal of confirming and entrenching the conclusions in a statistically significant manner.

of the overvaluation of the price, the high equity prices that existed in the record high period, later on are exchanged for lower prices.

Figure 1
Number of IPOs and TA 125 Index performance



SOURCE: Based on reports to the TASE.

Against the background of the wave of offerings in 2011, it is worth examining the efficiency of the Israeli equity market by examining the IPO underperformance phenomenon. The research question is thus: Does the long term underperformance phenomenon exist in Israel?

2. Literature survey

Lowry et al. (2017a) present an updated survey of the literature on equity IPOs. The survey indicates that the question of whether the long term underperformance phenomenon exists has not yet been resolved. Several papers find significant evidence of underperformance. Among the most notable of these is Ritter (1991), which examined IPOs in the US in 1975–84, and found significant evidence of underperformance, which is in line with the taking advantage of the window opportunity hypothesis.[4] Gompers and Lerner (2003), Loughran and Ritter (1995), and Spiess and Affleck-Graves, (1995) continued the work of Ritter (1991), and found additional evidence for the underperformance phenomenon in larger samples (1970–90), (a phenomenon found as well in the equities of secondary offerings). The main papers focused on the US market. However, there are also papers that found supporting evidence for the phenomenon in Canada (Kooli and Suret, 2004), in the UK (Coakley et al., 2008), and in Greece (Thomadakis et al., 2012). However, in some cases researchers qualified the findings and claim that the conclusions are sensitive to how the performance is measured and to the length of the investment period, as well as being impacted by the underperformance being measured at times only in periods of particularly solid activity—"hot market" periods.

[4] A "Window of Opportunity" is a situation in which the company is of the view that the market is overvaluing it, and exploits this to issue shares for which it receives the (excessive) market price.

In contrast to papers that found evidence supporting the underperformance, Drobetz et al. (2005) did not find evidence of that phenomenon in the Swiss capital market, Schultz (2003) presents a model showing that in an efficient market as well there could be findings that are apparently consistent with the phenomenon: in the model the companies issue their shares when prices increase, even without market timing and without forecasting future performance.

Brau et al. (2003) examined 2 funding alternatives—issuing shares to the public, and selling the company to a competitor ("exit"). They present empirical evidence for the existence of a "premium" for IPOs: valuations received by companies issuing shares to the public are higher than those of companies sold to competing companies. In addition, they found that belonging to the high tech sector, market timing (issuing shares in a period when the market's assessment of the company's value is particularly high) and the relatively high share of holdings by parties at interest increase the probability that the company will issue shares despite the alternative of selling via a merger. Bayar and Chemmanur (2011) developed a theoretical model that deals with the factors impacting on the "premium" of IPOs. The model shows that one of the factors in the premium is information gaps: the competing entity, which is interested in buying the company, is able to estimate its value with greater accuracy than outside investors buying shares in the IPO, who may assess their value overoptimistically; companies will tend to issue their shares if they received high estimations in the issuance market. Bayar and Chemmanur (2012) provide empirical support for the hypotheses of Bayar and Chemmanur (2011).

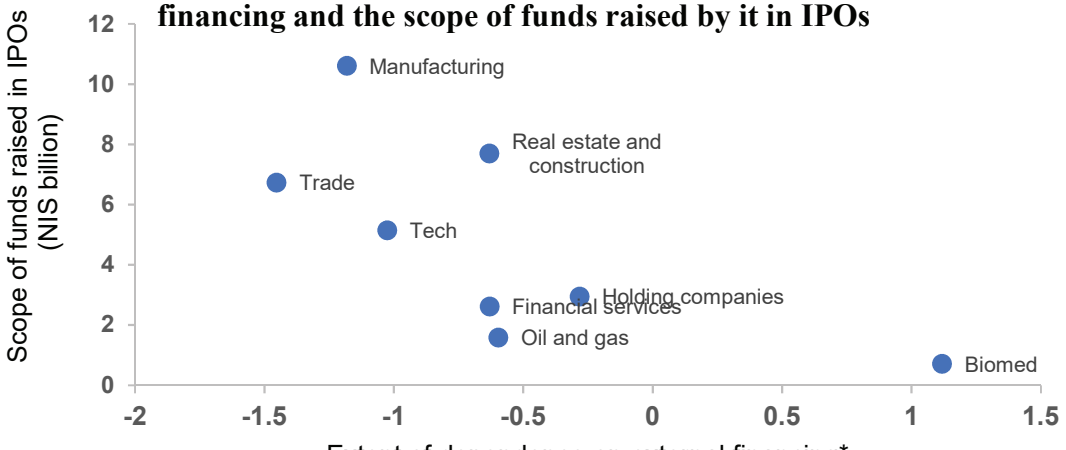
3. Characteristics of the companies issuing IPOs on the stock exchange

The sample includes 364 equities that were issued for the first time on the Tel Aviv Stock Exchange (TASE) in 2000–22. The issues arrived mainly in 2 waves (Figure 1): the first wave occurred in 2004–07 and was curtailed against the background of the Great Financial Crisis, and the second wave was in 2020–22, in the period of exiting the COVID-19 crisis, and was curtailed in 2022, in view of the increased tightening of the financial conditions worldwide and increasing interest rates worldwide and in Israel. The year 2021 was anomalous from the perspective of the past 20 years. The two waves differ in the industry composition of the issuing companies: in the wave of the 2000s, trade and services companies were the main ones, while in the wave of the 2020s it was high-tech companies. The notable industries in terms of number of issues and scope of capital raised among all the companies in the sample were trade and services, real estate and technology (Table 1). Manufacturing was notable in terms of number of issues, but not the scope of money raised. In terms of the industry composition of the issues, it is interesting to note the work of Rajan and Zingales (1998), who claim that financial development can contribute to economic growth. They show that industries that are dependent, more than other industries, on external funding, succeed in developing at a faster pace in countries with more developed capital markets. In order to examine the connection between the extent of dependence of industries that issued shares on the TASE with external financing and the scope of their funds raised, the extent of dependence on external financing in Israel was calculated (as the gap between the capital investments to flows from current activity, normalized in respect of the scope of capital investments), and a negative relationship was found between it and the scope of capital raised (Figure 2). Thus, for example, the biomed industry, which is characterized by its high dependence on external financing[5], raised the smallest scope of capital of all the industries that issued equities to the public. The

[5] Rajan and Zingales (1998) refer to the pharma industry as the industry with the highest dependence on external financing.

negative relationship between the level of dependence on external financing and the scope of capital raised could indicate that obtaining external financing is not a major consideration among companies issuing shares on the TASE.

Figure 2
The link between the industry's dependence on external financing and the scope of funds raised by it in IPOs



* Extent of dependence on external financing is calclated as the gap between equity investments and flows from ongoing activity, divided by equity investments.
SOURCE: Based on financial statements of public companies.

The waves of issuances are also differentiated by the quality of the issues: in the issues of the second wave, in contrast to those of the first wave, the share of losing companies—those that reported negative profit in the year preceding the issue[6]—was high and anomalous relative to the issues of the earlier years (Figure 3). A possible explanation for that is seen in the industry composition: a solid majority (approximately 75 percent) of the losing companies were early-stage startup companies, which stood out in the wave of 2020. These companies are considered as high risk, relative to trade and services companies, that stood out in the wave of the 2000s. The second wave was thus characterized as higher risk than in the first one.

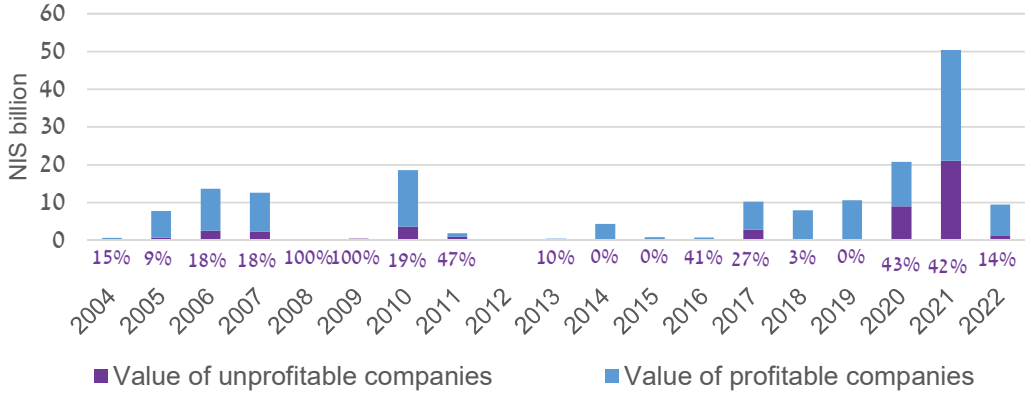
An examination of the size of the issues indicates that the amounts raised are not high: a strong majority of issues (about 88 percent) are issues that raised amounts lower than NIS 200 million, and approximately 55 percent (198 issues) raised amounts lower than NIS 50 million (Table 2). An examination of scopes of financings compared to total market value of the equities indicates that the average scope of financing is less than 1 percent of the equity market value.

6 The stock market itself assigns importance to the pre-offering history of profits/losses, and even presents, as a requirement in one of the alternatives for listing for trade, a condition of having a profit totaling at least NIS 4 million in the year preceding the offering. For details see the information page on offering alternatives on the stock exchange website:
https://info.tase.co.il/Eng/listings_ipo/listing_securities/Pages/ipo_alternatives.aspx

Table 1
Distribution of issues in the sample, by industry

Industry	Number of issues	Scope of capital raised (NIS million, fixed prices of 2000)
Biomed	15	708
Trade and services	74	6,617
Financial services	17	2,612
Holding companies	20	2,557
Manufacturing	83	10476
Insurance	5	251
Oil and gas	14	1,588
Real estate	59	7,448
Technology	77	5,149
Total	364	37,158

Figure 3
Market value of companies issued, divided into profitable and unprofitable companies*



Percentages: the rate of change of losing companies divided by the value of total IPOs that year.
Companies that are unprofitable in the year prior to the IPO. By makret value as of the last business day of the correspnding year.
SOURCE: Based on TASE data.

Table 2
Distribution of IPOs by offering size

IPO size	Number of offerings	Scope of capital raised (NIS million, fixed prices of 2000)
Small (less than NIS 50 million)	198	5442
Medium (NIS 50–200 million)	129	1,2473
Large (NIS 200–1000 million)	34	1,0740
Very large (more than NIS 1,000 million)	3	8753

4. Methodology

4.1 Calculation of abnormal return

The common method for calculating returns in the literature, due to Ritter (1991), is also the primary method used in this paper. It calculates the excess holding rate of return—the Buy and Hold Abnormal Return (BHAR) (after adjusting for dividends). One of the advantages of this method is that it reflects the returns of an investor who purchases the shares at the IPO and holds them for a lengthy period of time (a common strategy among investors).[7] This method also assigns equal weights to issuing companies and not to the assessment period, and thus is more appropriate to disclosing companies' strategic conduct. If the companies do time the market and choose the most appropriate time for an issuance, assigning equal weights to various periods will weigh on the identification of the excess returns, because the periods during which the companies chose to issue will receive the same weight as will periods of very little, or total lack, of issues.

The definition of the excess holding rate of return is:

$$BHAR_T = \left[\prod_{i=1}^{T}(1 + r_{i,t}) - 1\right] - \left[\prod_{i=1}^{T}(1 + r_{benchmark,t}) - 1\right]$$

where:

$r_{i,t}$ is the yield of equity i during period t. t=1 is the first day of trading after the issue

$r_{benchmark,t}$ is the yield of the benchmark index in period *t*

where:

J is the benchmark and the group of companies adjusted according to size/group of companies adjusted by growth potential

$r_{Benchmark,t}$ is the yield of the benchmark index in period t

$$r_{benchmark,t} = \sum_{j=1}^{J} r_{j,t}$$

[7] In the literature, this measurement method has been criticized. Mitchell and Stafford (2000) claimed that the issues are grouped over time, and therefore it is difficult to measure standard deviation of their returns (that is, because of the correlation between them), which adversely impacts checking the hypotheses. This is also joined by Schultz (2003), who claims that companies that issued shares in a "hot market" should not be assigned excess weight, and that returns should be measured in a different way: to assign each of the periods the same weight, unrelated to the question of how many companies issued in the period. These researchers propose measuring the returns by calculating the performance in calendar times, and to assign, as noted, equal weights to all periods and not to all companies. Loughrn and Ritter (2000), who deal with the various methods of measuring the returns, provide an answer to the criticism and determine that the method that assigns equal weight to all companies is the one that makes it possible to identify underperformance.

The Cumulative Abnormal Return (CAR) was also used. This method calculates the excess returns each period, and then accumulates the returns over the investment horizon. Its advantage compared to the BHAR is the lack of sensitivity to outlier observations (see Gompers and Lerner, 2003).

To calculate the cumulative excess return, we first calculate the excess return

$$ar_{i,t} = r_{i,t} - r_{benchmark,t}$$

And then the cumulative excess return over the desired investment horizon (number of months):

$$CAR_T = \sum_{t=1}^{T} ar_t$$

4.2 The benchmark indices for calculating the excess return

To calculate the excess return requires comparing the stock's performance (return) to the performance of an appropriate benchmark, so that the excess return reflects the share's performance net of the benchmark performance. The benchmark has to reflect the "expected" return, meaning performance without the issue. There are two approaches to choosing a benchmark (for an expanded discussion, see Loughran and Ritter, 2000): (1) The normative approach, which proposes a model that provides a forecast of the "expected" return. (The generally accepted models are those like CAPM or Fama's three-factor model.[8]) The excess return is calculated as the difference between stock performance and the model's forecast. The disadvantage of this approach is that if the model is flawed then the excess return that was calculated will also be wrong. This result was named the "joint hypothesis problem", as a single calculation checks both the correctness of the model and the existence of excess return. (2) The positive approach—according to which there should be supervision of the factors found empirically to impact on the return, such as company size (market value) and its growth potential (book value to market value ratio). In this way, examining the excess return makes it possible to check whether the equity returns of IPOs are related to the effects of the said functions, or whether this is a separate phenomenon. This paper chose 3 benchmark indices that reflect the positive approach were chosen:

- **Market index:** This index reflects the alternative chosen by a passive investor, who could have invested his capital in "the entire equity market" instead of investing specifically in IPOs. The market index is represented by the Tel Aviv 125 Index.
- **Companies similar in size to the checked ones:** In order to compare the performance of IPO equities with the performance of companies traded on the market, each equity was assigned to a group of companies with a market value similar to that of the checked company—the company that issued the IPO. The coordination is made by market value of the IPO at the end of the first day of trading. The control groups included all the companies traded for at least 1 year prior to the IPO date, and the market value gap between them and the IPO companies does not exceed 10 percent.

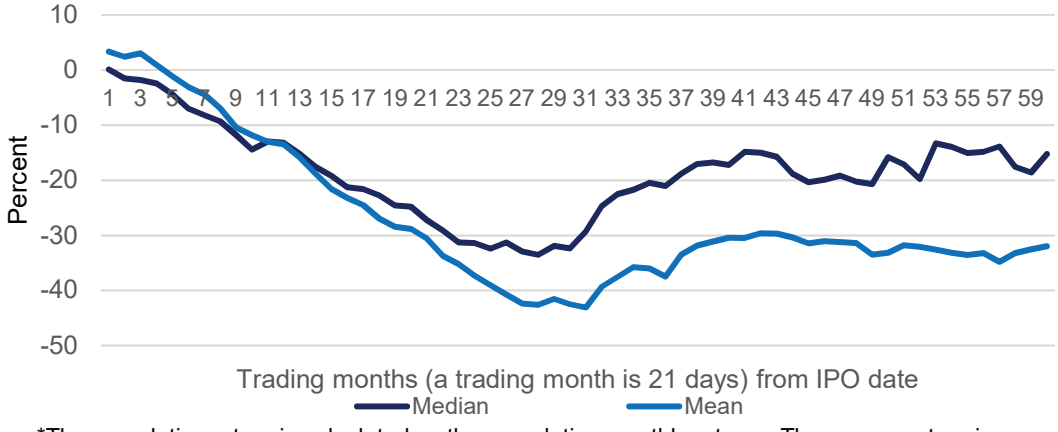
[8] See Fama and French (1993).

- **Companies similar in the book/market value ratio to the checked ones:** The book/market value ratio reflects the market's assessments of the company's growth potential. In order to compare the performance of the equities initially offered to those of companies traded in the market, a control group was prepared for each share. The control group included companies in which the book/market value ratio is similar to that of the company that issued the shares. The adjustment was made according to the book/market value ratio of the initial offering in the issue quarter. The control group included all the companies traded at least 1 year before the IPO date, and the gap between the book/market value ratio of the control group and that of the company that issued for the first time did not exceed 10 percent.

5. Equity returns after the offering

Figure 4 presents the development of the cumulative excess return (compared to the Tel Aviv 125 Index) over time. The return was calculated with a monthly frequency, and a trading month was defined as 21 consecutive trading days. It can be seen that at the beginning of the trading (for 27 trading weeks) the returns of the issues become more inferior over time. After 27 trading months the trend reverses—the excess return in the coming periods is positive, as seen in the rising part of the return graph. However the improvement over the rest of the trading does not succeed in compensating for the inferior returns at the beginning, so that in any point of time the cumulative excess yield is negative. As time passes, some of the companies exit the market (for various reasons, such as delisting or merger), and as a result the sample for which the returns are being measured gets smaller with time, which reduces the reliability of the measurement. In addition, if there is a connection between past performance and future performance, the removal of the failing companies from the sample is likely to contribute to the trend of improvement seen in the graph.

Figure 4
Cumulative excess return of IPOs from issue date*



*The cumulative return is calculated as the cumulative monthly returns. The excess return is calculated as the difference between the cumulative return of the equity and the excess return of the TA 125 Index in the corresponding period.
SOURCE: Based on TASE data.

Table 3 presents the excess holding return (BHAR) (Buy and hold abnormal return) of equities initially offered relative to each of the reference benchmarks (Tel Aviv 125), a sample of companies similar to the examined companies in size, and a sample of companies similar to the examined companies in regard to the

book value to market value ratio. Equity performance was measured over 3 time periods—1 year, 3 years, and 5 years—from the IPO date, in order to examine if the equity performance changed over time. The findings indicate consistent underperformance. The excess return relative to the Tel Aviv 125 shows the difference between returns on investing in the general shares market and those on investing in IPOs. It can be seen that the excess return is negative in all investment ranges, and that extending the range increases the loss. Thus, investors who purchased shares issued at the end of the first trading day lost, on average, about 12 percent of their investment relative to the returns on the market portfolio after a year. The loss increased and after about 5 years it reached 20 percent. Barber and Lyon (1997) note that the statistical distribution is characterized by skewness, and recommend making adjustments for that in a statistically significant check. Therefore, here the significance of the estimations is checked both in terms of t standards[9] and with the assistance of the correction proposed in respect of the skewness.[10] Similar to Gompers and Lerner (2003), it was found that the results in the 2 methods are very similar, however, unlike other research, the results in the Israeli sample are significant in both the tests.

In addition, a comparison to performance of similar companies (in terms of size or growth potential), shows that the equity returns for IPOs are inferior: Comparing the IPOs of such companies to those of veteran companies similar to them in size (market value) shows that an investor who bought equities in an IPO lost about 12 percent relative to investment in the comparison companies (a similar result to that of the performance compared to the Tel Aviv 125 Index), and after 5 years the loss grew to about 25 percent. A comparison of returns of companies with a book to market value ratio similar to that of first-time issuers shows a more moderate difference—after a year, an investor in IPOs lost about 6 percent, and after 5 years the loss increased to 20 percent. In total, the picture conveyed from the analysis of the BHAR is of consistent underperformance compared to all benchmarks and to all ranges.

Measuring performance via the cumulative excess return method leads to similar conclusions in terms of quality—inferior returns in all reference benchmarks and to all terms (Table 4). Qualitatively, there are certain differences in the results—calculating excess holding rates of return (BHAR) shows that returns are more negative the more the range of investment increases, while in the cumulative excess return method, it appears that after 3 years the loss compared to the alternative is largest.

[9] Statistically, a t-standard test is calculated by the equation:

$$t_{sa} = \sqrt{n}\left(S + \frac{1}{3}\hat{\gamma}S^2 + \frac{1}{6n}\hat{\gamma}\right)$$

[10] Statistically, the test correcting for the skewness is calculated by the equation:

$$t_{stat} = \frac{\overline{AR_\tau}}{\sigma(AR_\tau)/\sqrt{n}}$$

where:

$$S = \frac{\overline{AR_\tau}}{\sigma(AR_\tau)}, \qquad \hat{\gamma} = \frac{\left(\sum_{i=1}^{n}\left(AR_{i,\tau} - \overline{AR_\tau}\right)^3\right)}{n\sigma(AR_\tau)^3}$$

Table 3
BHAR–(Excess holding return) (t statistic values in parentheses)

Range of investment (years)	Benchmark		
	Book value/market value ratio	**Tel Aviv 125 Index**	**Size (market value)**
1	-5.7% (-2.27)	-11.5% (-4.49)	-12.1 (-3.97)
3	-14.1% (-3.73)	-19.1% (-5.08)	-21.4 (-5.26)
5	-19.8% (-3.47)	-26.7% (-5.2)	-25.1 (-3.64)

Table 4
Cumulative overperformance (CAR) (t statistic values in parentheses)

Range of investment (years)	Benchmark		
	Book value/market value ratio	**Tel Aviv 125 Index**	**Size (market value)**
1	-8.5% (-3.08)	-12.8% (-4.24)	-10.3% (-2.9)
3	-30.7 (-5.04)	-29.3% (-4.23)	-21.4 (-5.26)
5	-29.1% (-3.67)	-25.1% (-3.72)	-15.2% (-1.88)

6. Conclusion

An examination of returns of initially offered equities over the long term found that IPOs present negative excess returns in the long term, meaning inferior performance. The negative excess return were obtained compared to 3 reference indices—the Tel Aviv 125, a sample of companies similar to the examined companies in terms of size, and a sample of companies similar to the examined companies in terms of the book value to market value ratio. The equity returns were measured over 3 periods: 1 year, 3 years, and 5 years from the offer date. This was in order to check if there is evidence of changes in the equity returns over time. It was found that the equities of the IPOs presented negative excess returns relative to all the reference indices in all investment ranges. Compared to findings from other markets, which at times presented results that are not statistically significant, the results in Israel are more significant and indicate a "long term underperformance" phenomenon in the Israeli stock market. A possible explanation for the phenomenon is investor overconfidence, and as such timing of the offering by the companies. Indirect support for the explanation is obtained from the underperformance, which indicates the payment of a "premium" by investors and on the concentration of the issues in periods of a rising stock market—waves of issues.

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EXPOSURE OF INSTITUTIONAL INVESTORS TO POLLUTING COMPANIES[1]

- In this analysis we examine how climate-related issues are expressed in the financial markets in Israel and globally, and we analyze the exposure of Israel's financial institutions to polluting companies.
- Over the past two years, Israel's financial regulators have stepped up the measures applied in integrating ESG (environmental, social and governance) considerations in the investment and risk-management decision making processes of financial companies. Such action notwithstanding, there is no requirement obligating financial institutions to report their exposure to polluting companies, just as there is still no such requirement in other parts of the world.
- We found that the share of the institutional investors' total investment portfolio exposed to polluting companies dropped in the period under review, from 5.5 percent in January 2009 to 3.8 percent at the end of 2022. However, in the tradable corporate assets portfolio held by these institutions, the exposure rate remained relatively stable at around 12 percent.
- The share of the institutional investors' total equity portfolio exposed to polluting companies is low by international comparison.
- An allocation by investor category shows that at December 2022, mutual funds have the highest rate of exposure to polluting companies at 7.2 percent of their total investment portfolio, while the pension funds have the lowest rate of exposure at 2.4 percent. The different exposure between the two categories of fund is mainly attributable to differences in the mix of the investment instruments, since when comparing this investment from the total tradable corporate portfolio alone, the exposure rates obtained are the same – 12.1 percent in December 2022.

1. Foreword

According to the IPCC (AR6) report issued in February 2022, the effects of climate change are already felt in extreme climate conditions and weather events all over the globe. Evidence of extreme events such as heatwaves, heavy rainfall, drought, tropical cyclones, and particularly their attribution to the impact of mankind, have become more pronounced since the previous IPCC report published in 2014 (AR5). Compared with the pre-industrial revolution period, the changes relative to the pre-industrial revolution period include an increase of 1.07^0C in the average global temperature, retreating icebergs, warming of the upper layer of the sea, higher ocean acidification, rising sea levels of 20 cm. and more.

Climate change and extreme weather events pose risks leading to a growing awareness in Israel and other parts of the world of the importance of managing climate and environmental risks in a range of areas, including the financial system. The financial system is exposed to climate-related risks through two key channels – physical risk and transition risk.

[1] Authors: Meital Graham-Rozen and Shir Davidovitch.

Physical risk derives from the exposure to losses resulting from acute climate phenomena such as heatwaves, floods and wild fires, as well as losses arising from chronic climate phenomena developing over time, such as desertification and rising sea levels. Risks from the transition to a low-carbon economy derive from policy and regulatory changes, changes in technology, as well as changing public tastes and conduct in the process of reducing greenhouse gas emissions (GGE).

The financial system is exposed to the risk of climate change in its various channels. Materialization of these risks could lead to financial loss in different time frames and of different magnitudes, depending on the nature of the economy and the channels of exposure of the various entities within the financial system to those risks. The degree of exposure to the materialization of transition risks and physical risks differs among the different financial companies due to variance in the distribution of their financial exposure and also to a possible variance in the effect of the exposures on the future development of their business.

The most significant climate-related milestone in the past few years is the signing of the Paris Agreement (or Paris Climate Accords) in 2015. This agreement obligates its signatories, Israel included, to submit to the secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) every five years, a national goal (or nationally determined contribution (NDC)) for reducing greenhouse gas emissions that is more ambitious than its predecessor. The emission reduction policy relies on technology developments that require considerable finance. Finance is required for the construction of infrastructures to assimilate renewable energy, to adapt the activity of existing companies, for research and development (R&D) of new technologies, and more. These expenses may be covered by government or through private funding by way of equity or debt. According to OECD estimates from 2017[2], meeting the goal of limiting global warming to 2^0 at a probability of 66 percent will require global investment of $6.9 trillion per year for the next ten years.

This analysis focuses on the subject of climate in the Israeli and global financial markets and centers on an attempt to quantify the scope of the exposure of the different institutional investors[3] to polluting companies[4] in Israel, and examines how it has developed over the last 15 years.

2. Environmental investments

Sustainable finance generally refers to investment policies that are about including ESG (Environmental, Social and Governance) considerations at the level of individual securities, portfolios or issuers. Within the framework of sustainable investments, green investments are considered to be those focusing on environmental issues. Green investments include those associated directly with climate change through mitigation[5] or adaptation[6] as well as investments that contribute to the environment but do not contribute directly to climate change. Investments in climate-change mitigation are generally called low-carbon

2 Organization for Economic Cooperation and Development (OECD) (2017). Investing in Climate, Investing in Growth. OECD Publishing. Paris.

3 Insurance companies, pension funds, mutual funds and provident funds.

4 We have defined as polluting companies those companies defined as such by the Index Committee of L&E (Life and Environment) and/or companies associated with the stock exchange energy and oil and gas exploration sectors, and/or companies listed in the Ministry of Environmental Protection's Pollutant Release and Transfer Register. Further information appears later on in this paper.

5 Mitigation of the effects of climate change by reducing greenhouse gas emissions. The financial sector can help in this respect by diverting capital to investments in green technologies.

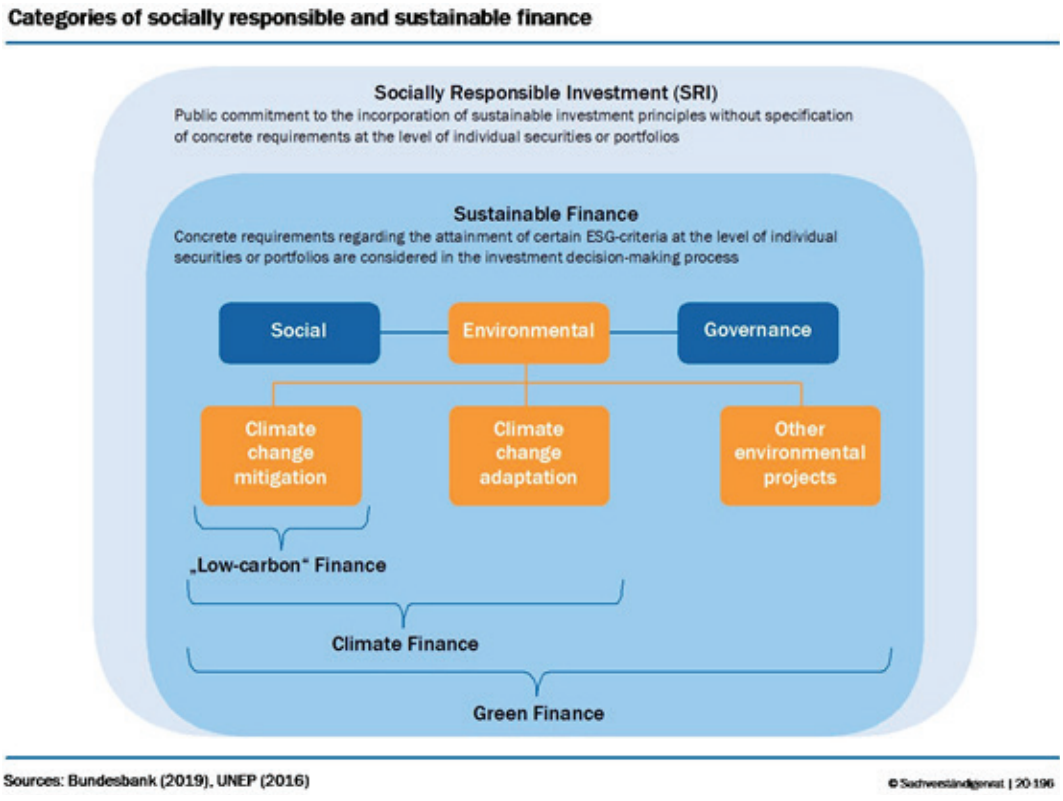
6 The adaptation required of the financial system to the climate crisis incorporates assimilating a policy to manage climate risks by maintaining stability of the financial system. This policy is necessary at the level of companies, financial institutions and supervising entities and it requires the development of models, new stress tests and regulations that will help classify activities by their exposure to climate risks.

investments. Figure 1 presents a schematic description of the social-environmental investments described above, as generally referred to in the world at large.

In addition to classifying investments as socially responsible investments, methods must be developed for classifying and identifying assets that are relevant to these goals. There are several methods for categorizing firms according to "green" criteria aimed at creating competition between the companies regarding greener activity. (See Appendix A for additional information.)

Just as there are different definitions for economic activity that is considered green, there are also numerous possibilities for classifying economic activity that is harmful to the environment. Under the European Union Taxonomy, only economic activity that makes a significant contribution to the environment is currently defined as green, while the conditions of economic activity that significantly harms the environment will be published at a later date. In general terms, threshold data will be defined to form the basis for deciding whether economic activity adversely affects one of the six environmental objectives of the EU.[7] This classification requires a response to two questions—whether it is possible to improve the environmental impact of economic activity through technology developments, and whether the economic activity passes the defined threshold for causing substantial damage to the environment.

Figure 1: Environmental-Social Investment Frameworks



SOURCE: Liebich, Lena; Nöh, Lukas; Rutkowski, Felix; Schwarz, Milena (2020):Current developments in green finance, Arbeitspapier, No. 05/2020, Sachverständigenrat zur Begutachtung der Gesamtwirtschaftlichen Entwicklung, Wiesbaden.

7 Climate change mitigation, climate change adaptation, sustainable use and protection of water and marine resources, transition to a circular economy, pollution prevention and control, protection and restoration of biodiversity and ecosystems.

Additionally, financial institutions can analyze the extent to which their different portfolios are exposed to climate by means of the CPRS (Climate Policy Relevant Sectors) classification. This method, developed in 2017, is based on a classification of economic activities from the perspective of climate transition risks. (In Europe this classification is known as NACE, and in Israel the Central Bureau of Statistics has corresponding sectors at different levels of detail.) The most general classification is 9 categories of economic activity, including fossil fuel, electricity and utilities, energy intensive, buildings, transportation and agriculture, and each category covers different economic sectors.[8] Another possible classification is based on the intensity of greenhouse gas emissions (GGE), namely—the volume of emissions relative to the volume of the company's economic activity. The emissions are measured in scopes. Scope 1 measures the company's direct emissions (e.g., by the vehicles and industrial plants in its possession); Scope 2 covers indirect emissions, originating in the purchase of polluting raw materials (mainly due to the use of electricity); Scope 3 is indirect emissions that are not part of Scope 2 and occur over the company's supply chain. Scope 3 covers the company's investment portfolios in the case of financial institutions. The first and second categories are fairly simple to evaluate and report, but there are still no clear reporting standards for Scope 3. Furthermore, companies reporting Scope 1 and Scope 2 emissions do not always report Scope 3 emissions. There are methods for assessing the volume of the emissions even if they are not reported by the companies, based on economic sector and their volume of activity, and many institutions are assisted by external consulting companies that specialize in evaluating such data.[9]

As in other parts of the world, in Israel too there is a growing approach that investors should receive more disclosure on climate-related issues and that such disclosure should be enhanced and standardized. To help governments, central banks, and financial regulators improve the way they address the possible impact of climate risks on the financial system, over the past few years international financial and economic organizations (FSB, IMF, BIS, OECD, NGFS, and others) have begun to engage in this field from different perspectives—mainly with respect to financial stability, recommendations to central banks, and recommendations to those responsible for the supervision and regulation of financial institutions. Some of these entities are involved in improving disclosure, transparency and enforcement and work to create uniform standards and frameworks for risk management and the redirection of investments. Appendix B presents the measures taken by Israel's financial regulators in this regard,[10] and it shows that there has been a marked acceleration of the measures introduced in the past two years, meaning that the three financial regulators (Banking Supervision Department; Capital Market, Insurance and Savings Authority; and the Israel Securities Authority) now emphasize the integration of environmental, social, and governance considerations in investment and risk-management decision making processes. Nonetheless, there are no mandatory requirements in Israel that obligate financial companies to report their exposure to polluting companies, a situation similar to that in other parts of the world.

8 Battiston, Stefano, et al. (2022). "The NACE-CPRS-IAM mapping: A tool to support climate risk analysis of financial portfolio using NGFS scenarios". Available at SSRN (2022).

9 From "Mapping climate risk: Main findings from the EU-wide pilot exercise" by the EBA, May 2021.

10 Appendix C presents the measures adopted by supervisory authorities around the world.

3. Exposure of institutional investors to polluting companies

Considerable uncertainty surrounds the pace and intensity of the development of physical climate risks and transition risks, in the form of policy measures to be assimilated as part of the global effort to address climate change. The financial companies' exposure to these risks in the future is liable to increase to the point that it will affect various aspects of their activity. These companies are exposed to environmental risk as part of their investment risk, by way of investment of the assets that they manage. Furthermore, growing public awareness of and the demand for environmentally sustainable conduct is accompanied by an increase in the reputation risk of companies that fail to take action to mitigate climate risks. All companies in the economy, financial institutions included, face such reputation risk. Notably, insurance companies are also exposed to investment risk by way of the investment of their assets: through the credit risks of their borrowers or a decline in the value of collateral that is exposed to environmental risk, or by way of credit risk, if a reinsurer's financial position deteriorates due to investments it is forced to make as a result of environmental regulations.[11]

One of the key risks arising from climate risk lies in the failure to price these risks into the price of the assets. Government action to reduce greenhouse gas emissions, such as carbon tax, could lead to a reduction in the value of the shares and lower the credit rating of industries based on fossil fuels. This could lead, in turn, to an increase in the leverage of the companies and in all probability to an increase in their risk premium, and specifically to a greater risk of bankruptcy.

In this chapter, we attempt to quantify the exposure of the institutional investors (insurance companies[12], mutual funds, provident funds[13] and pension funds) to polluting companies, namely that share of the institutional investors' total investment portfolio that is invested in polluting companies. We have defined these companies in accordance with the L&E (Life and Environment) Index Committee[14] definition of polluting companies and/or companies associated with the stock exchange energy and oil and gas exploration sectors, and/or companies listed in the Ministry of Environmental Protection's Pollutant Release and Transfer Register (PRTR).[15]

11 For further information, see Box 2 in the Bank of Israel's Financial Stability Report for the first half of 2022: "Climate risk and the financial institutions".

12 Profit-sharing portfolio only.

13 The study funds are included in this category.

14 The launching of the fossil-free TA-25 share index in 2020 by the umbrella organization of Israel's environmental organizations included the establishment of an L&E Index Committee, which set guidelines for defining fossil-fuel (polluting) companies: (1) companies engaged in the exploration, production, transmission, storage and refining of fossil fuels (gas, coal, oil, oil shale and its derivatives); (2) companies engaged in the construction and operation of power stations generating electricity on the basis of fossil fuels; (3) companies whose main purpose is to finance a fossil-fuel corporation and/or receive royalties from fossil-fuel companies; (4) companies with a controlling interest (according to the definition of this term in the Securities Law) in a fossil-fuel company. The L&E Index Committee may deviate from these guidelines at its discretion should it find justification for such action.

15 Information from the database is reported to the Ministry of Environmental Protection and published annually under the Environmental Protection Law. This database includes data on the emission of polluting substances into the environment, the flow of sewage from industrial plants to sewage processing plants, and the transfer of waste for treatment or to landfill. According to Ministry of Environmental Protection sources, emissions originating in the industries reported to this database account for more than 60 percent of all emissions by Israel's industries. The report lists the range of emissions that are above the threshold conditions for reporting, but at relatively low volumes.

The Index Committee has defined 48 companies as fossil fuel companies, and 16 of them are listed on the TA-125 share index. 43 of these companies have shares or participation units while the rest are bond companies. The 43 companies that have shares or participation units are associated with six economic sectors: 28 companies are oil and gas exploration companies (of which 19 belong to the oil and gas exploration subsector and 9 belong to the energy subsector), 10 companies belong to the investment and holdings sector, 2 companies to the real-estate and construction sector, one company belongs to the industry sector (chemicals, rubber and plastics subsector), one belongs to the trade and service sector (commerce subsector) and one company belongs to the technology sector (cleantech sub-sector).

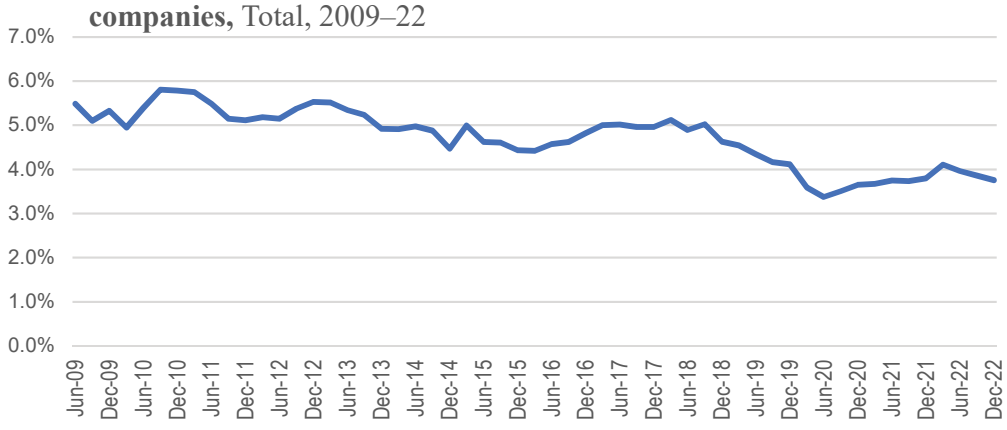
In contrast, the PRTR includes Israel's 575 largest industrial plants and monitors their emissions. The PRTR data refer only to the companies' direct emissions (Scope 1) and do not include the indirect emissions stemming from the company's activity (Scope 2 and Scope 3). These plants belong to companies from different economic sectors, including agriculture, metals, waste and sewage, energy and chemical industries, minerals, and food and beverages. Of these companies, 52 are publicly traded companies (7 are also listed on the L&E Index)—24 of these companies have shares and 28 are bond companies. At the end of 2022, the total market cap of the companies listed on the L&E Index, the companies associated with the oil and gas exploration and energy sectors and the public companies included in the PRTR data, account for 15 percent of the stock market segment and 17 percent of the tradable debt on the TASE.

Figure 2 describes the share of the institutional investors' total asset portfolio that is directly exposed to polluting companies, between 2009 and 2022. The graph shows that in this period, direct exposure declined by just 3.8 percent at the end of 2022 (even though the value of the polluting companies increased over time). An allocation by investor category (Figure 3) shows that at December 2022, the mutual funds have the highest rate of exposure to polluting companies—7.2 percent, and their share has been growing since the end of 2014. Pension funds have the lowest rate of exposure, at 2.4 percent, and it has remained almost unchanged over time. Notably, the difference in the rate of exposure between the mutual funds and pension funds is mainly attributable to differences in the mix of the investment instruments, since if we compare the percentage exposure to polluting companies among the mutual funds and pension funds from the total tradable corporate portfolio, we obtain the same figures—12.1 percent in December 2022. Likewise, the trend and percentage exposure of the insurance companies and provident funds are very similar. It should be emphasized that these percentages are underestimates, for two reasons; first - because the companies in the L&E Index and oil and energy exploration sectors are all public companies, and second because identifying the polluting companies from the PRTR data is mostly textual and does not cover all the companies.

There are several possible explanations for the difference between the decline observed in the percentage exposure of the provident funds and insurance companies and the increase in that of the mutual funds. First, the goals of these investment entities differ with respect to their duration and risk level, and second, they are affected by the regulations applicable to them. Provident funds and insurance companies are generally required to make long-term investments and invest in assets with a higher rating than mutual funds. Consequently, given that the polluting companies' assets are generally in sectors characterized by higher risk, it is reasonable to assume that they will account for a larger share of the mutual funds' investment portfolio than the provident funds, insurance companies, and pension funds. Pension funds, which must maintain a longer but low-risk investment outlook, invest in government bonds more than other institutional investors, which explains their relatively low rate of exposure.

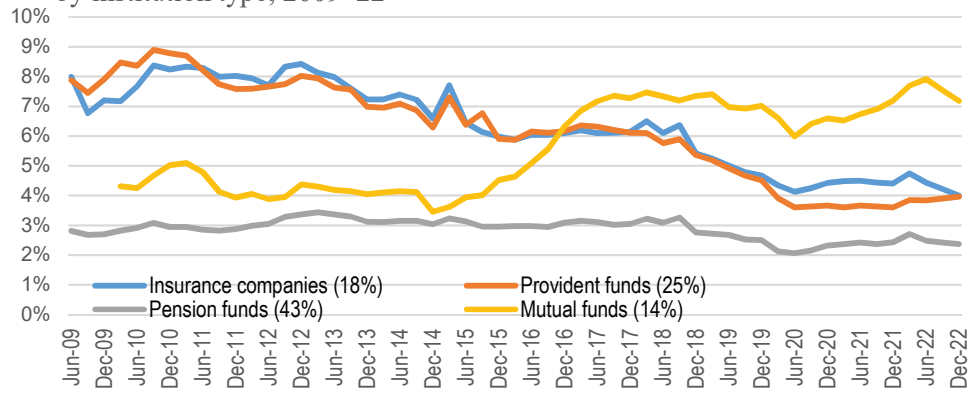
Figure 4 helps us compare the same investment instruments among the categories of institutional investors by showing the exposure of the institutional investors to polluting companies as a percentage of the tradable corporate assets they hold. This comparison shows similar rates of exposure among the institutional investors throughout the period and shows that the rate of exposure during this period is fairly stable at around 12 percent.

Figure 2
Share of institutional investors' exposure to "polluting" companies, Total, 2009–22



SOURCE: Based on PRTR (Pollutant release and transfer registry), TASE, and Praedicta.

Figure 3
Share of institutional investors' exposure to polluting companies, by institution type, 2009–22

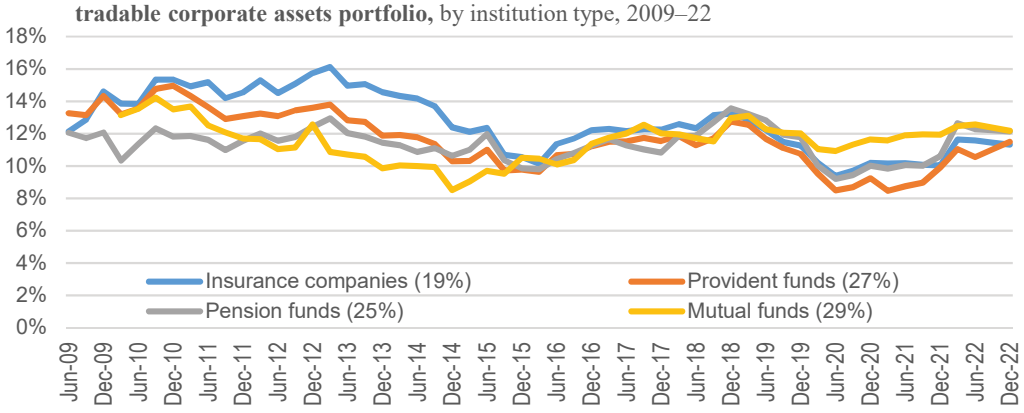


In parentheses are the shares of the insitution's assets out of total institutional investors' assets.
SOURCE: Based on PRTR (Pollutant release and transfer registry), TASE, and Praedicta.

For several reasons, it is difficult to compare the share of the financial institutions' holdings in Israel with that of their peers in other countries; these include regulatory differences[16], the structure of the financial markets, and principally the different methods of classifying companies as polluting companies. Drawing such comparisons might become simpler as the issue of the impact of climate change on the financial system becomes more firmly established from both the research and oversight perspectives, as disclosure improves and as the European Taxonomy also becomes applicable to polluting economic activity.

16 The different investment rules might lead to different decisions being made regarding the allocation of the investments.

Figure 4
Share of institutional investors' exposure to polluting companies, out of the tradable corporate assets portfolio, by institution type, 2009–22



SOURCE: Based on PRTR (Pollutant release and transfer registry), TASE, and Praedicta.
In parentheses are the shares of the insitution's tradable corporate assets out of total tradable corporate assets of institutional investors.

Benz et al. (2020)[17] estimated the extent of the exposure of different investors[18] around the world[19] to companies with high carbon emissions intensity[20] (ratio of CO_2 emissions to volume of economic activity) between 2000 and 2015, and the key results of their assessment appear in Figure 5. Notably, their study shows that this exposure is measured only as a percentage of the investors' equity portfolio. The graph shows that the rate of exposure increased to 27 percent among the institutional investors and mutual funds until 2007, it was stable until 2011, and thereafter trended downward up to the end of the period under review—like the asset portfolio of Israel's institutional investors in the same period. According to the data, the exposure reached 19.7 percent in 2015. For the sake of comparison, at the end of that year, the institutional investors in Israel had exposure of 18.1 percent to polluting companies in the equity portfolio alone, based on the classification in this paper. Benz et al. examined whether different categories of investors prefer companies with high carbon emissions intensity and they found that governments actually prefer such companies, whereas individuals, investment consultants, and mutual funds have an aversion to them.

The banking system's exposure to climate transition risk is discussed in the Banking Supervision Department's Annual Review for 2021, Box 1.2. Box 1.2 contains an analysis of the banking system's exposure to climate transition risk, where, for example, the bank might sustain such negative impact due to financing the activity of companies affected by the repercussions of an economic shift to goals that are consistent with a low CO_2 emissions policy ("CO_2 emissions"). This vulnerability could affect a company's loan repayment capability and accordingly, the bank's sensitivity and degree of exposure to borrowers affected by it. The analysis indicates that the total gross credit balance risk for large borrowers with a high level of CO_2-equivalent emissions (polluting borrowers) was about NIS 19.1 billion at the end of 2020

17 Benz, L., Paulus, S., Scherer, J., Syryca, J., & Trück, S. (2021). Investors' carbon risk exposure and their potential for shareholder engagement. Business Strategy and the Environment, 30(1), 282–301.

18 Governments, institutional investors, hedge funds, private equity, investment consultants and mutual funds.

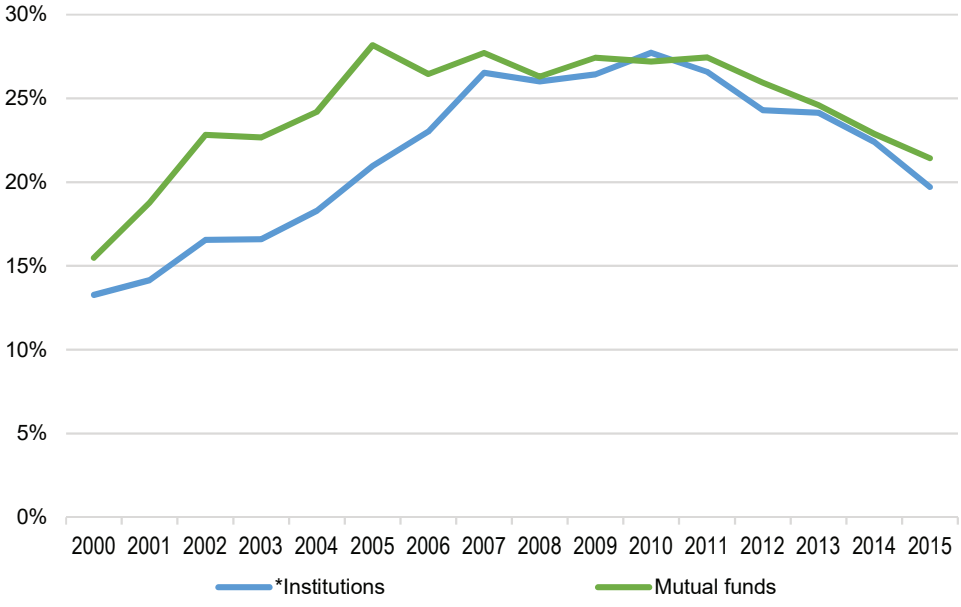
19 The data on holdings include some 12,700 investors based on the Thomson Reuters database which includes holdings valued at $31 trillion in more than 70 markets worldwide – approximately one third of the global market capitalization of listed domestic companies according to World Bank data in 2020 (https://data.worldbank.org/indicator/CM.MKT.LCAP.CD).

20 We add that the figures we chose to present in this paper classify companies as polluting companies by industrial sector using the Thomson Reuters Business Classification (TRBC)—energy (coal, electricity, oil and gas, etc.), the energy intensive industrial sector (chemicals, construction materials and metals) and the energy intensive products sector (such as transportation and aviation).

(according to PRTR data). This represents an increase of about 57 percent relative to the end of 2019, when total credit risk in this category was about NIS 12.2 billion. The level at the end of 2020 also accounts for about 6 percent of the total credit risk due to large borrowers in the banking system and 2.3 percent of the banking business credit balance. Notably, the analysis in this box only shows a partial picture of the volume of credit that the banking system allocates to borrowers who are exposed to environmental climate change risks.[21]

In conclusion, in the period under review, we find a downward trend in the share of institutional investors' exposure to polluting companies from their total investment, so that at the end of 2022 it was just 3.8 percent (despite the fact that the value of the polluting companies rose over time). Nonetheless, the portfolio of tradable corporate assets held by the institutional investors maintained a relatively stable rate of exposure at around 12 percent. An allocation by investment category shows that in December 2022, the mutual funds have the highest rate of exposure to polluting companies (as a percentage of their total investment portfolio) at 7.2 percent, while the pension funds have the lowest rate of exposure at 2.4 percent. The difference in exposure between the two types of funds is mainly attributable to differences in the mix of the investment instruments, since when comparing this investment from the tradable corporate portfolio only, we obtain the same rates of exposure—12.1 percent in December 2022. The exposure of the institutional investors to polluting companies as a percentage of their total share portfolio is low by international standards.

Figure 5: Aggregate exposure to CO_2 in various institutions' investment portfolios, annual data, 2000–15



*Banks, pension funds, insurance companies, and provident funds.
SOURCE: Benz, et al. (2020)

21 See explanation inside the box.

APPENDIX A – METHODS FOR CLASSIFYING FIRMS BY "GREEN" CRITERIA

1. ESG ranking
2. Green classification by private organizations or countries—such as the EU Taxonomy[22], which the Ministry of Environmental Protection is working to assimilate in Israel.
3. "Best in class" criterion, namely – the greenest firms in a particular sector.
4. "Best in progress" criteria, namely – those firms that have made the most progress in reducing their environmental impact.
5. "Negative criterion"—withholding investment possibilities relating to countries, industries or companies that do not comply with fundamental environmental standards. This criterion can be modified by setting a quota for the share of profit from economic activity that adversely affects the environment. Such modification is important to provide insurance companies and banks with room for maneuver given that they are invested in all sectors of the economy and an overly broad restriction might harm their loan options.

[22] The EU Taxonomy is a framework for classifying economic activity with a positive (green) or negative (brown) impact on the environment. The Taxonomy attempts to encourage sustainable investments, to allow for risk management, determine the degree of exposure to "brown" economic activity, assimilate the European Green Deal and the objectives set by the European Commission towards 2030.

Appendix B – Regulatory measures introduced by Israel's financial regulators on climate-related issues

Supervising entity	Date	Regulation
Banking Supervision Department	June 2009	Letter containing a requirement for banking corporations to identify and assess environmental risks as part of their risk assessment process and to take action to assimilate management of the exposure to environmental risk within the context of risk managmeent.
	October 2011	Publication of a Corporate Social Responsibility Report addressing environmental perspectives.
	December 2020	A letter on "Environmental Risk Management" stating that in preparation for implementation of the accounting treatment of environmental risks, the Supervisor of Banks intends to conduct a round of discussions to launch the preliminary process required to formulate and characterize the purpose and management of environmental risks in the banking system. In this context, and in preparation for the process, the Banks were asked to monitor the recommendations and guidelines published by leading international agencies dealing with the matter, including a response to supervisory expectations with respect to risk management and disclosure.
	February 2021	Letter on "Environmental and Climate Risks Management" containing a requirement from the banks to complete a questionnaire on the management of environmental risks, which reflects some of the practices, standards and recommendations of international entities and regulators in various countries.
	December 2021	Circular on "Disclosure to the Public of Environmental, Social, and Governance (ESG) perspectives", according to which, from 2021, the banks are required to provide detailed disclosure in their financial reports of their exposure to environmental risks, including climate-related risks, and they are also required to specify in the disclosure the international standards they apply and how the environmental perspectives form an integral part of their business goals and strategy.

	December 2022	Circular on "Disclosure to the Public of Environmental, Social and Governance (ESG) perspectives", which sets out the topics on which it is recommended that qualitative and quantitative disclosure should be provided with respect to management of a banking corporation's environmental risks and opportunities, including climate-related risks. Additionally, more information must be provided on the degree of involvement by the board of directors and management on material ESG issues and the manner in which the banking corporation defines its impact strategy. The circular also states that the possibility is being examined of obligating the external verification of certain data included in the ESG report.[1]
	June 2023	Management directive on "Principles for effective management of climate-related financial risks" according to which banking corporations are required to operate on the basis of a document published by the Basel Committee in June 2022.[2]
Capital Market, Insurance and Savings Authority	2017	Directive on corporate social responsibility at the "adopt or disclose" level.[3]
	November 2021	Directive on the integration of ESG considerations in the investment policies of financial institutions. Accordingly, the investment policy published by a financial institution on or after July 2022 should include information about the investment considerations pertaining to ESG risks and also to developing risks such as cyber and technology risks that could affect investment portfolio performance.
	January 2022	Publication of the principles of Own Risk and Solvency Assessment (ORSA). Within ORSA, insurance companies must take into account ESG risks if they have the potential to materially affect the ORSA.

	May 2022	The Authority opened up the possibility of launching a sustainability track in all products, to be administered in line with the UN's Sustainable Development Goals (SDGs). The third tier of savings (study funds, investment provident funds, etc.) will also allow for the establishment of an environmental investment track, which will focus on investments making a positive contribution to the environment and mitigating damage to the environment, including damage resulting from climate change.
Israel Securities Authority (ISA)	April 2021	Review and recommendations on the issue of disclosure regarding CSG and ESG risks. The document was published after a broad response to an appeal published by the ISA for consultation with the public and discussions on this subject with the representatives of publicly traded companies, institutional investors, regulators, academics, etc. The recommendations emerging from this process included a call by the ISA to all reporting corporations to voluntarily report ESG risks. It was also recommended that: (1) the report would be published on the company's website or on a special webpage on the ISA's website; (2) the report will be based on generally accepted international criteria such as the GRI (Global Reporting Initiative) or SASB (Sustainability Accounting Standards Board); (3) the report will be published in English to facilitate accessibility by international investors and rating companies who prepare rating reports based on ESG data; (4) as noted, the report will be published close to the date of publication of the periodic report for the relevant reporting year. The document also stipulates that the ISA intends to help reporting corporations publishing such a report by providing professional training and workshops for their representatives.

	December 2022	Directive to fund managers and major license holders on integrating ESG considerations in investment decision making and risk management. Accordingly, the relevant entities must examine whether, as part of their work, there is room for ESG considerations in risk management, in choosing investments, in analyzing the impact on yield, investigating customers' needs, voting policy at general meetings, and other perspectives. The directive also stipulates that major license holders and fund managers must include in an immediate report whether ESG considerations are an integral part of their policies and if so, how, and they must also detail their considerations in determining their policy on the subject.[4]

1 https://home.treasury.gov/news/press-releases/jy0426

2 https://www.sec.gov/news/press-release/2022-46

3 https://www.federalreserve.gov/publications/climate-scenario-analysis-exercise-instructions.htm

4 https://www.ecb.europa.eu/press/pr/date/2022/html/ecb.pr220704_annex~cb39c2dcbb.en.pdf

Appendix C – Climate-change related action taken by global market supervisory entities and international institutions

The US

In March 2021, the US Federal Reserve ("the Fed") published a document explaining how risks arising from climate change could affect financial stability. The principal conclusions set out in the document are: (1) The Federal Reserve's financial stability monitoring framework must be flexible enough to incorporate key elements of climate-related risks; (2) more research and analysis should be undertaken in this field to incorporate these risks into financial stability monitoring, including substantial improvements in data and models; (3) efforts at transparency around climate-related financial exposures may help clarify the nature and scope of financial stability risks relating to climate change.

The FSOC (Financial Stability Oversight Council) addressed the subject in a 2021 report[23] on Climate-related Financial Risk which highlighted climate change as a threat to the financial stability of the US. The recommendations accompanying the report include preparing an assessment of climate-related risks to financial stability by analyzing scenarios, assessing the need for new regulations, enhancing climate-related disclosures, improving the availability of climate-related data and building capacity and expertise on the subject.

In March 2022, the US Securities and Exchange Commission (SEC) proposed laws[24] to enhance and standardize climate-related disclosures for investors. These include the collection of information about climate-related risks that could affect their business and financial position, including greenhouse gas emissions, as an index for measuring exposure to transition risks. The proposed requirement regarding GGE is mandatory for Scope 1 and Scope 2 emissions, but for Scope 3 emissions it is only mandatory is there is a real risk relating to them, or if the business has set targets for such emissions. The proposal is in its final stages, after completion of the comments period, but it is unclear precisely when it will actually become legislation.

In January 2023, the Federal Reserve published instructions for a pilot exercise in climate-related scenario analysis[25] for the six largest banking corporations in the US. The exercise will include an analysis of the effect of physical risks and transition risks, as well as reporting on the possible impact of climate change on activity. Unlike stress tests, the exercise will not affect the capital requirements, based on the Fed's approach that climate-related risks are already part of the monitoring of financial stability.

In Europe

In October 2020, the European Banking Authority (EBA) published a discussion paper identifying and explaining environmental risk factors and outlining ongoing initiatives undertaken by supervising institutions and corporations. The discussion paper emphasized the EBA's belief in the need to improve the incorporation of ESG risk management policy in business strategy by: assessing the business model's resilience in the long-term, setting ESG targets, and reviewing the possibility of developing sustainable products while engaging with customers. The EBA also proposed improving existing supervisory review

23 https://home.treasury.gov/news/press-releases/jy0426
24 https://www.sec.gov/news/press-release/2022-46
25 https://www.federalreserve.gov/publications/climate-scenario-analysis-exercise-instructions.htm

processes while integrating ESG entities and developing this field among supervisory entities. In May 2021, the EBA published findings from a pilot exercise on a climate-related stress test that was conducted by 29 banks in 10 different countries, representing 50 percent of all the sector's assets within the EU.

In November 2020, the European Central Bank (ECB) circulated a document titled "ECB Guide on Climate Related and Environmental risks" setting out its expectations from the commercial banks on climate and environment-related topics. This document forms the basis for a supervisory process in which the banks will be required to provide a self-assessment of their exposure to climate and environment-related risk based on the guidelines and to prepare plans on that basis to resolve the gaps between their exposure and the ECB's expectations from them.

In September 2021, the European Commission published a proposal to amend the Solvency II Directive (after a five-year trial) which included comments on a range of topics, including environmental risks, in an effort to fall into line with the European Green Deal in addressing the impact of climate change on the risks. The proposal includes a general requirement for insurance companies to make environmental risks an integral part of their risk management with respect to their investment and underwriting strategies.

In July 2022, the ECB published a climate agenda,[26] setting out the objectives and the action to be taken to achieve them. The three core objectives defined are managing and mitigating the financial risks associated with climate change and assessing their economic impact, promoting sustainable finance to support an orderly transition to a low-carbon economy, and sharing their expertise to foster wider changes in behavior. Six key areas of activity were defined to help put these objectives into practice: (1) Assess the macroeconomic impact of climate change and mitigation policies on inflation and the real economy; (2) Improve the availability and quality of climate data to better identify and manage climate-related risks and opportunities; (3) Enhance climate change-related financial risk assessments; (4) Consider options for monetary policy and operations and assess the impact of climate change monetary policy; (5) Analyze and contribute to policy discussions to scale up green finance; (6) Increase transparency and promote best practices to reduce the environmental impact. Some of the measures that have already been adopted include evaluating the impact of climate-change mitigation policies on the ECB's macroeconomic and fiscal projections, including climate-change considerations in macroeconomic modeling for the purpose of policy simulations, developing and conducting climate stress tests of the European financial system (including the ECB and National Commercial Banks – NCBs), evaluating the integration of financial climate-related risks in the credit rating process of individuals and companies, etc.

In Norway – ESG reporting and due diligence is voluntary for the majority of Norwegian companies. In December 2021, a law entered into force applying European Sustainable Financial Disclosure regulations based on the EU Taxonomy.

In Switzerland – New disclosure regulations are due to enter into force at the beginning of 2024. Supervised financial corporations and large companies will be obligated to publish an annual ESG report, including the financial risks to which the company is exposed and the volume of its greenhouse gas emissions (based on standards similar to the European directive). An additional obligation imposed on Swiss companies (unrelated to their size) relates to human rights. Companies engaged in heavy metals, activity in high-risk regions or giving rise to reasonable suspicion of the exploitation of minors must perform due diligence

[26] https://www.ecb.europa.eu/press/pr/date/2022/html/ecb.pr220704_annex~cb39c2dcbb.en.pdf

tests and report their results annually. The date on which these new regulations will enter into force remains uncertain but in preparation, some Swiss companies have already published ESG reports based on the European directive.

International institutions

In May 2020, the Network for Greening the Financial System (NGFS)[27] published a Guide for Supervisors[28] which forms the basis for establishing professional norms in the supervision of financial institutions. The Guide contains five core recommendations for Supervisors: (1) To examine how climate-related and environmental risks transmit to the economies and financial sectors and how these risks are likely to be material for the supervised entities; (2) Develop a clear strategy, establish an internal organization and allocate adequate resources to address climate-related and environmental risks; (3) Identify the exposures of supervised entities that are vulnerable to climate-related and environmental risks and assess the potential losses should these risks materialize; (4) Set supervisory expectations to create transparency for financial institutions in relation to the supervisors' understanding of a prudent approach to climate-related and environmental risks; (5) Ensure adequate management of climate-related and environmental risks by financial institutions and take mitigating action where appropriate. In June 2021, the International Monetary Fund (IMF) published a document[29] recommending that an international carbon price floor should be set to prevent a situation in which countries refrain from imposing a carbon tax so as not to harm their competitiveness.

In October of that year, the IMF published a paper that discusses fostering the transition to a green economy. The document emphasized that the sustainable investment fund sector can be an important driver of the global transition to a green economy. The document notes that this sector remains relatively small and that fund managers face major hurdles (e.g., data gaps, challenges related to greenwashing, multiple disclosure requirements and the lack of standard, globally accepted classifications). To simplify assessment of the risks and opportunities for business sector portfolio managers to make the transition to a green economy and prevent greenwashing, the document notes that policymakers should urgently strengthen the global climate information architecture, comprising: (1) A series of consistent climate-related disclosure standards (IFRS 2021); (2) High-quality, reliable and comparable data on climate-related metrics, including forward-looking metrics; (3) Globally agreed-upon principles for sustainable finance classifications that must be well defined and dynamic requiring a global effort for progress to be made. The key conclusion emerging from the IMF document is that additional research is needed to provide a better understanding of the optimum fiscal incentives. To help increase awareness about climate-focused funds and attract investors to ESG oriented channels of investment, investment managers should emphasize the distinction between the broad concept of sustainability and purely climate considerations.

27 An organization established in 2017 comprising central banks and financial supervisors from all over the world aimed at reinforcing the global response required to comply with the targets of the Paris Agreement and to strengthen the role of the financial system in climate-related risk management and to mobilize finance to support the transition toward green investments and sustainable development.

28 Guide for Supervisors: Integrating Climate Related Risks into Prudential Supervision.

29 https://www.imf.org/en/Publications/staff-climate-notes/Issues/2021/06/15/Proposal-for-an-International-Carbon-Price-Floor-Among-Large-Emitters-460468

Prior to the Glasgow climate summit (COP26), the International Association of Insurance Supervisors (IAIS), which sets the international standards for insurance supervision, published a statement regarding its commitment to strengthening its response to climate change. The statement sets out the organization's approach to its role in addressing climate change and the risks to which it is exposed as a consequence of climate change.

In June 2022, the Basel Committee on Bank Supervision (BCBS) published "Principles for the Effective Management and Supervision of Climate-related Financial Risks".[30] This paper is a first effort to regulate the banks' treatment of climate-related financial risks, and it sets a uniform international standard for financial supervisors and regulators in this field.

[30] "Principles for the Effective Management and Supervision of Climate-related Financial Risks", BCBS, June 2022.

PERSONAL INSOLVENCY PROCESSES IN ISRAEL INTERNATIONAL COMPARISON[1]

- An economic rehabilitation proceeding is one in which, at its end, the debtor is rehabilitated and given a fresh start. The extent of the proceeding's effectiveness is reflected in the Leniency Index, a metric that the economic literature recognizes as a determinant of many economic and financial developments.
- After the Insolvency and Financial Rehabilitation Law went into effect in late 2019, personal insolvency procedures in Israel positioned the country's Leniency Index in the middle of rankings among a broad sample of countries.
- Israel did not rank higher mainly due to high costs of filing for personal insolvency and the minimum level of debt needed for filing, which is high by international standards.
- Thought should be given to reducing the cost to the debtor of filing for personal insolvency in Israel, along with lowering the minimum threshold of debt or broadening the criteria for decreasing the indebtedness of low-asset and low-income debtors.

1. Background

The Insolvency and Financial Rehabilitation Law, 5778-2018, effective September 2019[2], brought about a major change in the personal insolvency field in Israel. Its main purposes were to establish the debtor's financial rehabilitation as a central value, increase the share of returns to creditors, enhance the stability and certainty of law, and make proceedings more effective—faster and lighter in terms of bureaucratic burden. A World Bank working group report on the topic defined effective financial rehabilitation as the type that ends with the debtor being rehabilitated and given a "fresh start."[3] The economic explanation that underlies this argument is that an effective proceeding encourages business enterprise, incentivizes labor effort among debtors who are undergoing rehabilitation, and therefore, promotes macroeconomic productivity. This approach encourages persons who are typified by over-indebtedness and struggle to service their debts to embark on an orderly and effective proceeding with which they may cope with debt repayment. However, legislation that allows debtors to launch insolvency proceedings more easily may also have adverse effects, *inter alia* on borrowers' incentives to engage in appropriate financial conduct. Accordingly, the World Bank rapporteurs emphasize the immense importance of distinguishing between borrowers who amass debts deliberately or malevolently and those who tumble into financial distress in good faith due to the realization of a financial risk that they took or a chain of events beyond their control.

Revising insolvency policy in the direction of greater compassion toward the debtor is not unique to Israel; it reflects a broad global trend. A move toward regulating insolvency proceedings began in the late 1970s. The United States started the process, setting a standard for additional countries to follow. Since then, no

1 Authors: Roy Stein and Yehonatan Berzani.

2 In the past, personal insolvency proceedings in Israel were regulated under the Bankruptcy Ordinance, which was based largely on a British ordinance from 1914; its new version (1980) was also grounded in the Mandatory ordinance and remained in effect until it was replaced September 2019.

3 See the World Bank working-group report on legal personal insolvency frameworks: https://documents1.worldbank.org/curated/en/668381468331807627/pdf/771700WP0WB0In00Box377289B00PUBLIC0.pdf

few European countries have begun to promote and pass legislation that regulates personal insolvency proceedings—first the more advanced economies in Scandinavia and Western Europe and, from 2000 on, many others. The list of countries that settled their personal insolvency laws and the year in which each one did so appears in Appendix 1. Walter et al. (2022) found that these countries' settlement of insolvency proceedings and meaningful legislative reforms led to increases in their leniency indices.[4]

Ofir, Berzani, and Stein (2023) examined the effect of judicial legislation in Israel and found, as did many authors in respect of other countries, that the legislation affects the motivation of financially pressed individuals to launch insolvency proceedings and the advisability of their doing so. That is, the legislation enhanced the ease and the leniency of the insolvency proceedings, reflected in an increase in the leniency index and, in turn, the advisability of filing for insolvency. In the analysis that follows, we test the leniency of Israel's legislation relative to that of other advanced economies. For the purposes of the comparison, we applied one of the latest methods for calculating the Israel Leniency Index—based on data obtained from surveys among multiple experts.[5] Survey-based methods have the advantage of providing uniform definitions of the indicators that are used to calculate each country's leniency index. We calculated the index for Israel on the basis of a professional opinion from Israeli lawyers from academia, practice, and the judiciary who are active in the field of personal insolvency. They filled in a questionnaire identical to that on which Walter and Krenchel (2021) based their study. Using the Israeli leniency index, calculated in this document, we compare the values with those of several European countries and the US in order to examine insolvency proceedings in Israel by international comparison, identify legal characteristics unique to Israel, and offer policy recommendations accordingly.

2. Literature review

In recent years, the economic and financial effects of insolvency reforms in many countries have attracted a growing body of literature. These studies, based on analyses of different countries' legal and regulatory environments, usually calculate an index based on legal characteristics of a range of respects—hereinafter, the Leniency Index. In Section 5, we describe the effects of changes in the leniency of insolvency proceedings on economic and financial activity, as found in the empirical literature, while in this section we review the literature on measuring the relevant legal environment in different countries. White (2007), analyzing the indirect effect of legal changes relating to insolvency on economic activity in several advanced economies[6], found three indicators that reflect most of the positive impact on economic activity: (1) the right to file for insolvency, (2) the cost of doing so, and (3) the terms for discharge of liabilities by debt restructuring. Heuer (2014) conducted a comparative survey of the basic rules and general norms of insolvency legislation in fifteen advanced economies. He looked into the differences in legislation among the countries in terms of the conditions for eligibility to launch the proceeding, the complexity of the proceeding itself, the method and the possibility of debt forgiveness, and creditors' involvement in making decisions in the course of the proceeding. Heuer emphasized the effect of the state's social and cultural

4 The Leniency Index represents the judicial environment by means of qualitative data such as dummy variables or by means of quantitative data based on proceedings actually carried out. Among the group of countries that enacted major reforms in this field, the index increased by around 0.22 point on average.

5 This stands in contrast to data sampled from existing information systems in different countries for the conduct of proceedings. The leniency index is an accepted index in the research literature that deals with these matters.

6 This study looked into insolvency proceedings in the United States, France, Germany, the UK, and Canada in terms of the creation of imbalances between generating insurance value for debtors and punishing debtors for insolvency, which generates insurance value for lenders.

norms on the design of the legislative system in this context. Graziano et al. (2019), reviewing personal-insolvency policies in thirty European countries, presented a full survey (conducted by legal experts in each country) including historical information about the legal system, with the help of fifteen indicators that reflect different characteristics of each country's legal environment. Similarly, Ramsay (2020) examined different countries' legislative policies concerning insolvency proceedings that are aimed at low-income debtors. He found that the traditional conservative approach, which requires debtors to pay a minimum sum to their creditors (a minimum income payments order), is ineffective for numerous low-income debtors.

Andrews and McGowan (2018) probed differences in the design and legislation of insolvency laws between 2010 and 2016 in thirty-six OECD countries including Israel, but their reference to Israel was based on the now-defunct Bankruptcy Ordinance. They based their review on indicators that they calculated with the help of a survey sent to legal experts in the participating countries. The investigators defined four typical components of the legislation: (1) effectiveness of treatment of failed entrepreneurs; (2) mechanisms meant to keep the proceeding from starting; (3) tools for use in debtor rehabilitation; and (4) stigma. They found acute and meaningful differences in legislation among the countries, particularly in the amount of time needed to obtain discharge, actions to prevent insolvency, and the extent of debtor restrictions. The legal changes that the countries carried out within the specified time frame improved policies toward debtors, and the investigators recommended reforms in additional OECD countries. Israel's score in this study was low by the standards of the participating states but an international comparison based on Israel's new law, effective late 2019, would be of interest.

Walter and Krenchel (2021) specified seven components of policy that are reflected in personal-insolvency laws, comprised of thirty-five indicators. Basing themselves on the scores of these indicators for each of the twenty-five countries they examined, they calculated leniency indices for these countries. Thus, they were able to examine the legal processes that affect the set of incentives for overly indebted individuals to file for insolvency. We applied this method to Israel (Section 3) and set up an international comparison of legal characteristics after the new legislation was applied (Section 4).

3. How the Israel Leniency Index was calculated[7]

The Israel Leniency Index was calculated based on the method developed by Walter and Krenchel (2021). Its seven components and a general description of its constituent indicators appear in Table 1.[8] Our research shows that the seven components cover the main legal characteristics with which one may determine the leniency and effectiveness of mechanisms pertaining to the treatment of debtors who file for insolvency.

7 Adv. Noam Herzog of the Israel Ministry of Justice and György Walter of Corvinus University in Budapest helped us with clarifications about the questionnaire and made a major contribution to the study.

8 A breakdown of the components, the indicators, and the methods used to determine the score appears in Table 2.2 in Appendix 2.

Table 1
Components of the Leniency Index

Component	Main characteristics
1. Straight bankruptcy (accessibility, existence)	The very existence of a structured bankruptcy / insolvency proceeding[1] that allows debtors (under terms established in the law) to obtain forgiveness of their debts and have a fresh start.
2. Eligibility	The value of this component is derived from indicators that represent the extent of the restrictions that prevent debtors from launching the proceeding; these originate in the debtor's income and wealth, criminal record, and similar events in the past (if any).
3. Cost, expensiveness (transaction costs):	The costs imposed on debtors when they instigate the proceeding and in its course. This value is a composite of indicators that represent the level of the court fee for beginning the proceeding, the party to the proceeding who pays (creditor; debtor/state) and compulsory deposit.
4. Complexity	The extent of complexity of the personal insolvency proceeding. The value of this component is a composite of indicators that represent the range of types of creditors in the insolvency case, the range of types of legal and governmental institutions that manage the proceeding, the complexity of professional stewarding of the proceeding, and the availability of legal advice services for debtors.
5. Process	Restrictions and leniencies that apply to debtors in the stages of the proceeding. The value of this component is a composite of indicators that represent the possibility of settling debt by means of an arrangement (without starting the legal proceeding), the adjudicating and determining player in the income payments order and who determines its identity, the extent of the possibility of liquidating all debtor assets for the bankruptcy estate, debtor restrictions during the proceeding, and punitive measures against debtors who fail to comply with the income payments order.
6. Conditions for discharge at debt restructuring	The terms under which a debtor is entitled to full discharge. The value of this component is a composite of indicators that reflect the likelihood of an effective proceeding for the purpose of full forgiveness, the maximum duration in time until forgiveness is given, and the types of debts included in forgiveness.
7. Stigmas of during and after filing	The stigma against debtors who embark on insolvency proceedings. The value of this component depends on indicators that reflect the social and economic pressures that influence individuals in choosing whether or not to launch proceedings—the existence of financial restrictions, public disclosure of information about proceedings under way against the debtor, and the extent to which the debtor may not instigate an identical proceeding in the future.

1. *Bankruptcy* is the professional term commonly found in the research literature to denote legal proceedings that allow overly indebted persons to settle their debts and have a fresh start. The legislation in Israel, applied in late 2019, repealed the Bankruptcy Ordinance and replaced the term *peshitat regel,* bankruptcy, with *hadlat pera'on,* literally "in default on payment," i.e., insolvency, as the accepted term in Israel, largely because it is considered less stigmatic. In this document, the term *insolvency* is used as a default in order to standardize the terminology of the comparison

3.1 Index indicators and components

The index was calculated using a dedicated professional questionnaire developed by Walter and Krenchel (Table 2.2 in Appendix 2). The questionnaire consists of thirty-five numerical indicators that reflect the values of seven components. Each indicator in the questionnaire is ranked in values of 0, 1, and 2, the lowest value denoting a relatively stringent approach to debtors in proceedings. Each component is based on a simple average of the mode in each indicator that reflects it, and the weight of each indicator in the index is determined in two ways. In the first method, every component is weighted identically at 14.3 percent (simple average); in the second, the weighting is predicated on experts' opinions (Table 2.5 in Appendix

2). According to the literature that deals with calculating an index on the basis of qualitative information, it appears that no single method is agreed upon and accepted by all and that the simpler method, which assigns equal weight to all components, is more common in empirical studies (OECD, 2008, La Porta et al., 1998).

3.2 Calculating the Israel Leniency Index

To calculate the index that represents legislative characteristics in Israel, we approached Israeli jurists in academia, practice, and the judiciary who deal with personal insolvency and asked them to fill in the questionnaire based on the Insolvency and Financial Rehabilitation Law, which went into effect in Israel in late 2019.[9] (Table 2.1 in Appendix 2 gives the experts' particulars and Table 2.3 provides a statistical account of their scoring.) The index and its components are based on the mode of the levels of scoring given in the Israeli experts' opinions. We found that the variance in the experts' scoring is small apart from the indicators included in one component—complexity of the process, for which half if not more of the opinions were scored differently from the mode.

The Israeli leniency index yielded by the equal-weights system is 1.15—in the middle of the range of rankings among a broad sample of countries, in which the median is 1.14. When the index is calculated on the basis of weights determined by experts, Israel's index remains the same but the values of several index components change. Three important indicators that received low scores among the components were highly weighted by the experts:

1. the high cost of filing for insolvency, one of the indicators of the cost-of-proceedings component;
2. the high total minimum amount of debt for applying for insolvency, included in the criteria-of-eligibility component;
3. civil and financial restrictions that apply during the proceeding, included in the component of restrictions and leniencies during the proceeding.

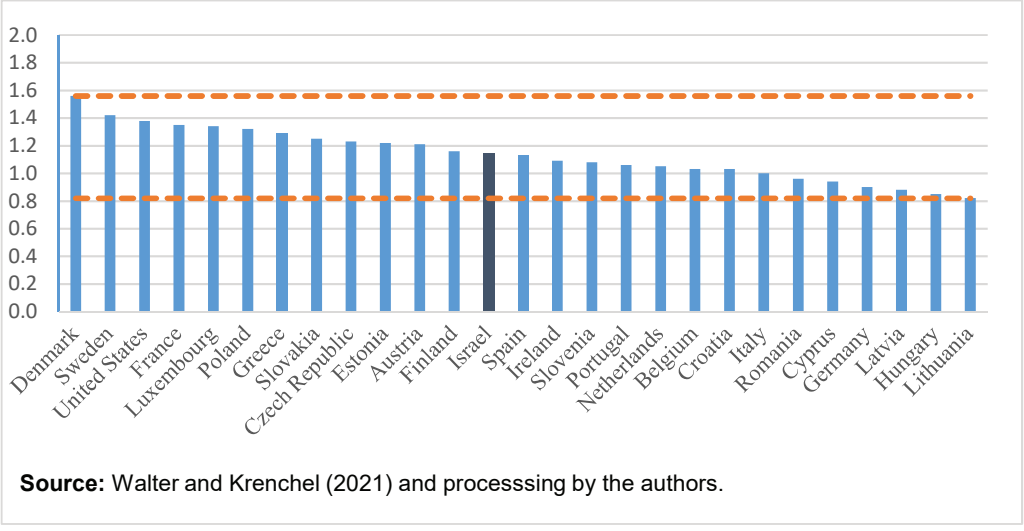
Notably, the low scoring of the first two indicators has a stronger effect on the scores of the components, due to the small number of indicators that these components include. The restrictions-and-leniencies component is comprised of eleven indicators; therefore, each indicator has a smaller impact on the component score.

4. Findings

Israel ranks thirteenth among the twenty-seven countries examined (Figure 1). These findings show that the total characteristics of the legislation in Israel do not tilt inordinately in debtors' favor. The highest indices were found in Denmark, Sweden, and the United States.

[9] See Insolvency and Financial Rehabilitation Regulations— https://www.nevo.co.il/law_html/law01/501_802.htm?fireglass_rsn=true.

Figure 1
The Leniency Index calculated by the fixed-weights method, and the maximum and minimum indices (broken lines)



Source: Walter and Krenchel (2021) and processsing by the authors.

In this section, we broaden the analysis and focus on specific components of the leniency index in Israel, ranked specifically in comparison with the countries in the sample, and on their basis examine the unique legal characteristics (if any) of personal insolvency proceedings in Israel.

Straight bankruptcy (accessibility, existence)

The very existence of a structured and direct insolvency proceeding that allows debtors to obtain forgiveness is a basic and important indicator in the index and Israel receives a maximum score in regard to it. Two countries—Greece and the US—earned a maximum score in the full component by offering the possibility of recovering an asset deposited as creditor security in order to obtain full forgiveness, even if the value of the asset is smaller than the total debt. Most European countries, to date, do not offer a direct personal insolvency proceeding; therefore, their score on this component is zero.

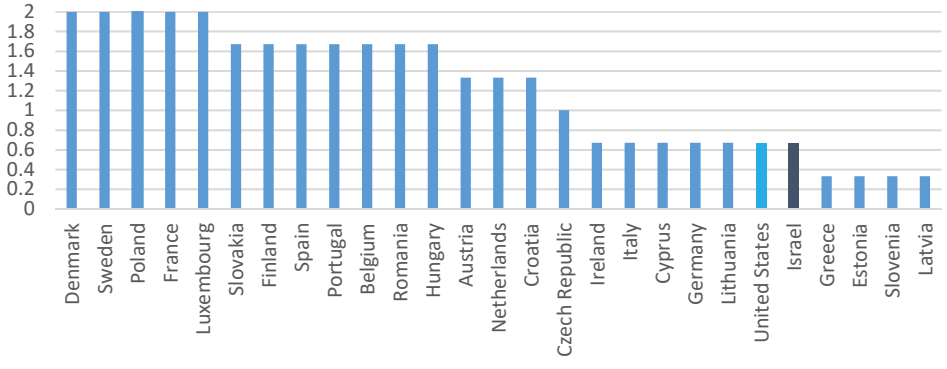
4.1 Eligibility

This component reflects the extent of debtors' eligibility to file for proceedings. Its value is derived from indicators that represent the debtor's level of income, criminal record (if any), size of debt, and social stigma. Israel's score in this indicator is not an outlier relative to the scores of the comparison countries (1.4) but, unlike most countries, Israel has a score of zero in the indicator that represents the minimum level of debt for opening a proceeding. This is because most countries set the minimum at less than €1,000 (or have no minimum at all) whereas Israel's minimum is NIS 53,000 (approximately €13,000). Notably, the legislation allows even debtors with liabilities below the threshold to begin insolvency proceedings if special reasons pertaining to them justify this, including whether proceedings against them under the Tax Ordinance are under way. According to data from the Enforcement and Collection Authority, the proportion of files that are acted upon by force of this power—debt below the statutory minimum—is very small relative to the total number of files and tends to zero.

4.2 Cost, expensiveness (transaction costs)

This component captures the level of financial outlays that debtors face when they begin proceedings and in their course. The value of the component is derived from indicators that represent all costs—lawyers' fees, compulsory fees, and demand for a deposit by the courts. In Figure 2, we see that Israel is positioned relatively low among the countries in the sample. To elucidate the main reasons for this, we looked into the ranking of the indicators of which this component is composed. We found that the indicator of level of court costs in Israel receives the value of zero (Table 2.3, Appendix 2). Israel ranks low in this indicator due to the total fee required at the outset and in the course of the proceedings (c. NIS 1,400[10]). In most countries in the sample, the fee is smaller than €100 (c. NIS 400) and is sometimes fully covered by the state or the creditors. Notably, the Israeli legislation that went into effect in 2019 marks an improvement in this component[11] but the total fee in Israel remains high by international comparison. Most debtors who file for insolvency on account of small debts have scant assets and income; therefore, the relatively high fee is an impediment to them in setting the procedure in motion.

Figure 2
Components of the cost of launching proceedings index



Source: Walter and Krenchel (2021) and processsing by the authors.

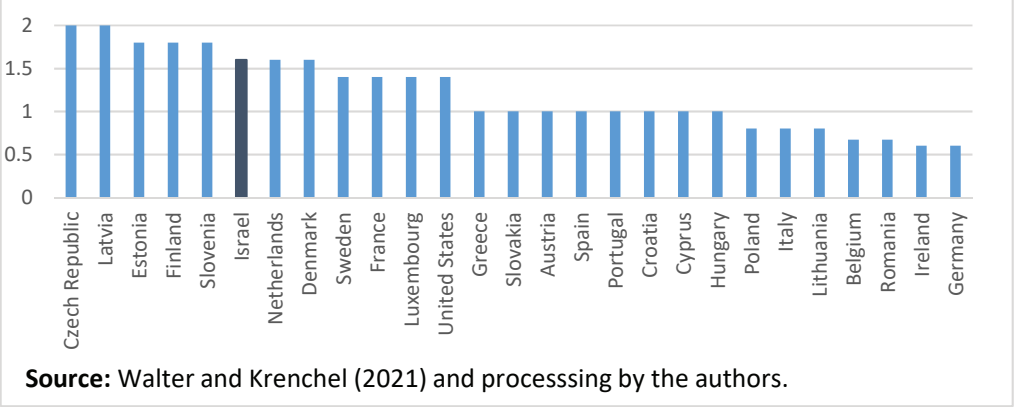
4.3 Complexity

This component is used to estimate the level of procedural complexity of the personal insolvency proceeding. Its constituent indicators are the number of players involved and the number of different proceedings, the extent of complexity of proceedings in the opinion of both professionals and debtors, and the possibility of obtaining public legal aid. Figure 3 shows Israel ranks high among the countries in the sample. This finding indicates that the insolvency law that went into effect in late 2019 engineered a reform in the institutions that manage these proceedings. Notably, the variance among the Israeli experts' opinions in regard to all indicators included in this component is especially wide.

10 The applicant pays NIS 900 of the total fee and the remaining NIS 500 is paid from the bankruptcy estate in the course of the proceeding. This leniency went into effect about two years after the legislation was applied. In addition, according to the regulations, debtors who pass the financial tests for entitlement to legal-aid representation pay no fee whatsoever at the beginning of the proceeding; the entire fee is paid from the bankruptcy estate. According to data from the official receiver, some 45 percent of debtors pay no fee at the beginning of the proceeding.

11 Before the legislation, debtors paid more than NIS 2,500 for the proceeding; regulations adopted pursuant to the legislation reduced the sum to NIS 1,600 and a further decrease, to NIS 1,400, occurred in the course of 2021.

Figure 3
Index component that represents the level of proceedings complicatedness and complexity



Source: Walter and Krenchel (2021) and processsing by the authors.

5. Effect of legislation on economic and financial activity

In this section, we describe the effects of the Israeli legislation on economic activity. Legislation that lightens the severity of the proceedings from the debtor's standpoint makes it more worthwhile for overextended debtors to file for insolvency. This finding has been found significant in many empirical studies and in the aftermath of the insolvency legislation that went into effect in Israel in late 2019 (Ofir, Berzani, & Stein, 2023).[12] According to the World Bank working group, an effective proceeding may, among other things, encourage creditors to desist from collection attempts and incentivize debtors to participate actively in rapid settlement of their debts, possibly boosting total business productivity in the near and medium terms.[13] Furthermore, an effective proceeding that incentivizes debtors to invoke it in order to break out of the cycle of over-indebtedness may induce debtors to change their economic modus operandi in the labor market and improve their business entrepreneurship in the long-term. The possibility of a fresh start for businesspeople in cases of failure provides a safety net that mitigates fear of being active in this field. The research literature mentions tax revenues as empirical proof of the improvement in productivity because effective insolvency proceedings may incentivize debtors to apply their productive energies, utilize their full future potential in the long term, and, as a result, pay income tax and make social-insurance contributions from their income. Empirical studies dealing with these effects indeed found a strong connection between the leniency of insolvency proceedings for business entrepreneurship and productivity. Lee et al. (2011), examining the connection between enacting systematic insolvency laws that take a gentle approach toward debtors and business entrepreneurship, found that this nexus exists in the long term. In contrast, Walter et al. (2022) report that the gentleness of proceedings begins to affect the share of self-employed from the very time of the legislation, and that a small added effect exists the further one pulls away from that time. Jia (2015) found that insolvency laws that treat debtors gently (such as those in the United States) mitigate concern about the long-term effects of business failure and, in turn, promote business entrepreneurship and, therefore, have an upward effect on the economy's total production and output. In the same study, it was

12 One of the most meaningful changes that the legislation brought about is a major contraction of the duration of the proceeding, allowing debtors to return to sound economic life and creditors to receive faster repayment. Therefore, it is seen as an effective process at the aggregate level. The transfer of some files to the Enforcement and Collection Authority for treatment was meant to enhance the effectiveness of the proceedings and the possibility of adequate and rapid remedies.

13 See the World Bank report on personal insolvency legal systems: https://documents1.worldbank.org/curated/en/668381468331807627/pdf/771700WP0WB0In00Box377289B00PUBLIC0.pdf

found that pro-leniency legislation may affect business size: the additional businesses that are established due to legislative lenience are small ones typified by entrepreneurial activity, in which credit risk is relatively high. According to Gropp et al. (1997), reforms that incentivize debtors to file for insolvency prompt lenders to make less credit available to high-risk borrowers and more credit available to low-risk ones.[14] If credit supply to risky customers does contract, Gropp et al. recommend that these customers should consider other ways of financing their activity. One such possibility, typified by high financial risk, is venture-capital funds, which are an even more effective source of funding in risk-reward terms.[15] Efrat (2002) examined insolvency proceedings in various countries and aggregated them into groups on the basis of policies and the ability to give debtors a fresh start. He found that in most countries that offer easy credit, a government safety net—a policy allowing forgiveness and a financial fresh start—is unfurled.

Israel's Insolvency and Financial Rehabilitation Law, 5778-2018, effective late 2019, makes explicit reference to investigating, at the time the insolvency file is opened, the circumstances of how debtors created their debts. This attention in the law has reduced the extent of closure of files on grounds of debtor's bad faith. By inference, the legislative change successfully filtered out undeserving debtors from benefiting from insolvency proceedings even as the country's leniency index rose perceptibly (Ofir, Berzani, & Stein (2023).

As not enough time has passed since the Israeli law was applied, the effect of the legislation on economic and financial variables cannot yet be detected; this will be possible only in another few years.

6. Conclusion and policy recommendations

Availing ourselves of the leniency index that was calculated for this study, we compared the values of the Israeli index with those of several European countries and the United States, and found several legal characteristics specific to Israel. The legislation in Israel, which went into effect in late 2019 and facilitated personal-insolvency proceedings, positioned Israel in the middle of the leniency index rankings by international comparison. The low complexity of insolvency proceedings in Israel (a change that was an important part of the reform) gives Israel a high score in this respect. However, initiating proceedings in Israel is costly by the standards of the countries investigated. These costs may exacerbate the hardships of debtors who are in financial distress to begin with and may create an obstacle to the onset of a proceeding that may, once completed, bring about the hoped-for financial rehabilitation. Therefore, we propose that a decrease in the total cost of the proceeding be considered, as opposed to mere deferral of payment from the bankruptcy estate after the proceeding begins. This should apply in particular to low-asset and low-income debtors, whose debts are typically small. We also found that the minimum debt required to begin insolvency proceedings in Israel is very high by the standards of the countries examined. This may crimp debtors' eligibility for insolvency proceedings and, in turn, may make it harder to extract small sums from debtors on their road to a fresh start. We therefore recommend considering a decrease in the minimum level of debt or an expansion of the criteria that establish eligibility for insolvency proceedings among low-asset and low-income debtors.

[14] Gropp et al. looked into the connection between reforms in insolvency laws that bring about an increase in forgiveness and credit supply.
[15] See Chapter 4 in the Bank of Israel Annual Report for 2018, https://boi.org.il/media/nx2pqxpd/chap-4.pdf

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Appendix 1. Settlement of personal-insolvency proceedings in law: European countries and Israel

Country	Year of legislation
Denmark	1984
UK	1986
France	1989
Germany	1994
Sweden, Finland, Norway	1994
Austria	1995
Belgium	1998
Netherlands	1999
Ireland	2012
Portugal	2004
Slovakia	2006
Slovenia and Czech Republic	2008
Poland	2009
Greece	2010
Italy	2012
Spain	2013
Hungary and Croatia	2015
Romania	2018
Israel	2019

Appendix 2. Leniency index questionnaire, Israel's index scores, and breakdown of experts' opinions

The tables in this Appendix present Walter and Krenchel's (2021) questionnaire, the indicator and component scores of the leniency index, and a statistical breakdown of the Israeli jurists' answers that we used to calculate the Israel leniency index.

Table 2.1
The twenty experts who tendered opinions about the questionnaire and their areas of activity:

	Name	Area of professional activity	Institutional affiliation
1.	Professor David Hahn	Academia	Bar-Ilan University
2.	Dr. Omer Kimhi	Academia	University of Haifa
3.	Dr. Neta Nadiv	Academia	Reichman University
4.	Professor Ron Harris	Academia	Tel Aviv University
5.	Adv. Oren Harel	Private sector	
6.	Adv. Assaf Degani	Private sector	
7.	Adv. Itai Hess	Private sector	
8.	Adv. Lior Ben-Yosef Levi	Private sector	
9.	Adv. Haim Sachs	Public sector	Official Receiver
10.	Dr. Roy Stein and Yehonatan Berzani	Public sector	Bank of Israel
11–20	Judges, coordinated by Dr. Gali Aviv and Adv. Hila Buskila	Public sector	Judicial authority

Table 2.2
Questionnaire used to calculate the Israeli leniency index

Components of index [no. of indicators]	Indicators	Indicator scoring method
Straight bankruptcy option [2]	If straight bankruptcy (quick liquidation ends with discharge), liquidation exists	• Yes—2 • Simplified bankruptcy for entrepreneurs, or bankruptcy (and discharge) only for persons approved by court based on their status, wealth, poverty, etc.—1 • No - 0
	Secured asset – return and walk away option	• There is a walk away possibility (giving the asset but no further claims) —2 • No such walk away possibility 0
Eligibility criteria [5]	Entitled to participate (natural person, entrepreneurs)	• There is a unified, complex legal process for both entrepreneurial/business loans of private persons and for consumer debts, obligations —2 • Some processes are open for private person (consumer) and other for entrepreneurial obligations, business activity, but not in a complex, unified form —1 • Process is only for personal/consumer loans —0
	Income, wealth (income) constraint on minimum amount of debt to file	• A debt to wealth/income criteria as a restriction is defined to be eligible: No—2 Yes, for certain processes—1 Yes, for all processes—0
	Exclusion criteria of criminal record	• Criminal offence conviction is not obstacle for eligibility —2 • Criminal offences conviction of financial/bankruptcy crimes in connection with taking up/handling debt, bankruptcy, etc. is an obstacle —1 • Other criminal offences and acts (not just financial but other civic / or just suspicion /or being unemployed and not accepting job/ or gross negligence) is an obstacle —0
	Minimum amount of debt	• is equal/less than 1000 euro, or no minimum —2 • 100-5000 euro, or there are thresholds exist for separating different processes —1 • More than 5000 euro —0
	Stigmas for filing	• If filing for a similar process in the past is an excluding condition for filing again: less than 5 years ago or no such condition —2 less than 10 years but more/equal to 5 years —1 more, equal than 10 years —0
Cost of proceeding [3]	Court fee	• fee is paid by creditor, state, or possibility to get it free —2 • fees is equal or less than 100 euro—1 • fee is more than 100 euro or proportional —0
	Who bears the costs of the procedure	• Cost is dominantly beard by the creditor or state —2 • Cost is beard together by the creditor and debtor —1 • Cost is dominantly beard by the debtor —0
	Deposit for the costs	• No such deposit is required or can be exempted —2 • Deposit exist but likely to be less than 500—1 • Deposit exist but likely to be more than 500 euro —0

Table 2.2
Questionnaire used to calculate the Israeli leniency index

Components of index [no. of indicators]	Indicators	Indicator scoring method
Complexity (steps, phases, measures of the process) [5]	Who, how many office holders conducts the process (bankruptcy office, committee, court, municipality)	• Only one office/ office holder conducts all process (+court) —2 • 2 types of offices/ office holders could conduct the different types of procedures -1 • More than 2 types of offices / office holders conduct the different types of procedures —0
	Number of regimes named (routes like liquidation, debt settlement, restructuring proceeding, etc.)	• There are less than 3 different procedure-types are named —2 • There are 3 different procedure-types are named —1 • There are more than 3 different procedure-types are in legislation —0
	Complexity of the procedure for professionals (expert opinion)	• Less complex and relatively known —2 • Complex—1 • Highly complex and lack of knowledge from professionals (economists, layers) side —0
	Complexity for applicants (the workflow to start, to apply, consider eligibility criteria, etc.)	• Easy process how to start, to file —2 • Complex to start, to file —1 • Highly complex and lack of knowledge from debtor side —0
	Debt counselling service	• Counselling service is part of the official state system (even if officially financed nonprofit institution) and is free of charge —2 • Counselling service is part of the official state system (even if they are officially financed non profit institution) but not free of charge —1 • Counselling service does not exist or just in the private and/or nonprofit (not financed by state) area, or state provides only a simple homepage —0
Process of repayment [11]	Pre-action stage, amicable settlement	• No out of court process is named in the official process —2 • It is voluntary, but part of the system - 1 • It is compulsory requirement to go first before go to debt settlement —0
	Initiator (who is entitled to initiate procedure, creditor, debtor, public entity, combinations etc.)	• The debtor can initiate all the processes —1 • The creditor and the debtor can initiate the processes or the creditors some of the processes —1 • Only the creditor can initiate the process —0
	Are all creditors included	• All credit/obligations types (secured, unsecured, utility, not just bank loans, credit cards, etc.) are included —2 • Some loan types (like utility obligations, unsecured loans, student loan) is/are not included —1 • Only secured claims are included—0
	Repayment/debt relief plan	• Repayment plan is drafted by the debtor first —2 • Repayment plan is drafted by office/other mandated —1 • Repayment plan is drafted by the creditor —0

Table 2.2
Questionnaire used to calculate the Israeli leniency index

Components of index [no. of indicators]	Indicators	Indicator scoring method
	Degree of disability of the debtor during the process	This relates to restrictions on the debtor's civil and economic rights related to bankruptcy • if no restrictions are related (other than disposal of property, revenue)—2 • for also for economic disabilities (i.e. restrictions on obtaining credit, being involved in the management of a company)—1 • interference with mail and/or travel (i.e. prohibition on travel without consent, mail opened by trustee) civic disabilities (i.e. loss of right to vote, hold elected office, membership of professional groups) —0
	Violating the duties (debtor) results possible penalties	• No such penalties (maximum prohibition from doing business) —2 • Fine—1 • Fine and other penalties (detention, other prohibition)—0
	Possible measure, decision of during the repayment, debt settlement processes (due to a sudden event, the debtor is hit by an event, etc., the court can decide to relief partly from debt)	• There is a possible measure in the restructuring process: • partial debt reduction, or release – 2 • no partial reduction but measure to ease the payment-burden (suspending payment, suspend sale of assets, aid, or any other measures) – 1 • no such measure is possible – 0
	Decision mechanism (majority of creditors, court, etc.)	• The court can make alone an obligatory decision at approving the plan or at the end (like in a debt relief plan) – 2 • Majority of creditors and / or claim is necessary for approval – 1 • Majority of creditor is not enough and/or decision-making is more complex or not binding for everybody – 0
	Exemption income (value, magnitude, strictness of exemptions during process; properties or future income a debtor can prevent creditors from recovering)	This relates to prebankruptcy assets which are exempted from the bankrupt estate and so retained by the debtor. • if exemptions are more generous than listed below. – 2 • if exemptions of assets from the bankruptcy estate cover only personal items, tools of trade, etc. – 1 • if exemptions are 'negative', i.e. spousal common property can be • pulled into the estate – 0
	Asset sale	• Asset could be sold only with the consent of the debtor, or the debtor can sell it with the approval of the officer – 2 • In at least one process, finally the asset could be sold by the officer/court alone (by other process with the approval of the creditor)– 1 • Asset (in all types of process) could be sold by the officer (trustee, etc.) only with the approval of the creditor – 0
	Consequences of commencement of the procedure	• All actions (collection, other insolvency) against the debtor are suspended – 2 • Some actions (some auctions commenced prior bankruptcy, secured obligations, accrual or interest, penalties) go on – 1 • Nothing is suspended concerning collection - 0

Table 2.2
Questionnaire used to calculate the Israeli leniency index

Components of index [no. of indicators]	Indicators	Indicator scoring method
Conditions for discharge [5]	Discharge is possible (in at least one type of the processes)	Discharge is possible in the legislation: • Yes, without any revoking possibility - 2 • Yes, but could be altered, revoked for a while, in case of hiding assets, did against pari passu, etc. – 1 • No, discharge is not possible, all obligations must be paid - 0
	Length of necessary repayment period, settlement period	In debt repayment, relief plan based on the legislation • the length could of repayment could be maximum or less than 3 years – 2 • repayment plans based on loan is more than 3 less than 7 years – 1 • could last more/equal than 7 years/no limit is defined, or no discharge – 0
	Level of repayment benchmark, minimum quota for closing (as a percentage of debt)	• No minimum quota relative to debt is prescribed in the law – 2 • There is a minimum quota, but under or equal 25% of the debt appear in at least one of the process types – 1 • Minimum quotas are typically above 25%, or no discharge - 0
	Automatic discharge conditional of court decision	• Discharge is automatic if conditions are fulfilled (maximum formal decision is needed) - 2 • Discharge is always based on court decision - 1 • No discharge - 0
	Discharge is valid for all credits, claims depending on lodged in the process	• Yes, for all claims even if it was not lodged in the course of proceeding – 2 • Only for claims lodged in the course of proceeding – 1 • No discharge – 0
Stigmas [4]	Other provisions against the debtor on financial market (loan, banking, etc.)	• No formal limitation in accessing debt market – 2 • There is a formal limitation about further credit access for less/equal to 5 years – 1 • There is a formal limitation about further credit access (black list) after process is closed for more than 5 years – 0
	Publicity stigmas (appearance in public registries, announcements, etc.)	• No such registration exist – 2 • Information about the procedure not publicly available / or limited, difficult access – 1 • Information about the procedure is publicly available (in registration, etc.) – 0
	Limit on further access to similar discharge later on	• No such limit – 2 • There is a limit - for less or equal than 5 years – 1 • There is a limit - for more than 5 years or one shot - 0
	Names, calling of the procedures, laws	Name of the law: • Settlement/Restructuring or euphemistic phrase – 2 • Insolvency – 1 • Bankruptcy - 0

Table 2.3
Breakdown of scoring of indicators in accordance with experts' opinions

Components of index [no. of indicators]	Indicators	Avg. score	Mode	Experts deviating from mode (pct.)
Straight bankruptcy option [2]	Is straight bankruptcy possible?	1.9	2	15
	Secured asset – return and walk away option	0.6	0	30
Eligibility criteria [5]	Entitled to participate (natural person, entrepreneurs)	2.0	2	0
	Income, wealth (income) constraint on minimum amount of debt to file	1.2	1	25
	Exclusion criteria of criminal record	2.0	2	5
	Minimum amount of debt	0.1	0	5
	Stigmas for filing	1.9	2	10
Cost of proceeding [3]	Court fee	0.0	0	0
	Who bears the costs of the procedure	0.3	0	16
	Deposit for the costs	1.9	2	5
Complexity (steps, phases, measures of the process) [5]	Who, how many office holders conducts the process (bankruptcy office, committee, court, municipality)	0.8	0	53
	Number of regimes named (routes like liquidation, debt settlement, restructuring proceeding, etc.)	1.7	2	20
	Complexity of the procedure for professionals (expert opinion)	1.4	2	50
	Complexity of the procedure for professionals (expert opinion)	1.3	2	50
	Debt counselling service	1.6	2	21
Process of repayment [11]	Pre-action stage, amicable settlement	1.5	2	40
	Initiator (who is entitled to initiate procedure, creditor, debtor, public entity, combinations etc.)	1.0	1	0
	Are all creditors included	2.0	2	0
	Repayment/debt relief plan	1.1	1	5
	Degree of disability of the debtor during the process	0.1	0	5
	Violating the duties (debtor) results possible penalties	0.0	0	0

Table 2.3
Breakdown of scoring of indicators in accordance with experts' opinions

Components of index [no. of indicators]	Indicators	Avg. score	Mode	Experts deviating from mode (pct.)
	Possible measure, decision of during the repayment, debt settlement processes (due to a sudden event, the debtor is hit by an event, etc., the court can decide to relief partly from debt)	1.8	2	11
	Decision mechanism (majority of creditors, court, etc.)	1.9	2	5
	Exemption income (value, magnitude, strictness of exemptions during process; properties or future income a debtor can prevent creditors from recovering)	1.3	1	35
	Asset sale	1.0	1	0
	Consequences of commencement of the procedure	1.3	1	30
Conditions for discharge [5]	Discharge is possible (in at least one type of the processes)	1.0	1	0
	Length of necessary repayment period, settlement period	1.3	1	40
	Level of repayment benchmark, minimum quota for closing (as a percentage of debt)	2.0	2	0
	Automatic discharge conditional of court decision	1.4	1	35
	Discharge is valid for all credits, claims depending on lodged in the process	1.1	1	10
Stigmas [4]	Other provisions against the debtor on financial market (loan, banking, etc.)	1.0	1	0
	Publicity stigmas (appearance in public registries, announcements, etc.)	0.0	0	0
	Limit on further access to similar discharge later on	2.0	2	5
	Names, calling of the procedures, laws	1.0	1	0

Table 2.4
Average score of Israel leniency index based on mode of indicators

Components of index [no. of indicators]	Score
Straight bankruptcy (accessibility, existence) [2]	1.0
Eligibility [5]	1.4
Cost, expensiveness (transaction costs) [3]	0.7
Complexity [5]	1.6
Process [11]	1.2
Conditions for discharge at debt restructuring [5]	1.2
Stigmas of during and after filing [4]	1.0

Table 2.5
Weights of index components in accordance with experts' opinion[16]

Components of index [no. of indicators]	Weight
Existence of structured insolvency proceeding [2]	0.12
Eligibility criteria [5]	0.17
Cost of proceeding [3]	0.16
Complexity of proceeding [5]	0.12
Restrictions and leniencies during proceeding [11]	0.14
Conditions for forgiveness [5]	0.19
Social stigma [4]	0.11

[16] To determine the weights of the seven components of the index, Walter and Krenchel (2021) availed themselves of sixteen experts who had professional / academic backgrounds in this field in various countries.

PASS-THROUGH FROM THE EXCHANGE RATE TO PRICES[1]

- Starting from the second half of 2022, the pass-through from the shekel-dollar exchange rate to inflation in Israel has become stronger. While the average pass-through in the samples ending between June 2017 and June 2022 was 18 percent, it rose to 28 percent in the sample up to the end of 2022. Since then, it has remained at a similar rate (27 percent at the end of the period reviewed, namely the sample ending in June 2023).
- The strengthening of the pass-through from the shekel-dollar exchange rate is evident in both the tradable goods price index and the nontradable goods price index.
- The strengthening of the pass-through in Israel is consistent with the positive association found in the literature between the level of inflation and the degree of pass-through from local currency exchange rates to inflation, against the backdrop of a significant rise in global inflation. In the current analysis, it was found that the pass-through in Israel becomes significantly stronger when inflation exceeds the upper limit of the inflation target range (3 percent).
- The pass-through from the shekel-euro exchange rate is much weaker than that from the shekel-dollar exchange rate, and during most of the period examined, it was not statistically significant.

1. Introduction

In a small and open economy, the exchange rate plays an important role in determining the prices of tradable goods and, in turn, the rate of inflation. As a result, the exchange rate is an important pass-through channel of monetary policy to inflation in Israel. An accommodative monetary policy is expected to create pressure for devaluation and therefore accelerate inflation, while a contractionary monetary policy is expected to bring about appreciation and slow down inflation. This explains the importance of evaluating the strength of this channel.

The exchange-rate pass-through (ERPT) to prices, hereinafter referred to as the "pass-through," is defined as a change in prices that is correlated with a change in the exchange rate. The pass-through has a rate and a speed: the rate of pass-through is the extent to which a change (of one percent, for example) in the exchange rate affects prices, while the speed of pass-through is the time it takes for the change to be transmitted to prices. Full pass-through occurs when a change in the exchange rate leads to an identical change in prices. The pass-through reflects the correlation between the exchange rate and prices, which depends on, among other things, the average mix of shocks to the economy during the sample period[2], though it does not necessarily reflect a clear causal relationship.

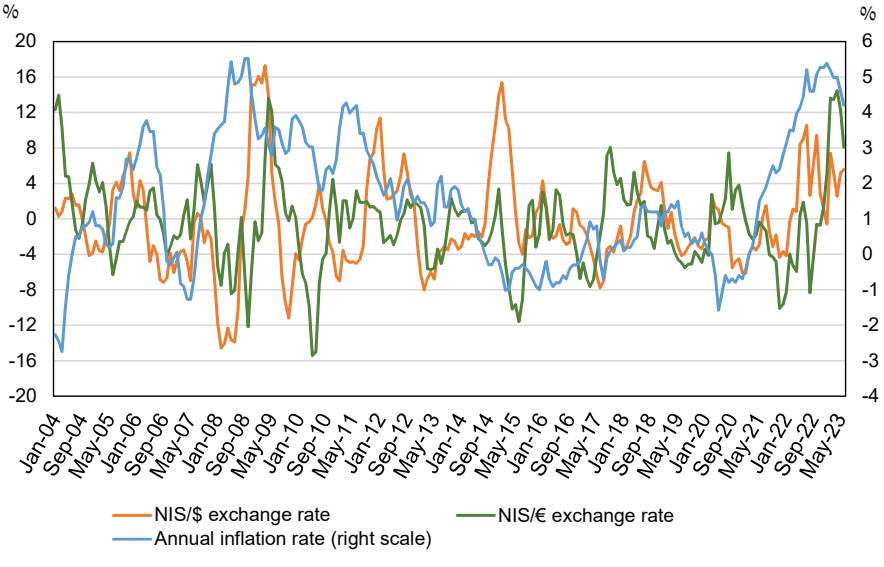
1 Authors: Uri Anzel, Eden Anavim and Ari Kutai. Thanks go to Ariel Zingler at the Bank of Israel for his help in data processing.

2 Pass-through reflects, among other things, the response of monetary policy, and therefore may vary according to the sample period being examined. For further details, see Forbes et al. (2018). To strengthen the assessment that pass-through reflects a causal relationship between the exchange rate and prices, it is customary in the literature to add controls for additional explanatory variables that may explain the correlation between the two variables, as was done in this analysis.

The economic literature on inflation and exchange rate pass-through points to a positive correlation between the inflation rate and the pass-through rate. Taylor (2000) argued that a low inflationary environment leads to weaker pass-through from exchange rates to local prices. The theoretical mechanism he proposes is based on the perception of individuals in the economy that changes in costs are less persistent in a low inflationary environment, and therefore pass-through is weaker.[3] Choudhri and Hakura (2006) examined this claim empirically over time for a panel of countries, finding strong and statistically significant evidence of a positive relationship between the pass-through rate and the average inflation rate, both over time and across countries. Similar findings were recently reported in the BIS Annual Economic Report (2022), which also relied on a panel of countries.[4] Given the relatively high inflation in Israel over the past two years, the question arises as to whether the pass-through from exchange rates to local prices in Israel has strengthened.

During 2022, there was a mixed trend in the shekel exchange rate, which exhibited high volatility (see Figure 1).[5] The development of the shekel during 2022 reflected a mix of a strengthening against the dollar and a weakening against the euro (for further details, see Section 3 of the Monetary Policy Report for the second half of 2022). In light of these trends, it is important to continue to test whether the pass-through rate from the shekel-dollar exchange rate to local prices is similar to that from the shekel-euro exchange rate.

Figure 1
Annual Inflation Rate vs. the Semiannual Change in the NIS/$ and NIS/€ Exchange Rates (monthly average)
January 2004–June 2023



SOURCE: Bank of Israel.

3 The economic literature offers additional explanations for the association between inflation and the strength of pass-through, among them changes in the market power of firms and their ability to engage in price discrimination in international markets (Goldberg and Knetter, 1997).

4 See Panel C, Figure 3 in the BIS report.

5 The analysis focuses on the pass-through from the exchange rate to changes in the CPI in the subsequent month, over a period of 6 months (a three-month moving average and its three-month lag; see the section on Methodology below). Figure 1 is intended to show the correlation between the variables over time, by displaying the semi-annual rates of change in the shekel-dollar and shekel-euro exchange rates relative to annual inflation.

In the current analysis, we conduct an updated estimation of the short-term pass-through from the shekel-dollar and shekel-euro exchange rates to inflation in Israel. The pass-through was examined using rolling linear regressions with a four-year window, based on monthly data since 2000.

Several studies have previously investigated the pass-through in Israel. Soffer (2006) investigated the pass-through rate for 31 CPI components and found that it was about 32 percent during the period 1991–98, declining to 23.5 percent during 1999–2004. In the early 1990s, inflation was high in Israel, reaching a peak of 20 percent; however, during those years, inflation declined until reaching the vicinity of price stability. Therefore, the findings of Soffer (2006) are consistent with the economic literature, which points to a positive association between the pass-through rate and inflation.

Orfaig (2015) proposed another method for examining pass-through that involved the calculation of the tradable portion of the CPI, which is meant to be affected by changes in the exchange rate.[6] She therefore assumed that in the long term the pass-through to the tradable goods components of the index is complete and found a pass-through rate of 36 percent. Kuzin (2019), who used a method similar to that presented in the current analysis, found that the pass-through from the shekel-dollar exchange rate strengthened starting from mid-2017, following a period of negligible pass-through since the beginning of 2010. Furthermore, he found that in the four-year window ending in June 2018, the pass-through was 18 percent and statistically significant. In this analysis, we extend the period examined by Kuzin (2019) and broaden the scope of the investigation to include the pass-through from changes in the shekel-euro exchange rate.

2. Methodology – calculation of the pass-through

We estimate the pass-through from changes in the exchange rate to prices using an OLS regression based on monthly data, from January 2000 to June 2023, using a rolling window of four years (48 months). This estimation allows us to test whether the pass-through has changed during the sample period. We include as explanatory variables the rate of change in the shekel-dollar or shekel-euro exchange rate (three-month moving average) and its three-month lag. To limit the possibility that the correlation between the exchange rate and inflation is due to a third factor, we include several control variables commonly used in the literature on exchange rate pass-through, namely the index of consumer goods import prices in Israel ("Paasche Index") in dollars (three-month moving average) and the rate of change of oil prices (three-month moving average)[7], as well as their three-month lag. To account for seasonality, we also include dummy variables for the months.[8] We also examine partial CPI series (hereafter referred to as the "General Price Index"): the index of tradable goods prices, the index of nontradable goods prices and the CPI excluding energy and fruits and vegetables. Accordingly, we estimate the following equation:

6 The estimation was based on the weight of the tradable components according to the input-output tables of the various sectors of the economy and their classification according to the CPI categories.

7 The price of Brent oil in dollars.

8 To ensure that the results are not biased due to the small number of observations relative to the number of variables, we conducted a sensitivity analysis that is described below. It confirms the conclusions using a seasonally adjusted CPI series without dummy variables. In addition, we carry out an estimation using the Weighted Least Squares method, in which the sample is longer and more weight is given to recent observations.

$$(1)\ \Delta cpi_t = Constant + \beta_1 \cdot \Delta e_{[t,t-2]} + \beta_2 \cdot \Delta e_{[t-3,t-5]} + \beta_3 \cdot \Delta pim_{[t,t-2]} + \beta_4 \cdot \Delta pim_{[t-3,t-5]} + \beta_5 \cdot \Delta oil_{[t,t-2]} + \beta_6 \cdot \Delta oil_{[t-3,t-5]} + \sum_{i=1}^{11} \gamma_i \cdot month\ dummy_{i,t} + \epsilon_t$$

Where:

ΔCpi_t – The monthly change in the log of the CPI;

$\Delta e_{[t`,t``]}$ – Moving average, from month t′ to month t″, of the log-change of the exchange rate (dollar or euro);

$\Delta pim_{[t`,t``]}$ – Moving average, from month t′ to month t″, of the log-change of the consumer goods import price index;

$\Delta oil_{[t`,t``]}$ – Moving average, from month t′ to month t″, of the log-change of the oil price index;

ϵ_t – The stochastic error.

3. Results

In this analysis, we define the pass-through from the exchange rate as the sum of the exchange rate coefficients (). The main assumption underlying this definition is that after controlling for import prices, oil prices, and seasonality, the exchange rate coefficients reflect the average pass-through from the exchange rate. A dynamic analysis of the changes in the dollar exchange rate to the General Price Index (using a moving window of 48 observations) shows that from the end of the first half of 2017 to the end of the first half of 2022, the pass-through was positive and statistically significant (at a level of at least 10 percent) and ranged from 11 to 26 percent (see Figure 2).

For samples ending in 2018 and 2019, the estimated pass-through was relatively high, at around 20 percent, but for samples that ended starting from the second half of 2020 until the second half of 2022, the pass-through was significantly weaker. In samples that ended early in the second half of 2022 and later, the pass-through from the shekel-dollar exchange rate strengthened and rebounded, and by the end of 2022, it reached its peak in over a decade at 28 percent. It has since then remained similar.[9,10] Looking at a slightly longer period, the pass-through remained weak relative to the beginning of the sample period, after declining during the period 2004–2011.[11] A similar decline in pass-through has been found in previous studies (for further details, see Kuzin, 2019).

9 The increase in the second half of 2022 relative to the average pass-through level since the end of the first half of 2017 (subsequent to the significant strengthening of pass-through from a negligible level) is not statistically significant. For more details, see Table A.2 in the appendix.

10 Detailed results of the pass-through coefficients, the pass-through for the previous three months (β1) and for the previous three months lagged (β2) are presented in appendix Tables A.1 to A.4.

11 One explanation for the weakening of the pass-through during these years is the intensification of competition in Israel. The Bank of Israel Annual Reports for 2016 and 2017 point to changes in consumer behavior in Israel, partly due to technological improvements that facilitated the comparison of prices and the option of purchasing products online. For further details, see Kuzin (2019).

The main results regarding the pass-through to the General Price Index are robust to changes in the estimation method, including the method for dealing with seasonality in the price index over the course of the year, namely: employing a seasonally adjusted CPI published by the CBS, rather than dummy variables; testing the pass-through derived from changes in the shekel-dollar exchange rate over a period of six months (rather than a three-month average and its lag); adding a control for changes in the CPI in the previous month; changing the rolling window size to three years; and how import prices are controlled for (by using the US Import Price Index rather than Israel's). None of these modifications in the estimation method alter the conclusions.[12] To ensure that the results are not biased because of the small sample size, we carry out an estimation using Weighted Least Squares, which assigns greater weight to more recent observations. We find that the average pass-through ranges from 15 to 19 percent, depending on the rate of decay in the weights over time and the sample size. We also conduct a Leave One Out Cross-Validation test to see if the trends observed are explained by a small number of outlier observations. In particular, we examine the excess decline in pass-through between 2014 and 2016 and the sharp increase observed in 2017. The test shows that omitting one or two outlier observations can, at most, slightly mitigate the decrease or increase in pass-through, but does not eliminate it (which is also the case when omitting a larger number of observations).[13,14]

To ensure that the results reflect broad effects of the exchange rate on prices in Israel, we also examine the pass-through to the CPI without the more volatile components of energy and fruits and vegetables. We find that the strengthening of the pass-through in the second half of 2022 is more pronounced when excluding these components. The pass-through to the adjusted index is 26 percent (at the end point of the data in June 2023; Figure 3).[15]

In line with the findings in the economic literature that there is a positive association between the strength of pass-through and inflation, we find that in Israel, the pass-through has likely strengthened in recent years, in parallel to the increase in inflation.[16] To further explore this conclusion, we expand the investigation by directly testing whether the pass-through rate depends on the annual rate of inflation. Korenok et al. (2022) found that the threshold at which individuals in the economy start to notice inflation is between 2 and 4 percent. Based on these results, we test whether the pass-through changes if inflation in the previous month was particularly high, i.e., more than 3 percent, which is the current upper bound of the inflation target range, and also more than 4 percent. Results are presented in Tables A.3 and A.4 and are consistent with findings in the literature.[17] Specifically, we find a heterogeneous effect in the average pass-through based on the sample starting in January 2010 (Table A.3). Thus, when inflation is below 3 percent, pass-through is weaker (about 8 percent), and when it is above 3 percent, pass-through is significantly stronger (20 percent). We obtain similar results with respect to inflation both below and above 4 percent. The

12 The results based on the US Import Price Index are similar to those of the baseline estimation and in particular in the trends over time. However, this approach yielded a weaker pass-through.

13 We noted that even after removing the 10 extreme outliers, which significantly reduces the sample size (which is based throughout on 48 observations at each point), the decrease and increase in pass-through remain.

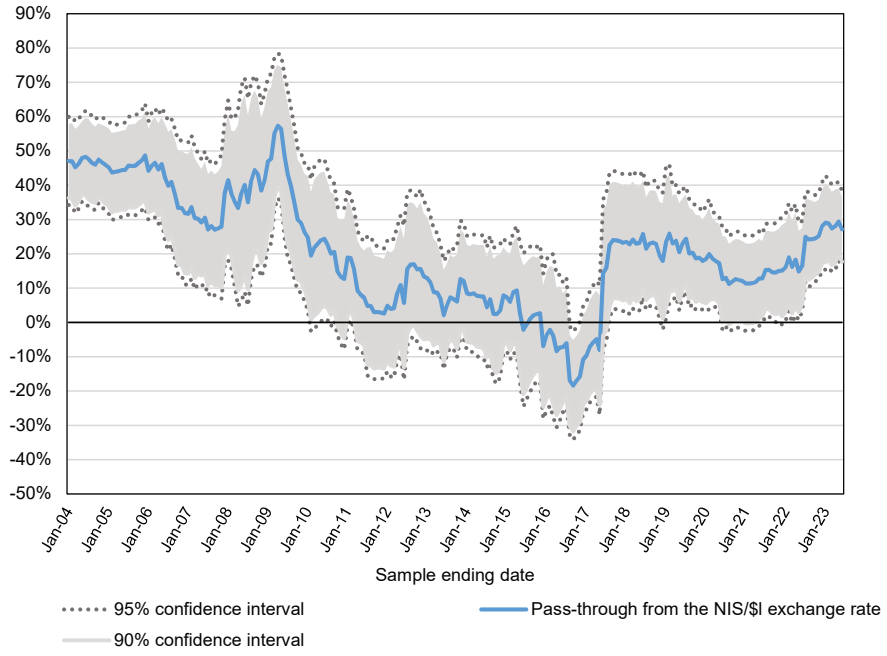
14 The additional results are available from the authors.

15 The trend in pass-through to the CPI excluding fruits and vegetables is similar to that of the pass-through to the General Price Index, and at the endpoint it is 27 percent. The decline in pass-through from the dollar exchange rate to the General Price Index to negative levels in 2016–17 is explained by changes in the pass-through from energy prices.

16 See footnote 8.

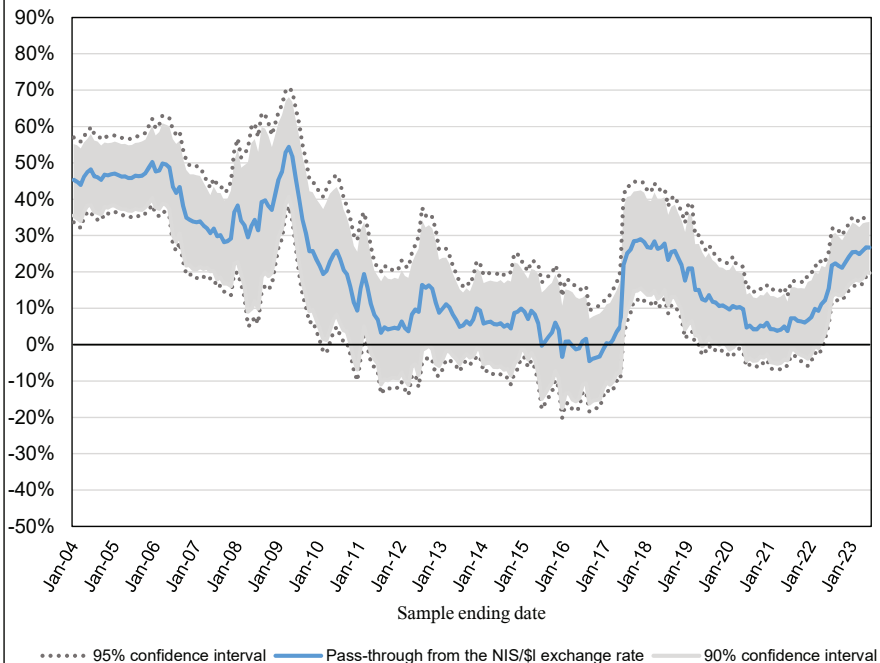
17 The tables present the pass-through when we allow the effect to depend on the annual rate of inflation rate: Table A.3 – In the period starting from 2010, the year in which the new Bank of Israel Law – 2010–11 established the Monetary Committee. The Committee convened for the first time a year later, in October 2011. Table A.4 – in the full sample starting from 2000.

Figure 2
Pass-through from the Dollar to Inflation
Ending date of the 48-month rolling window, January 2004–June 2023



Note: The figure presents the coefficient amounts of the NIS/$ exchange rate $(\beta_1 + \beta_2)$ from equation 1 for the regression in which the dependent variable is the CPI.
SOURCE: Bank of Israel.

Figure 3
Pass-through from the Dollar to Inflation net of Energy and Fruit and Vegetables
Ending date of the 48-month rolling window, January 2004–June 2023



Note: The figure presents the coefficient amounts of the NIS/$ exchange rate $(\beta_1 + \beta_2)$ from equation 1 for the regression in which the dependent variable is the CPI net of energy and fruit and vegetables.
SOURCE: Bank of Israel.

differences are statistically significant at a level of 10 percent.[18] Unreported results show that there is no increase in pass-through at rates of inflation above the target range midpoint (i.e., 2 percent).

4. Prices of tradable and nontradable goods

The pass-through to prices of tradable goods, which consist of imported products or products with import substitutes, are expected to be stronger than the pass-through to prices of non-tradable goods. However, a weaker, but still significant effect is expected for nontradable goods prices since some of them are produced using imported inputs (for example, in transportation where fuel is a major input). A dynamic analysis of the pass-through shows a strengthening of the pass-through from the shekel-dollar exchange rate to the price indices of both tradable and nontradable goods (Figures 4 and 5). In samples ending in the first half of 2020, the pass-through to tradable goods prices steadily weakened, and in the sample ending in May 2022, it reached a low point of only 14 percent. However, in the second half of 2022, the trend reversed and the pass-through strengthened. By the end of 2022, the pass-through to tradable goods prices stood at 37 percent, just below the peak recorded before the start of the downward trend, and since then it has remained at a high level. The confidence interval of the pass-through to the tradable goods price index is significantly broader than in the case of the nontradable goods price index.[19]

As expected, the pass-through to the nontradable goods price index has been weak during most of the period. From June 2017 to June 2021, it was weak and stable (about 10 percent). Since July 2021, there has been a gradual increase in pass-through, and the pass-through is statistically significant at the 5-percent level. The pass-through to the nontradable goods price index was 23 percent at the end of 2022 and has been stable since then. In the longer term, the pass-through to nontradable goods price index has much weakened, reaching negligible rates from 2009 to 2016, reaching negligible rates. The pass-through in the initial years of the sample was stronger because rental contracts were linked to the dollar. For further details, see Kuzin (2019).[20]

5. Pass-through from the shekel-euro exchange rate

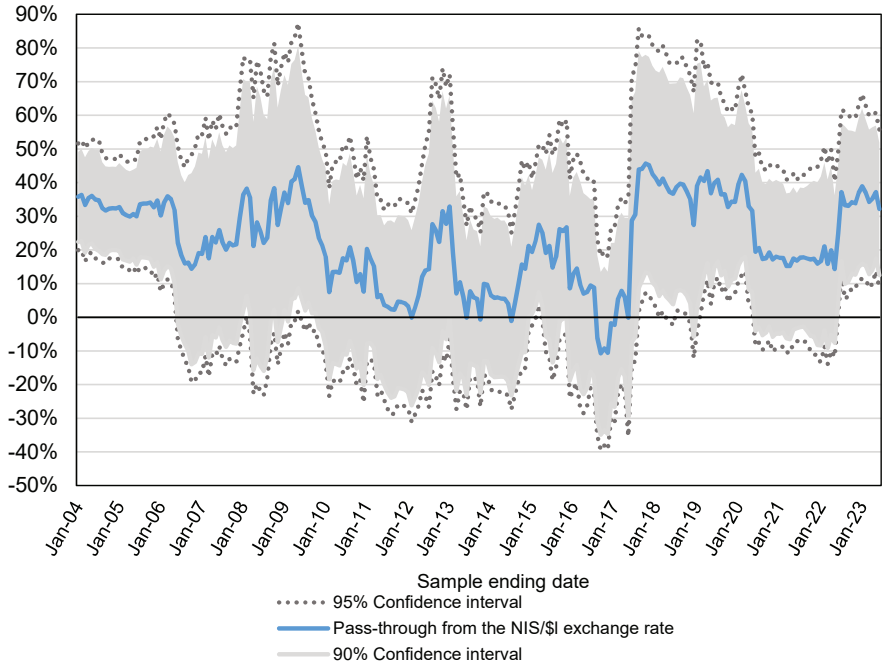
The nominal effective exchange rate remained largely unchanged in the second half of 2022; however, this stability reflected a mix of strengthening against the dollar and weakening against the euro. Due to these mixed trends, it is also important to estimate the pass-through from the shekel-euro exchange rate. Therefore, in addition to the pass-through from changes in the shekel-dollar exchange rate, we investigate the pass-through from changes in the shekel-euro exchange rate. We find that the pass-through from the shekel-euro exchange rate is negligible or very weak throughout most of the sample period (Figure 6),

18 In a longer sample, starting in January 2000 (full sample), we find the differences to be not statistically significant. However, in an analysis that included the US Import Price Index as the alternative index for import prices, those same differences are found to be statistically significant at a level of 5 percent when inflation exceeded 4 percent. (The results are available from the authors.)

19 Table A.2 presents results when we allow for a heterogeneous effect, a different effect starting from the second half of 2022. The strengthening of pass-through to the tradable goods index, relative to the average pass-through since 2017, is not statistically significant.

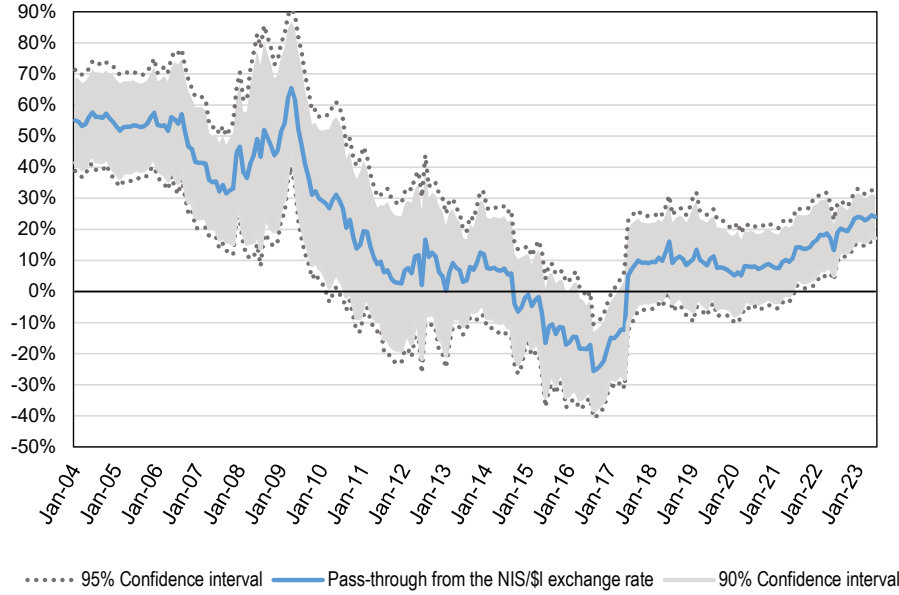
20 Unreported results regarding the heterogeneous effect of changes in exchange rates suggest that in samples starting from June 2017, the pass-through to the prices of tradables is similar for appreciation and depreciation, and is near 32–33 percent. The effect of a depreciation on prices of non-tradables is 24 percent, but the estimates for pass-through from an appreciation are volatile—it is sometimes close to the pass-through from a depreciation, sometimes close to zero, and on average negligible. The difference in pass-through to the prices of non-tradables between depreciation and appreciation for the sample since June 2017 is statistically significant at a level of 10 percent. Findings for the long samples are not unambiguous.

Figure 4
Pass-through from the Dollar to Tradables Prices
Ending date of the 48-month rolling window, January 2004–June 2023



Note: The figure presents the coefficient amounts of the NIS/$ exchange rate $(\beta_1 + \beta_2)$ from equation 1 for the regression in which the dependent variable is the CPI net of energy and fruit and vegetables.
SOURCE: Bank of Israel.

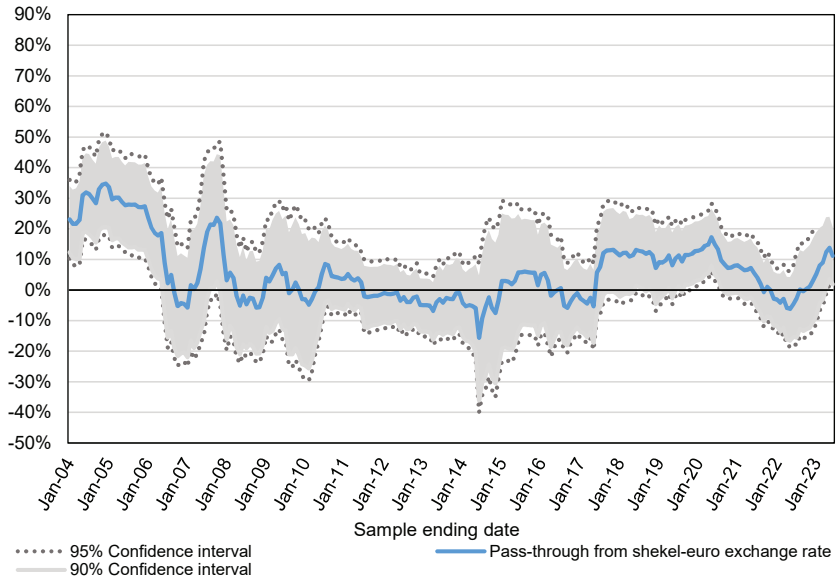
Figure 5
The Pass-through from the Dollar/Shekel Exchange Rate to Inflation
Ending date of the rolling 48-month window, Januarey 2004 - June 2023



Note: The figure presents the coefficient amounts of the NIS/$ exchange rate $(\beta_1 + \beta_2)$ from equation 1 for the regression in which the dependent variable is the nontradables CPI. SOURCE: Bank of Israel.

particularly at the endpoint when it reaches about 10 percent. This conclusion remains valid even after disaggregating the impact between the tradables and nontradables indices.[21] These results are in line with the Dominant Currency Paradigm, which states that most global foreign trade transactions are denominated in dollars. An analysis by the Export Institute from 2017 shows that 71 percent of Israel's imports of goods (excluding diamonds) are denominated in dollars, compared to only 22 percent in euros.[22] According to the paradigm, changes in the exchange rate of the dominant currency (the dollar) have a relatively strong pass-through in the short to medium term compared to changes in the bilateral exchange rate with the trading partner.[23] Furthermore, to support the findings that changes in the shekel-euro exchange rate do not have a strong impact on prices in Israel, we reestimate the pass-through from the shekel-dollar exchange rate, but with an additional control for changes in the cross dollar-euro exchange rate. The results indicate that the pass-through from the shekel-dollar exchange rate remains similar. In addition, no clear evidence is found that changes in the cross euro-dollar rate affect prices in Israel.[24]

Figure 6
The Pass-through from the Euro/Shekel Exchange Rate to Inflation
Ending date of the rolling 48-month window, January 2004–June 2023



Note: The figure presents the coefficient amounts of the NIS/$ exchange rate ($\beta_1 + \beta_2$) from equation 1 for the regression in which the dependent variable is the CPI.
SOURCE: Bank of Israel.

21 The results are available from the authors. The pass-through is weak for non-tradables, at about 7 percent. The pass-through to tradables is stronger at the endpoint, but is volatile.

22 For further information, see: Export Institute (2017), "Developments and Trends in Israeli Exports – Summary Report for the First Half of 2017". [Hebrew]

23 For further information on the "Dominant Currency Paradigm", see Chapter 3 of the Bank of Israel Report for 2017 and Gopinath and Itskhoki, 2021.

24 The results are available from the authors.

6. Conclusion

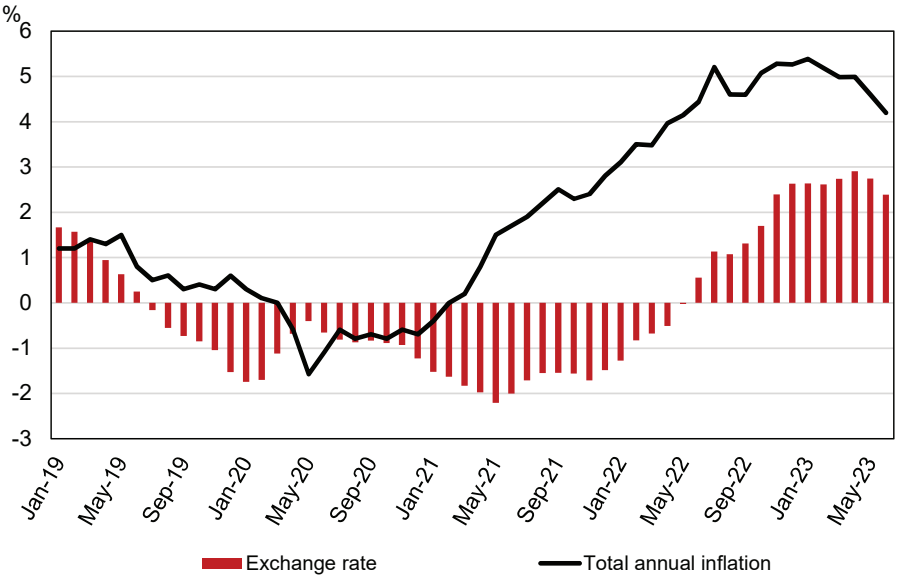
The pass-through rate is a critical variable in monetary policy decision-making. In an updated estimation, we find that the estimated pass-through from the shekel-dollar exchange rate has significantly strengthened in recent years, and in particular the pass-through to the prices of tradable goods. These results are in line with the economic literature, which indicates a positive relationship between the pass-through rate and inflation. An increase in the pass-through rate may suggest that changes in monetary policy that affect the exchange rate are having a greater impact on inflation than in the past. Based on the updated estimation of pass-through from the shekel-dollar exchange rate, it is estimated that the shekel's weakening by about 10 percent in 2022 (from an average level of 3.13 shekels per dollar in December 2021 to 3.45 shekels per dollar in December 2022) contributed approximately 2.5 percentage points to the increase in annual inflation (Figure 7).[25] In the first half of 2023, the shekel weakened by an additional 6 percent, leading to a further 1 percentage point increase in annual inflation. This contrasts with a negative contribution resulting from the strengthening of the shekel by about 1.5 percentage points each year from 2019 to 2021.[26]

We emphasize that this finding and its implications should be treated with caution due to the short period in which the increase in pass-through was observed and due to the uncertainty reflected in the confidence interval around the pass-through rate estimate, particularly in the case of the tradable goods price index. Nonetheless, it can be said that the current pass-through rate is in the higher part of its historical range.

Furthermore, while there is significant pass-through from changes in the shekel-dollar exchange rate to prices in Israel, the impact of changes in the shekel-euro exchange rate is usually very weak and not statistically significant, a result that is consistent with the Dominant Currency Paradigm. Therefore, we conclude that when analyzing the development of inflation in the short term (up to six months), greater attention should be paid to the shekel-dollar exchange rate than the shekel-euro exchange rate or the nominal effective exchange rate.

[25] The estimated contribution of the actual change in the exchange rate, namely, given the monetary policy that was implemented.
[26] The contribution is based on an estimate of the pass-through from a sample of 48 observations ending in June 2023.

Figure 7
The Estimated Contribution of the (NIS/$) Exchange Rate to Annual Inflation
January 2019 to June 2023



SOURCE: Bank of Israel.

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Appendices

Table A.1
Pass-through from the NIS/$ exchange rate
Monthly data, July 2019–June 2023

Variable	(1) General CPI	(2) Tradables index	(3) Nontradables index	(4) CPI net of energy, fruit and vegetable components
$\Delta e_{[t,t-2]}$	0.247***	0.426***	0.144***	0.199***
	(0.054)	(0.111)	(0.039)	(0.040)
$\Delta e_{[t-3,t-5]}$	0.025	-0.104	0.096**	0.068
	(0.055)	(0.115)	(0.040)	(0.041)
$\Delta pim_{[t,t-2]}$	0.246	0.521	0.075	0.280
	(0.288)	(0.597)	(0.210)	(0.213)
$\Delta pim_{[t-3,t-5]}$	0.206	0.331	0.124	0.154
	(0.189)	(0.391)	(0.137)	(0.140)
$\Delta oil_{[t,t-2]}$	0.014**	0.031**	0.004	0.006
	(0.007)	(0.014)	(0.005)	(0.005)
$\Delta oil_{[t-3,t-5]}$	-0.003	-0.018	0.006	0.002
	(0.009)	(0.018)	(0.006)	(0.007)
Dummy variables for months	+	+	+	+
Observations	48	48	48	48
R^2	0.705	0.642	0.764	0.784

* The results include controlling for the effects of seasonality via dummy variables for months.
The F-test to total the coefficients that represent the change in exchange-rate passthrough was found to be statistically significant at a 5% significance level for the CPI (F-test value is 7.25) and at a significance level of less than 1 percent for the other indices. F-test values are 22.24 for the headline CPI, 32.74 for the nontradables index, and 39.18 for the CPI net of the energy and fruit and vegetable components.

Table A.2
Pass-through from the NIS/$ exchange rate—heterogeneous impact from the second half of 2022
Monthly data, June 2017–June 2023

Variable	(1) CPI	(2) Tradables index	(3) Nontradables index
$\Delta e_{[t,t-2]}$	0.120**	0.183**	0.079**
	(0.048)	(0.090)	(0.035)
$\Delta e_{[t-3,t-5]}$	0.059	0.103	0.036
	(0.046)	(0.087)	(0.034)
$\mathbf{D}_{\mathbf{mid2022}}$	0.002	-0.0003	0.003***
	(0.001)	(0.003)	(0.001)
$\mathbf{D}_{\mathbf{mid2022}} \cdot \Delta e_{[t,t-2]}$	0.045	0.218	-0.065
	(0.099)	(0.186)	(0.073)
$\mathbf{D}_{\mathbf{mid2022}} \cdot \Delta e_{[t-3,t-5]}$	-0.031	-0.101	-0.024
	(0.102)	(0.193)	(0.076)
$\Delta pim_{[t,t-2]}$	0.109	0.117	0.110
	(0.152)	(0.286)	(0.113)
$\Delta pim_{[t-3,t-5]}$	0.029	0.124	-0.044
	(0.131)	(0.247)	(0.097)
$\Delta oil_{[t,t-2]}$	0.019***	0.039***	0.006
	(0.005)	(0.010)	(0.004)
$\Delta oil_{[t-3,t-5]}$	0.003	0.001	0.006
	(0.006)	(0.010)	(0.004)
Dummy variables for months	+	+	+
Observations	73	73	73
R^2	0.648	0.600	0.704

*The table presents the shekel-dollar exchange rate passthrough to inflation, when permitting a heterogeneous impact on the period that begins from July 2022. The results also include controlling for the seasonal effects via dummy variables for months.
F-tests for totaling the coefficients that represent the passthrough from the exchange rate are found to be statistically significant at a significance level of 5 percent for the CPI an the nontradables index (F-test values are 5.64 and 5.43, respectively) and 10 percent for the tradables index (F-test value is 3.65). The change in the exchange rate transmission in the second half of 2022 (total of coefficients) is not statistically significant.
** $D_{mid2022}$ is the variable that receives the value 1 when the reference is to a period after the middle of 2022, and 0 if otherwise.

Table A.3
Pass-through from the NIS/$ exchange rate—heterogeneous impact dependent on the inflation rate
Monthly data, January 2010–June 2023

Variable	(1) General CPI	(2) General CPI, inflation >3%	(3) General CPI, inflation >4%
$\Delta e_{[t,t-2]}$	0.094***	0.068**	0.076***
	(0.024)	(0.029)	(0.026)
$\Delta e_{[t-3,t-5]}$	0.053**	0.013	0.016
	(0.025)	(0.029)	(0.028)
$\pi > 4\%$			0.001
			(0.001)
$\pi > 3\%$		0.001**	
		(0.001)	
$\Delta e_{[t,t-2]} \cdot \pi > 4\%$			0.045
			(0.062)
$\Delta e_{[t-3,t-5]} \cdot \pi > 4\%$			0.099
			(0.062)
$\Delta e_{[t,t-2]} \cdot \pi > 3\%$		0.033	
		(0.052)	
$\Delta e_{[t-3,t-5]} \cdot \pi > 3\%$		0.086*	
		(0.050)	
$\Delta pim_{[t,t-2]}$	0.243***	0.173**	0.177**
	(0.082)	(0.084)	(0.085)
$\Delta pim_{[t-3,t-5]}$	-0.109	-0.153**	-0.131*
	(0.067)	(0.071)	(0.069)
$\Delta oil_{[t,t-2]}$	0.022***	0.022***	0.023***
	(0.004)	(0.004)	(0.004)
$\Delta oil_{[t-3,t-5]}$	0.005	0.004	0.005
	(0.004)	(0.004)	(0.004)
Dummy variables for months	+	+	+
Observations	162	162	162
R^2	0.511	0.542	0.540

*The table presents the results of the shekel-dollar exchange rate passthrough to inflation: The overall CPI (1), if permitting a heterogeneous impact on the period when: the annual inflation rate for the preceding year (t-1) exceeds 3 percent (2); the inflation rate exceeds 4 percent (3). The results also include controlling for the seasonal effects via dummy variables for months.
The F-test for totaling the coefficients that represent the passthrough from the exchange rate when inflation exceeds 3 percent and 4 percent are found to be statistically significant at a significance level of 10 percent (F-test values are 2.86 and 3.07, respectively).
** The variable π represents the annual inflation rate in the preceding month, in percent.

Table A.4
Pass-through from the NIS/$ exchange rate—heterogeneous impact dependent on the inflation rate
Monthly data, January 2000–June 2023

Variable	(1) General CPI	(2) General CPI, inflation >3%	(3) General CPI, inflation >4%
$\Delta e_{[t,t-2]}$	0.143***	0.139***	0.126***
	(0.019)	(0.025)	(0.021)
$\Delta e_{[t-3,t-5]}$	0.050***	0.036	0.035
	(0.019)	(0.024)	(0.023)
$\pi > 4\%$			0.001**
			(0.001)
$\pi > 3\%$		0.001**	
		(0.0005)	
$\Delta e_{[t,t-2]} \cdot \pi > 4\%$			0.028
			(0.040)
$\Delta e_{[t-3,t-5]} \cdot \pi > 4\%$			0.011
			(0.039)
$\Delta e_{[t,t-2]} \cdot \pi > 3\%$		-0.016	
		(0.034)	
$\Delta e_{[t-3,t-5]} \cdot \pi > 3\%$		0.004	
		(0.033)	
$\Delta pim_{[t,t-2]}$	0.212***	0.177***	0.178***
	(0.060)	(0.062)	(0.063)
$\Delta pim_{[t-3,t-5]}$	-0.056	-0.089	-0.079
	(0.052)	(0.054)	(0.054)
$\Delta oil_{[t,t-2]}$	0.027***	0.028***	0.028***
	(0.003)	(0.003)	(0.003)
$\Delta oil_{[t-3,t-5]}$	0.005	0.005	0.005
	(0.004)	(0.004)	(0.004)
Dummy variables for months	+	+	+
Observations	282	282	282
R^2	0.502	0.513	0.512

*The table presents the results of the shekel-dollar exchange rate passthrough to inflation: The overall CPI (1), the passthrough if permitting a heterogeneous impact when: the annual inflation rate for the preceding year (t-1) exceeds 3 percent (2); the inflation rate exceeds 4 percent (3). The results also include controlling for the seasonal effects via dummy variables for months.
The F-test for totaling the coefficients that represent the passthrough from the exchange rate when inflation exceeds 3 percent and 4 percent are found to be not statistically significant (F-test values are 0.07 and 0.61, respectively).
** The variable π represents the annual inflation rate in the preceding month, in percent.