



Debt-Financed

Investment for Growth

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Debt-Financed Investment for Growth

This paper describes a historic opportunity for the Israeli economy. The low interest rate facing the economy makes it possible to raise capital that can be channeled to growth-oriented projects, such as public infrastructure. In particular, increasing annual investment in public capital by 2% of GDP between 2023 and 2030 will increase the economy's rate of growth by about 0.5 percentage points relative to the forecasts of the Bank of Israel for 2027 to 2030.

This outcome is based on the fact that the stock of public capital per capita in Israel relative to GDP is about 50%, which is significantly lower than in other developed countries with similar characteristics to those of Israel (the benchmark countries), where the ratio is about 75% and GDP per capita is higher than that of Israel by about 30%.¹ As a result, there is a high return on additional investment in public infrastructure in Israel, which makes it particularly worthwhile.

During the past five years, there has been a significant decline in the long-term interest rate on government debt in both Israel and other countries. The nominal 10-year interest rate is currently between 1.0% and 1.3% and the real interest during the next three years is expected to be negative. The low real interest rate and the high return on investment in core infrastructures constitute an opportunity for policy change. This paper quantitatively evaluates the scenario of expected growth and the debt burden as a result of an increase in public capital investment financed by debt.² This scenario is compared to the growth forecasts of the Ministry of Finance and the Bank of Israel for 2021 through 2030.

The main scenario recommends making the necessary investments already in 2023 without reducing expenditure or raising taxes until 2025. This policy takes advantage of the period of low interest rates in order to solidify growth at a higher level from 2026 onward. According to this scenario, real growth will be about 4.5% between 2027 and 2030. This is higher than the 3.2% forecast of the Ministry of Finance, which assumes a decline in the rate of public investment relative to GDP, and the 4.1% forecast of the Bank of Israel, which is recommending a gradual increase of public investment but a rapid return to a low primary deficit.³

¹ The benchmark countries are Austria, Denmark, Finland, Ireland, the Netherlands, and Sweden.

² The scenario is based on economic literature that is comprehensively reviewed in this paper and in particular Blanchard (2022) and Ramey (2020).

³ As a result of a revision of the CBS data, the Bank of Israel is assuming basic growth that is 0.5 percentage points higher per year than in the main scenario.

Financing the increase in the stock of public capital in 2023–2024 by means of debt will raise the debt-to-GDP ratio to about 73% in 2024, as compared to about 68% according to the Bank of Israel forecast. However, lowering the primary deficit later on to a target level of 1.5% in 2028 and the additional growth that will be achieved by the investment will reduce the debt-to-GDP ratio to about 66.5% in 2030, a level similar to that expected by the Bank of Israel.

The main insight of the scenarios is that when the interest rate is significantly lower than the rate of growth, increasing public investment without raising taxes raises GDP per capita without enlarging the debt burden.

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1. Summary and conclusions

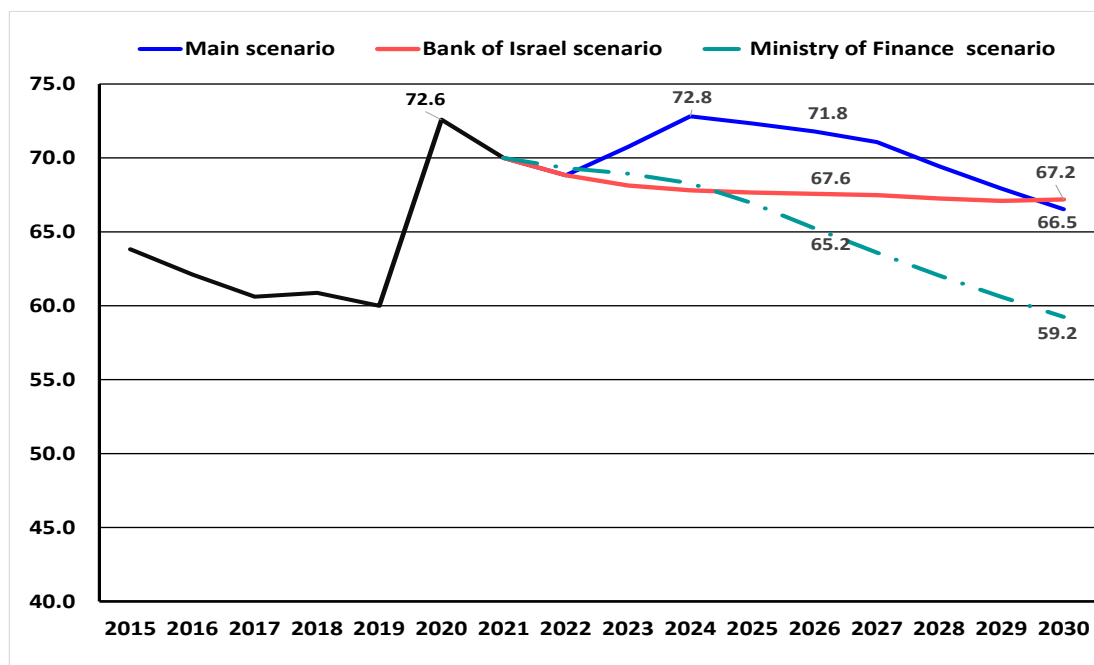
This policy paper analyzes a scenario of raising public expenditure in order to finance growth-oriented projects. The main case assumes an increase in investment in public capital of 2% of GDP (to 6% of GDP) in 2023. In view of the severe lack of public infrastructure, the convenient financing terms available to the economy can facilitate an aggressive investment policy, with the goal of advancing public projects that will raise the standard of living in Israel to that of the world's leading economies and will increase the economy's productivity.⁴ Enlarging public capital (and particularly in the transportation sector) will increase the rate of economic growth by close to 1 percentage point annually. In principle, the policy recommendation of this paper to increase investment in public capital is aligned with that of the Bank of Israel. However, the process that we are proposing is more rapid, since the Bank of Israel is advocating that public investment be raised gradually so as to reach 3% of GDP only in 2030 and, whereby two thirds of that amount are designated for physical infrastructure. These scenarios are in stark contrast to the Ministry of Finance's fiscal policy scenario whose goal is to return to a debt-to-GDP ratio of 60%. In this context, the Ministry of Finance is proposing that the tax base be expanded while **lowering** public investment relative to GDP starting in 2023.

Our findings are based on the economic literature on public capital as one of the factors that determines an economy's total productivity. For example, IMF economists estimate that increasing public capital by 1 percentage point raises GDP by one-tenth of a percentage point in the case of "general" public capital and close to two-tenths of a percentage point in the case of "core" public capital (transportation, communication, electricity, and the like). Given the low level of public capital in Israel, the application of these elasticities yields a high return on investment in public capital in terms of economic growth. In view of the large gap between this return and the low level of the interest rate facing the economy, it is worthwhile financing investment in public capital by means of debt. As shown by the literature (in particular, Blanchard, 2022), as long as the economy's rate of growth is higher than the interest rate, a fixed ratio of debt-to-GDP and of the debt burden to GDP can be maintained if the primary deficit does not increase. The addition to the growth rate that is made possible by the investment in public capital will create a large spread relative to the interest rate and will further reduce the potential risk implicit in raising the national debt.

⁴ There is a broad consensus among the economic institutions in Israel and abroad around the need to increase public investment in transportation infrastructure, energy, digitization, and human capital as a policy that contributes to the economy as a whole and to business investment in particular, with the goal of accelerating the recovery of the economy from the Covid-19 pandemic.

Based on these principles, the scenario that is examined in this paper is based on the following stages: (1) Increasing the structural deficit by about 2% of GDP in the years 2023–2024, without any change in taxation; (2) Reducing the size of the primary deficit relative to GDP starting in 2025 to a level of 1.5% by 2028, if necessary, by modifying tax rates. Based on the assumptions presented in the paper, this trajectory will lead to the following outcomes: an increase of about 0.5 percentage points in the growth of GDP as a result of the increase in public investment between 2025 and 2026 and an additional 0.3 percentage points approximately starting from 2027, as a result of higher productivity and a return to full employment (Figure 1).⁵ In parallel, the debt-to-GDP ratio will increase to about 73% in 2024 and will then decline starting in 2025 to about 66% in 2030.

Figure 1: Debt-to-GDP scenarios, 2021–2030



Source: Bank of Israel, Ministry of Finance and authors' calculations.

⁵ The scenario described is based on an optimistic estimate of the effect of public investment on growth. A calculation with a more conservative estimate of the increase in growth appears in Appendix IV.

According to this scenario, an increase in public investment in infrastructure financed by debt at a low interest rate will result in a real annual growth rate in GDP of about 4.5%, as compared to 3.2% in the Ministry of Finance scenario and 4.1% in the Bank of Israel scenario. It should be noted that the growth process in the Bank of Israel scenario adopts the revisions of Israel's growth figures by the Central Bureau of Statistics (CBS) in 2021,⁶ according to which average growth in Israel during the past ten years stood at about 4.2%, which is higher by about 0.5 percentage points than the previous series (3.7%).⁷ In contrast to the Bank of Israel, our main scenario adopts a more cautious position with respect to the basic growth rate of the Israeli economy and uses the estimates that preceded the CBS revision. Accordingly, the main scenario expects that in 2030, Israel's GDP (in 2020 prices) will be about NIS 2,138 billion which is 1% higher than that expected by the Bank of Israel and 10.5% higher than the Ministry of Finance scenario for that same year. **Had we adopted the CBS revised series for GDP and added 0.5 percentage points to the growth assumed in the main scenario, we would have concluded the 2030 GDP (in 2020 prices) would be about NIS 2,222 billion, which is 5% higher than that expected by the Bank of Israel and 15% higher than the Ministry of Finance scenario for that year.** In this case, the cumulative increase in interest payments between the recommended scenario and the Bank of Israel scenario is about NIS 11 billion. On the other hand, the addition to GDP totals about NIS 290 billion.

⁶ See Bank of Israel (2021), p. 19, which mentions that after the revision by the CBS of the GDP data for 1995 to 2020, which was published in August 2021, "the real rate of growth during the last 10 years was higher than previously reported by about 0.5 percentage points."

⁷ The CBS (2021), Statistical Abstract of Israel, Table 11.2

https://www.cbs.gov.il/he/publications/doclib/2021/11.shnatonnationalaccounts/st11_02x.pdf.

In our estimation, on the policy trajectory being discussed the debt service will not exceed that currently expected by the Bank of Israel. This is because the debt increase will be accompanied by a productivity hike and additional growth and therefore will not endanger the debt servicing following the temporary increase in the debt-to-GDP ratio. It should be noted that, even after its increase during the initial period, the debt-to-GDP ratio will not exceed 80%, which according to the S&P rating agency is the threshold for maintaining Israel's credit rating.⁸ Nonetheless, starting from 2025, there will be a need to consider modifying the tax system, with the following objectives: (a) a gradual return to a primary deficit of 1.5% in 2028; (b) avoiding an increase in the debt-to-GDP ratio beyond 80%, in order to maintain Israel's risk premium in the capital market; and, (c) exploiting the increase in growth to further reduce the debt burden if there is an increase in the global interest rate. The outcome of the scenario indicates that **as long as the cost of raising debt is low, a fiscal policy can be adopted that increases public investment in growth-oriented projects by about 2% of GDP to about 6% of GDP by 2030, without raising taxes or reducing public expenditure during the next three years and without endangering Israel's status in the global capital market. Raising taxes is likely to harm growth incentives, and reducing public expenditure will deteriorate services provided to the public.** The main finding from the scenarios is that when interest rates are significantly lower than the rate of growth, an increase in public investment without raising taxes increases GDP per capita and accordingly the tax burden is not increased.

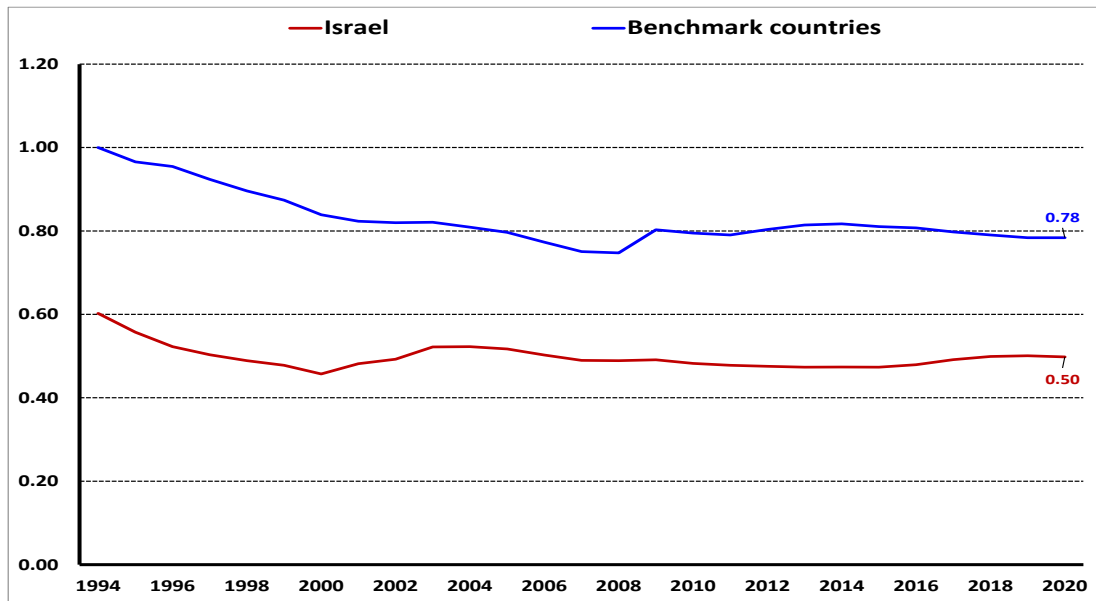
⁸ For the sake of comparison, the debt-to-GDP ratio in Austria rose from 89.1% in 2020 to 107.3% in 2021. In Denmark, it rose from 48.1% to 58.1%, in Finland from 69.9% to 82.1%, in Ireland from 68.8% to 71.6%, in the Netherlands from 62.3% to 69.8%, and in Sweden from 55.9% to 62.9%.

2. The low level of public capital in Israel and its effect on productivity and welfare

Total public capital consists primarily of public infrastructure, such as roads, seaports, and airports, as well as all components of the public transportation system. The stock of public capital is estimated based on the accumulated investment in infrastructure assets over time. According to accepted indices, the stock of public capital in Israel is significantly lower than in other comparable countries.

Figure 2 shows that, over time, the stock of public capital relative to GDP in Israel is consistently about 40% lower than in European countries of similar size but with a higher GDP per capita (the “benchmark countries”). This is a result of the fact that while the rate of investment in public capital relative to GDP in Israel tends to be similar to that of the benchmark countries (about 4%, Figure 3), Israel’s GDP grows at a significantly faster rate simply because its population growth rate is much higher. Accordingly, an investment rate of 4% of GDP is insufficient to close the gap. Moreover, the larger population requires greater investment in public capital in order to prevent a drop in **the level of public capital per capita** and a drop in productivity.

Figure 2: Public capital to GDP ratio, 1994–2020⁹

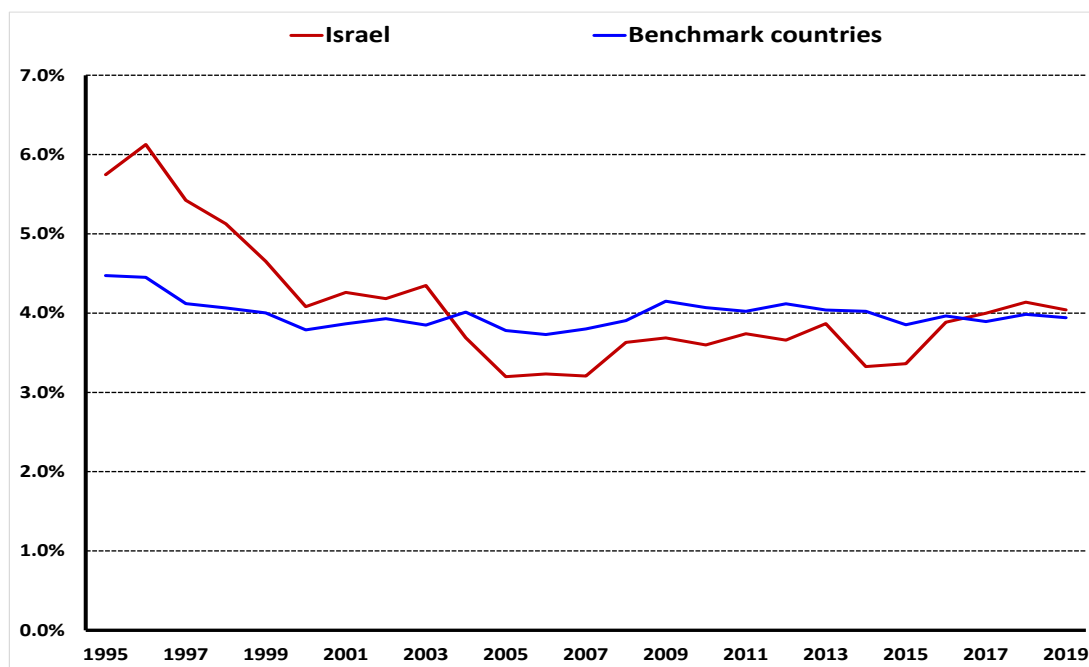


Benchmark countries: Austria, Denmark, Finland, the Netherlands, and Sweden.

Source: OECD (Government expenditure by function, Gross capital formation and investment grants); CBS.

⁹ Figure 2, which presents the ratio of public capital to GDP (denoted as κ_g in Appendix III), is constructed on the basis of the following assumptions: (a) a growth rate of nominal GDP in Israel of about 6.3%; (b) a growth rate of nominal GDP in the benchmark countries of 3.4%; (c) the public capital to-GDP ratio in 1994 was equal to 1 in the benchmark countries and 0.6 in Israel; (d) the annual rate of depreciation of public capital is 2%. The result is that in 2020, the ratio of public capital to GDP in the benchmark countries was 0.78 while in Israel it was only 0.50. Due to the low rate of depreciation, the result is dependent to some extent on the assumption regarding the ratio of public capital to GDP in 1994.

Figure 3: Gross investment and investment grants of the government sector as a percentage of GDP, 1995–2020¹⁰



Benchmark countries: Austria, Denmark, Finland, the Netherlands, and Sweden.

Source: OECD (Government expenditure by function, Gross capital formation and investment grants); CBS.

As noted, by the very nature of public capital, which serves the entire population, it is important to consider the per-capita stock, which is derived from the product of the ratio of public capital to GDP and GDP per capita. Eckstein and Lifshifz (2017) found that, in 2013, the stock of public capital per capita in the benchmark countries was double that of Israel. The aforementioned calculation, according to which the stock of public capital relative to GDP is 50% in Israel, raises the gap significantly. Taking into consideration that GDP per capita in Israel is about 75% of that in the benchmark countries, then public capital per capita in Israel is only about 37% of that in the benchmark countries.¹¹

¹⁰ The rate of investment in public capital (the coefficient σ_g in Appendix III) reflects both investment made directly by the government and capital transfers to companies in the business sector that are implementing public capital investments. OECD data make it possible to identify those two channels. The source of data for this series for Israel and the benchmark countries is OECD: government expenditure by function (COFOG), specifically gross capital formation and investment grants. The revised CBS series for gross public investment (including investment grants provided by the government sector) in Israel between 1995 and 2020 is similar to that in the OECD countries and on average is about 4% of GDP.

¹¹ See also Eckstein, Menahem-Carmi and Sumkin (2021) who estimate that the ratio of public capital per capita in Israel to that in the benchmark countries is 35%.

The severe shortage of public capital in Israel can be demonstrated by means of the transportation situation in Israel. The average investment per resident in public transportation infrastructure in Europe (\$15,000) is 7.5 times higher than that of Israel (\$2,000).¹² The number of vehicles per kilometer of road is 3.5 times that in the OECD countries and 4.3 times that in the benchmark countries (Austria, Denmark, Finland, the Netherlands, and Sweden).¹³ The proportion of trips by public transportation within total motorized trips in Israel (Tel Aviv) is only about 10%, which is about one-quarter of that in the developed countries.¹⁴ The mileage traveled in public transportation in Israel (Tel Aviv) is 50 km per resident, which is about one-half of that in major cities in the developed countries like Austria (Vienna), Denmark (Copenhagen), and Finland (Helsinki).¹⁵ Finally, the average speed of public transportation in Israel (Tel Aviv) is about 15 km/h, which is also half of that in developed countries like Austria (Vienna), Denmark (Copenhagen), and Finland (Helsinki).¹⁶ The disparity in between public transportation infrastructure in Israel relative to the benchmark countries alone is estimated to amount to at least NIS 250 billion.¹⁷ Without investment in transportation infrastructure, the disparity in public transportation infrastructure between Israel and the developed countries will grow substantially. For example, without investment in the Metro system in the Tel Aviv area, the disparity will grow by about NIS 100 billion by 2040.¹⁸ Accordingly, the elimination of the disparity between Israel and the benchmark countries in public capital per capita, in all its components, requires a massive investment of public capital. In particular, in order to eliminate the disparity within 15 years and on the assumption that real per-capita GDP will grow by 2.2% annually in Israel (the average rate of increase between 2010 and 2019) requires an annual increase in public per-capita capital of about 5%.¹⁹ This rate of growth requires in turn **an annual investment of 5%–6% of GDP in public capital**, at least in the initial years when the ratio of public capital to GDP will still be in the vicinity of 50%.²⁰ In the economic context, the improvement in public infrastructure to the level in the benchmark

¹² Sharav (2021), p. 3.

¹³ OECD (2020), p. 49; Sharav (2019), Part A, p. 10.

¹⁴ Sharav (2021), p. 4; Sharav (2019), Part A, p. 17.

¹⁵ Sharav (2019), Part A, p. 15; Ministry of Transportation (2012), p. 12.

¹⁶ Sharav (2019), Part A, p. 15; Ministry of Transportation (2012), p. 13.

¹⁷ Sharav (2019), Part A, p. 14.

¹⁸ Shiftan and Sharav (2020).

¹⁹ The calculation is based on a geometric increase of 1.072 over 15 years and multiplying the result by 0.37.

²⁰ On the assumption that the population grows at an annual rate of about 2%, then increasing public capital per capita by about 7% requires increasing public capital by about 9%. To this should an annual depreciation of public capital of about 2% should be added. If the ratio of capital to GDP is 0.5, then an investment of 5.5% of GDP is required in order to raise public capital per capita by 7.2%.

countries, and in particular in public transportation, will bring about a significant increase in productivity (OECD, 2020, Figure 1.26, p. 49).

In practice, there is currently a stock of plans for investment in infrastructure. Table 1 lists the investment projects in the national zoning plan for a passenger-dense transportation system at a detailed level of planning for Gush Dan (red, green, purple, and BRT light rail lines), Ashkelon, Ashdod, Netanya, Hadera, Haifa, and Jerusalem,²¹ with an overall value of at least NIS 176 billion (not including the cost of the Metro, which is estimated at about NIS 150 billion).²² Table 2 adds another NIS 102 billion in the areas of energy, security, water, ports, sewage, communication, construction, the environment, etc. **The implication of implementing these plans is an annual increase in public investment of about NIS 30 billion (about 2% of GDP) over the next 15 to 20 years.** About 45% of total public investment in these infrastructures is expected to be carried out by the private sector.

Table 1: Transportation infrastructure – list of public investment projects, 2021

Transportation infrastructure	Estimated costs (millions of NIS)	Average years of execution
Light rail	83,664	6.8
Heavy rail	49,307	6.3
Public transport routes	18,353	3.7
New roads	17,562	3.5
Interchange	2,487	3.0
High capacity buses (BRT)	2,201	4.3
Air transport: upgrading airport Infrastructure	1,092	4.8
Bike paths	850	4.0
Terminal	440	3.0
Total investment in transportation	175,956	4.1

Source: Prime Minister's Office (2021).

²¹ Missing is the development plan for Metropolitan Be'er Sheva.

²² Sharav (2019), Part C, p. 8 and part B, p. 2.

Table 2: Other infrastructure – list of public investment projects, 2021

Other infrastructure	Estimated costs (millions of NIS)	Average years of execution
Energy	30,783	3.2
Security	25,850	4.4
Water	19,001	6.8
Sea ports	7,805	5.3
Sewerage	6,509	3.4
Social infrastructure	5,607	5.6
Communication	3,000	7.0
Construction	2,850	3.7
Environment	907	4.0
Total investment - other infrastructure	102,312	4.4

Source: Prime Minister's Office (2021).

3. Public capital and economic growth

The function of public capital in economic growth has been studied in both empirical and theoretical contexts. Some of the empirical evidence is historical, such as the effect of developing the railroad infrastructure during the 19th century on economic growth in the US (Fogel, 1964). Other studies looked at more recent periods, such as Fernald (1999) who shows that development of the road system in the US in the 1950s and 1960s had an impact on productivity and growth. On the theoretical level, the literature examines the connection between public capital (or public capital per capita) on the one hand and GDP and growth on the other by including public capital as a factor that raises total productivity in the aggregate production function (a seminal work in this area was Baxter and King, 1993).

In quantitative estimations, the main parameter in the economic model is the elasticity of GDP with respect to public capital. Bom and Lighthart (2014) carried out a thorough survey of the literature on this parameter. According to their findings, and based on dozens of studies, the elasticity of GDP with respect to public capital was found to be 0.102. With regard to “core capital” (transportation, communication, electricity, water, and the like), the elasticity is even higher (0.170). Devadas and Pennings (2018), who are World Bank researchers, adopted these values in their calculations for all countries.

Ramey (2020) calibrated a general equilibrium model for the US, based on dynamic optimization of a representative household. She used an elasticity of 0.05, based on Baxter and King (1993), but also considered higher values, like those found by Bom and Lighthart (2014).²³ The modelling method facilitates a discussion of two important aspects of the issue. The first is positive and deals with the effect of public capital on GDP beyond its direct contribution according to the production function. A further contribution is the result of general equilibrium considerations. Due to the rates of substitution between the factors of production, raising the level of public capital increases the marginal productivity of both private capital and labor and therefore increases the accumulation of private capital and GDP. The second aspect, which is, of course, related to the first, is normative. The model makes it possible to characterize — in terms of the basic parameters of the representative consumer’s preferences and the basic parameters of technology — the optimal level of public capital relative to GDP and the optimal rate of public investment (see Appendix III).

²³ See also the 2017 revision of the paper:
https://ec.europa.eu/economy_finance/events/2017/20170124-ecfin-workshop/documents/presentation_bom_en.pdf.

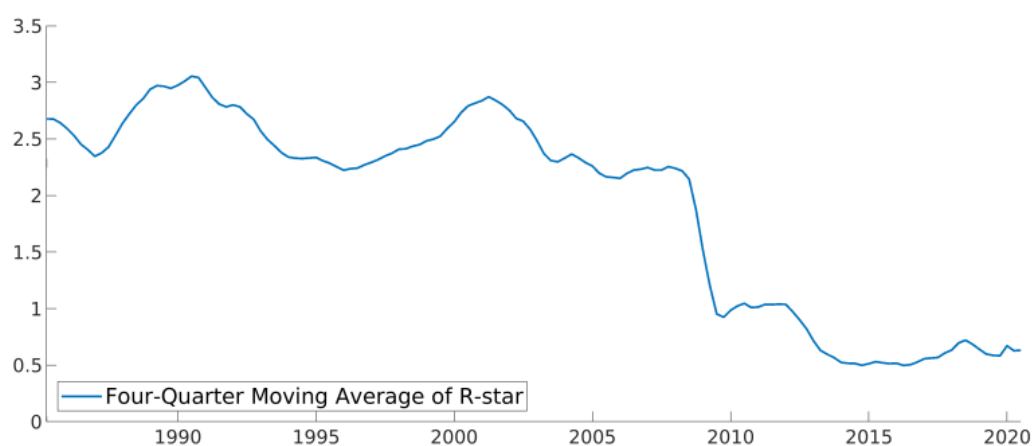
Our growth scenario is based on the model of an aggregate production function described in Appendix III. In particular, the model assumes that the public infrastructure enters the production function like total productivity and that increasing it is not at the expense of private investment. In order to quantitatively estimate the contribution of public investment to the growth in GDP in Israel, we adopt two values for the elasticity of GDP with respect to public capital (following Devadas and Pennings, 2018): 0.17 in the case of “core” public capital; and 0.10 in the case of total public capital. These values, which are higher than those of Ramey (2020), reflect the fact that the ratio of public capital to GDP in Israel is significantly lower than the average for the developed countries, specifically the US. These modifications are responsible for easing our estimate of the contribution of public investment to growth. According to the calculation in Appendix III, and given that the ratio of public capital to GDP in Israel is 0.5 (Figure 2), increasing public investment in core infrastructure by 2% will raise the rate of growth in GDP by 0.4 percentage points for the lowest value of the elasticity and by about 0.7 percentage points for the highest value of the elasticity, which appears to be more relevant due to the “core” nature of public investment in Israel.²⁴

²⁴ Devadas and Pennings (2018) estimate that additional investment of one percentage point of GDP in public capital raises the rate of growth in GDP by only 0.1–0.2 percentage points. Their calculations include additional parameters (such as the efficiency of public capital) and are based on the lower value of elasticity of GDP with respect to public capital.

4. The financing of investment and the debt burden at low interest rates

The book by Olivier Blanchard, one of the most important macroeconomists worldwide, will soon be published. The book, *Fiscal Policy Under Low Interest Rates* (Blanchard, 2022), is summarized in 45 points. The first 10 points relate to the decline in interest rates to historic lows in recent decades, as can be seen in Figure 4 and 5. The reasons for this have to do with long-term factors: longer life expectancy, reduced fertility and aging of the population, low growth in productivity, which forces individuals to increase their savings in order to finance future consumption, and higher demand for safe assets. The increase in income in countries with large populations, such as China and India, in turn increases saving worldwide. Accordingly, interest rates are expected to remain low for a long period (see also Bernanke, 2017). In particular, Blanchard's main point (point no. 10) is that **interest rates are lower than the rate of GDP growth ($g > r^*$)**.²⁵ Figure 5 illustrates the declining interest rates. The graph tracks the uninterrupted fall in the nominal return on US government bonds and the convergence of the returns on Israeli bonds those of the US following the drop in Israeli inflation. It is this trend in interest rates and the aforementioned long-term analysis that led central banks to make major revisions in their forecasts of the expected interest rate (Figure 4).

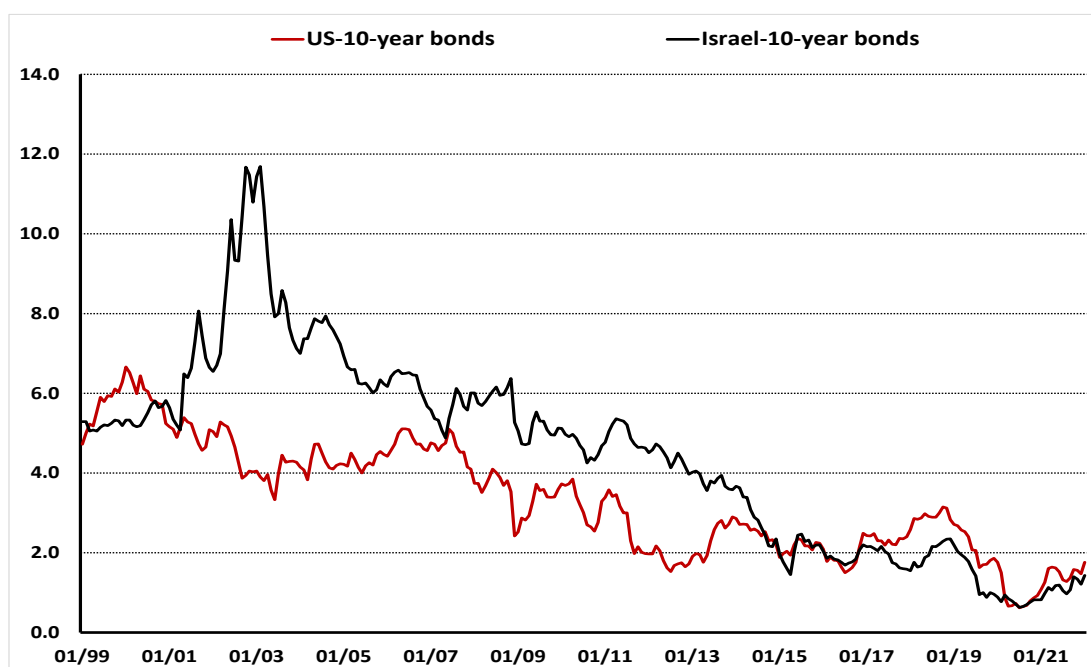
Figure 4: Fed forecasts of the expected real interest rate in the long term



Source: New York Federal Reserve Bank.

²⁵ This empirical fact raises theoretical difficulties that are related to the question of why individuals are prepared to hold assets with low returns. For a recent discussion, see Reis (2021).

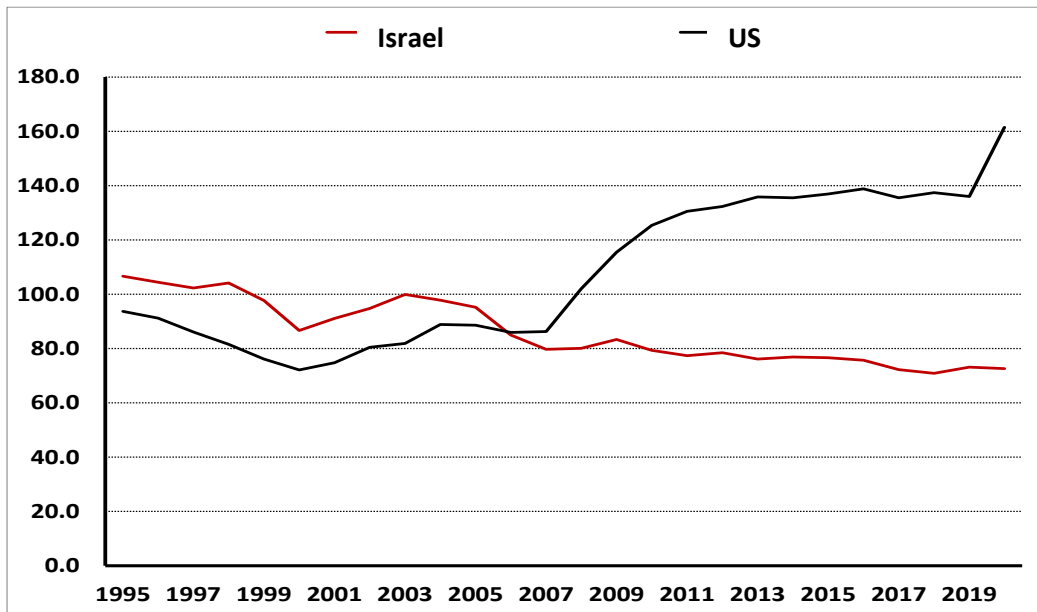
Figure 5: Nominal return on 10-year bonds, US vs Israel



Source: FRED, Israel: <https://fred.stlouisfed.org/series/IRLTLT01ILM156N>. US: <https://fred.stlouisfed.org/series/GS10>.

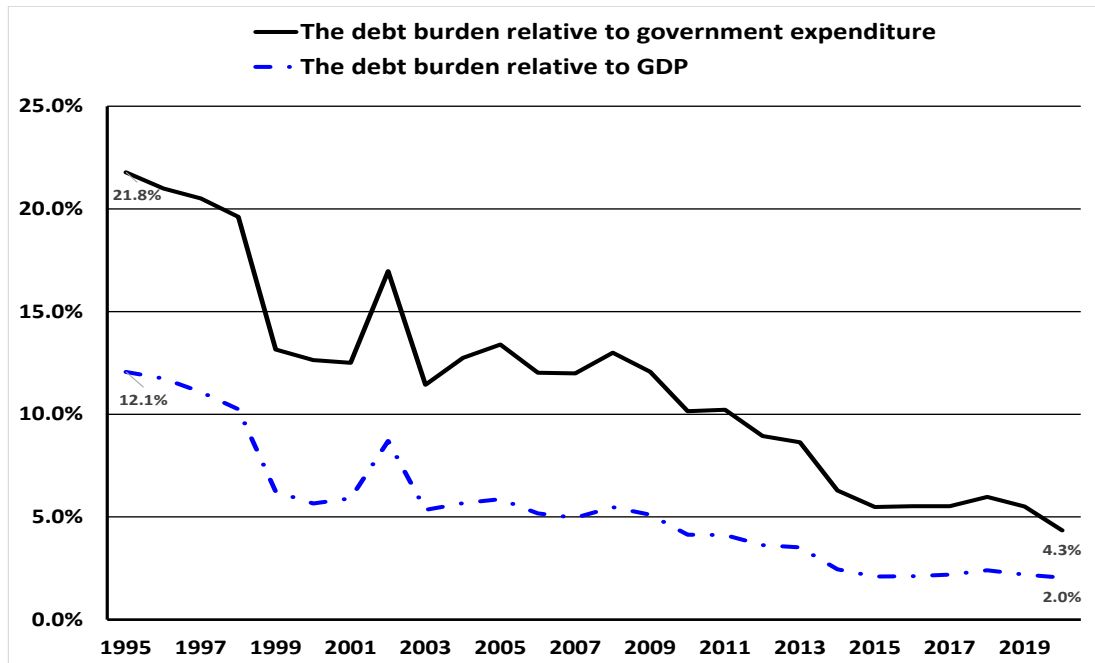
Blanchard's next points deal with sustaining the debt. Interest rates that are lower than the rate of growth in GDP allow for fiscal space (point 11) and in fact, in the developed countries in general and, particularly in the US, the interest rate has reached a historical low (Figure 5) despite the rise in the debt-to-GDP ratio (Figure 6). However, according to Blanchard, the variable that deserves attention is the **debt service relative to GDP**, or in other words, the cost of interest payments relative to GDP rather than the ratio of debt-to-GDP per se (point 16). In Israel, the debt service relative to GDP and relative to government expenditure has declined significantly as a result of the drop in interest rates, and, in 2020, it stood at 2.0% and 4.3%, respectively (Figure 7).

Figure 6: Debt-to-GDP ratio, the US and Israel, 1995–2020



Source: OECD, <https://data.oecd.org/interest/long-term-interest-rates.htm#indicator-chart> , <https://data.oecd.org/gga/general-government-debt.htm>.

Figure 7: The debt burden relative to GDP and to government expenditure in Israel, 1995–2000



Source: Bank of Israel and the authors' calculations.

Blanchard also directly relates to the issues dealt with in this section of the paper: Can low interest rates be exploited in order to finance growth-oriented investment by means of expanding the debt? The answer is, in his opinion, dependent on the degree to which growth also increases the government's tax revenues. Nonetheless, according to Blanchard, **the question of public investment should be separate from the question of financing it. As long as the return on that investment is higher than the rate of interest, it should be carried out** (points 17, 18 and 19).²⁶

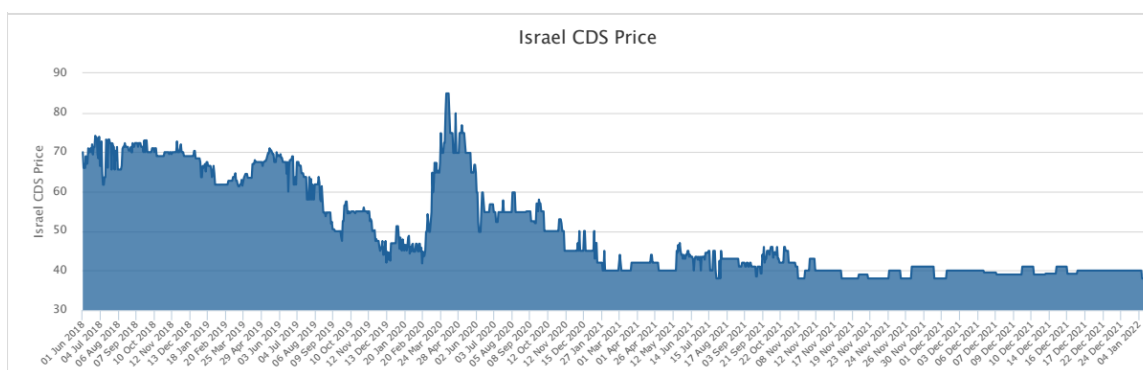
Also in his lecture to the American Economic Association, Blanchard (2019) claimed that the high US debt has no fiscal cost.²⁷ The claim is based on a straightforward intuition. In contrast to a private borrower who has a finite horizon, the horizon of a country practically infinite. Therefore, and unlike the case of the private borrower, countries need to service only the interest payments while the principal can be rolled over. Accordingly, for a given level of debt, as long as the interest rate is lower than the rate of growth in GDP, the interest payments on the debt do not require the imposition of additional taxes and therefore do not constitute a fiscal burden. Despite the broad consensus around the empirical facts, Blanchard's claim has led to a vociferous and critical discussion in the literature. For example, Brumm et al. (2021) expanded the discussion in Blanchard (2019) to an open economy and pointed out that expanding the debt has consequences even when the interest rate is low. van Wijnbergen, Olijslagers, and de Vette (2021) explicitly included the debt's risk premium in their calculations based on the claim that the existence of risk affects the pricing of assets and this changes the calculation. Barro (2020) also claims that as a result of the risk premium, which is due to extreme events, the risk-adjusted interest rate is higher than the economy's rate of growth. Blanchard (2022) also relates to the issue of risk (point 28).

²⁶ Most of the later points deal with the implications of fiscal and monetary policies that go beyond the scope of our paper.

²⁷ In 2019, the US debt stood at 108% of GDP. It rose to 127% in 2020 as a result of the Covid-19 pandemic.

In practice, it appears that, in the case of Israel, the adjustment to be made for risk is currently small. It is a fact that the insurance premium in the market for Israeli government bonds (the 5-year CDS) is also low in historical terms and currently stands at about 40 basis points (Figure 8). It appears that the capital market’s risk estimate for Israel is a result of the drop in the debt-to-GDP ratio to a level of about 60% prior to the pandemic, the stability in government expenditure at around 40% together with responsible budget management from 2003 to 2016 and apparently also the relative decline in geopolitical risk relative to previous periods.

Figure 8: Monthly 5-year CDS spread for the State of Israel, basis points, 2018–2022



Source: <https://www.assetmacro.com/israel/credit-default-swaps-cds/israel-cds>.

Accordingly, we assume below that, in the range that is relevant for the discussion, the interest rate on Israel’s debt will remain significantly lower than the rate of economic growth in the recommended scenario for the years 2023 to 2027. In particular, we assume that interest rates will remain low at least as long as the debt does not exceed 80% of GDP. As we will see, this constraint is met in all the scenarios that we examined.²⁸

²⁸ It is worth noting that in its survey of Israel the S&P rating agency mentioned that Israel’s threshold of risk is a debt-to-GDP ratio of 80%.

The dynamic of the debt's development is described in Appendix II. The trajectory of the debt-to-GDP ratio and the debt burden and their speed of convergence, is dependent on the government's fiscal policy (collection of taxes and reduction/expansion of government expenditure), the rate of nominal growth, the nominal interest rate, and the primary deficit.²⁹ According to Blanchard's points, as long as the nominal interest rate on the debt is significantly lower than the nominal rate of growth and **given a fixed level of the primary deficit relative to GDP**, the debt-to-GDP ratio and the debt burden converge. The time it takes to converge and in particular the debt-to-GDP ratio and debt burden to which the economy converges are also dependent on the primary deficit and its trajectory: high primary deficits lengthen the convergence and lead to a higher debt-to-GDP ratio and debt burden while low primary deficits shorten the convergence and lower ratios are achieved.

²⁹ The primary deficit is total government expenditure without interest payments on the public debt less total government revenue (taxes).

5. The Ministry of Finance and Bank of Israel scenarios for fiscal policy and growth trajectories

5.1 The Ministry of Finance’s multiyear budget plan for 2022 to 2025

At the end of July 2021, the Ministry of Finance published a multi-year budget plan for the years 2022 to 2025 which presented the trajectories for fiscal policy, the deficit-to-GDP ratio and the resulting debt-to-GDP ratio (Ministry of Finance, 2021b). According to the Ministry of Finance scenario, the fiscal policy trajectory was planned according to paragraph 40a of the Budget Principles Law (1985) which relates to a three-year budget plan. The plan paraphrases paragraph 6 and sets out a framework whereby “the government will not support by legislation, promote by way of regulation, contracts or any other commitments whose implementation involves an increase in government expenditure or a reduction in State revenues that will lead to a deviation from the fiscal frameworks set in the Frameworks Law, unless it takes compensatory measures that will constitute a budget source.” It is nonetheless important to mention that the expenditure constraints in paragraph 40a relate to the Deficit Reduction and Restrained Expenditure Law. This law was revised in 2018 for the 17th time, with the submission of the last budget that was approved before the that passed in November of 2021 by the new government.³⁰ The amendment included raising the permitted deficit in 2019 to 2023 relative to the previous trajectory, with an intended return to the deficit target of 1.5% of GDP in 2024 (Table 3).

According to the plan, the Ministry of Finance’s goal is to reduce the deficit-to-GDP ratio to about 3.4% in 2022, about 2.5% in 2023, about 2.0% in 2024, and about 1.7% in 2025 (with an average of 2.5% from 2022 onward).

Table 3: Ministry of Finance – The trajectory of the fiscal deficit (percent of GDP)

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Fiscal deficit	4.5	3.4	3.0	2.4	1.8	1.5	1.5	1.5	1.5	1.5

Source: Ministry of Finance.

³⁰ Even though all of the revisions to the deficit were upward and in 2018–2019 the deficit was at its highest, the debt-to-GDP ratio continued to decline. The growth in the deficit during these years was not a result of an increase in infrastructure investment but rather and primarily transfer payments to selected populations.

Accordingly, the debt-to-GDP ratio will decline from about 70% in 2021 to about 60% in 2030.

In order to meet the deficit target, the Ministry of Finance suggests the following “convergence measures:”

- **Convergence measures on the expenditure side:** such as reducing civilian or defense expenditure.
- **Convergence measures on the revenue side:** such as cancelation of tax exemptions, raising tax rates, imposition of taxes on products with negative externalities, and also expanding the tax base by closing tax loopholes.

Furthermore, the Ministry of Finance is warning that in coming years an increase is expected in interest payments relative to previous years, as a result of the effects of the Covid-19 pandemic and the need to raise large sums of money in order to compensate for the drop in revenues and to allow for the budget expenditure and economic programs to deal with the pandemic.

These convergence measures will lead to a reduction in government expenditure of about NIS 15.7 billion in 2021, about NIS 25.8 billion in 2022, about NIS 29.8 billion in 2023, about NIS 29.1 billion in 2024, and about NIS 21.4 billion in 2025.

The implementation of contractionary convergence measures affects the level of the government budget and the level of public investment. Thus, according to the Ministry of Finance plan, following the increase in the level of government expenditure on infrastructure from 1.9% of GDP in 2019 to 2.9% in 2022, starting from 2022 it will remain relatively unchanged in monetary terms — at about NIS 47 billion.³¹ Since according to the plan nominal GDP is expected to grow at an average rate of about 5.6% between 2021 and 2025, **the public expenditure on infrastructure relative to GDP will decline** from about 2.9% in 2022 to about 2.6% in 2025 (Table 4).

³¹ The ministries and authorities included in the infrastructure category are the Ministry of Energy, the Ministry of Transport and Road Safety, the Government Water and Sewage Authority, and the Ministry of Construction and Housing.

Table 4: The forecasts for growth, inflation, the government deficit, the debt-to-GDP ratio, and government expenditure on infrastructure

Variable	2021	2022	2023	2024	2025
Total government liabilities (billion NIS)	429.1	450.1	473.2	489.8	504.3
Convergence measures (billion NIS)	15.7	25.8	29.8	29.1	21.4
Government expenditures on infrastructure, percentages of GDP	2.9	2.9	3.0	2.7	2.6
Fiscal deficit to-GDP ratio (with convergence measures)	4.5	3.4	3.0	2.4	1.8
Debt-to-GDP ratio (with convergence measures)	70.0	69.1	68.7	68.1	66.7
Nominal GDP growth	6.6	6.5	5.2	4.7	5.0
Real GDP growth	5.1	4.7	3.4	3.2	3.2
Inflation	1.4	1.5	1.8	2.0	2.0

In 2019, government expenditure on infrastructure was NIS 27.4 billion, which constituted about 1.9% of GDP.

Source: Ministry of Finance.

We estimate that between 2026 and 2030, total public investment in infrastructure will be 3.2% of GDP, consisting of about 2.6% current investments and another 0.5% of GDP (NIS 7.5 billion per year for 20 years) for investment in the Metro project that will begin in 2025 and will be spread out over 20 years (Table 5). Together with public investment carried out by the private sector, which accounts for about 0.7% of GDP, the result is that total public investment including infrastructure will continue to be lower than 4% of GDP between 2026 and 2030.³²

³² Between 2010 and 2020, support for investment carried out by the private sector totaled about 0.7% of GDP.

Table 5: Direct public investment in infrastructure (percent of GDP)

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Public investment in infrastructure (percent of GDP)	2.9%	2.9%	3.0%	2.7%	2.6%	3.2%	3.2%	3.2%	3.2%	3.2%

Source: Ministry of Finance and Government Decision 200
https://www.gov.il/he/departments/policies/dec200_2021.

5.2 The Bank of Israel plan for accelerating economic growth

As in the case of this paper, the Bank of Israel is recommending that the government increase public investment in order to finance programs improving the education system, incentives to invest in physical capital, improvement in transportation and communication infrastructure, and improvement of the business environment, in parallel to reducing the structural deficit. According to the Bank of Israel recommendations, the increase will reach a level of 3% of GDP in 2030, where two-thirds of it will be channeled to physical infrastructure (Table 6).

Table 6: Trajectory of the increase in public investment (percent of GDP)

Year	2023	2024	2025	2026	2027	2028	2029	2030
Trajectory of the increase in public investment (percent of GDP)	0.4	0.8	1.1	1.5	1.9	2.3	2.6	3.0

Source: Bank of Israel.

In the Bank of Israel model, the increase in public investment has an effect, albeit indirect, on the growth in GDP. According to the model's assumptions, the investment will improve the infrastructure in terms of congestion on the roads and thus will raise total productivity in the economy. The quantitative estimation is dependent on the degree to which public investment affects the index of transportation infrastructure quality on the one hand and the intensity of the connection between the index of transportation infrastructure quality and total productivity on the other (Argov and Tsur, 2019a, 2019b).

The Bank of Israel recommends a gradual increase in public expenditure over a period of about 8 years. It examined a number of alternatives for the financing of fiscal measures and their effect on the deficit and debt-to-GDP ratio — with and without the structural deficit. Note that after the revision of the rate of growth by the CBS in 2021, the Bank of Israel raised its growth estimates (unrelated to public investment) by 0.5 percentage points per year.³³ The growth estimates that appear in Table 7 include this addition starting from 2023.

Table 7: Bank of Israel, policy alternatives — mix of financing of public investment, the government deficit, the debt-to-GDP ratio, growth forecasts, and inflation

mix of financing of public investment	Variable	2021	2022	2023	2024	2025	2030
Financing 1/3 through increasing the deficit	Fiscal deficit to-GDP ratio	4.5	3.6	3.5	3.5	3.5	3.7
	debt-to-GDP ratio	69.2	68.9	68.8	68.3	68.4	68.7
Financing without increasing the deficit	Fiscal deficit to-GDP ratio	4.5	3.6	3.4	3.2	3.1	2.6
	debt-to-GDP ratio	69.2	68.9	68.7	68.0	67.7	64.6
	Nominal GDP growth	8.0	7.3	6.5	6.0	5.8	6.1
	Real GDP growth	6.5	5.5	4.7	4.5	4.0	4.1
	Inflation	1.5	1.8	1.8	1.5	1.8	2.0

Source: Bank of Israel.

According to the Bank of Israel scenarios, the gradual increase in public investment starting in 2023 up to 3% of GDP in 2030 according to the trajectory in Table 6 will result in a debt-to-GDP ratio of about 68% in 2025 and about 65–69% of GDP in 2030, depending on the method of financing the debt.

³³ See Bank of Israel (2021), p. 19, and footnote 6 above.

6. The main scenario

6.1 Historical background: the deficit, the national debt, and growth

In order to provide the historical background, we present the data for Israel's debt-to-GDP ratio, the burden of interest payments, the primary deficit, the nominal interest rate, and nominal growth in recent years.

Israel's debt-to-GDP ratio in 2019 reached a historic low of about 60% (Table 8). In 2020, the ratio increased by about 12.6 percentage points relative to 2019, as a result of the fiscal expansion to deal with the Covid-19 pandemic and also the relatively high deficit in the 2018–2020 budget. In 2021, the debt-to-GDP ratio was about 70%.

Israel's **fiscal deficit** (the difference between government expenditure and government revenues) stood at 4.5% of GDP in 2019. It rose to about 11.8% in 2020 and fell to 4.5% of GDP in 2021.

Moving from the fiscal deficit to the primary deficit requires **two** adjustments. The first is definitional: the fiscal deficit includes the burden of the debt's interest payments while the primary deficit does not. The second is more fundamental and stems from the interest paid by the Israeli government to pension funds on designated bonds. This interest is paid at a higher rate than the market's and therefore the difference constitutes a subsidy. We categorize that implicit subsidy as current public expenditure, as is the case for other forms of support (Table 8), rather than as part of the interest burden on the national debt. Altogether:

The **burden of interest payments** has been on a downward trend as a result of the declining cost of raising capital. In 2019, the debt service amounted to about 2.2% of GDP. It fell to about 2.0% of GDP in 2020 despite the dramatic rise in the debt (Table 8). In 2021, the debt service constituted about 2.3% of GDP.

The **pension subsidy** rose from about 0.5% of GDP in 2017 to about 0.7% of GDP in 2020 (the weight of pension subsidies within total interest payments rose from about 55% in 2016 to about 76% in 2020).³⁴ Taking this into account, the adjusted primary deficit is obtained.

The **primary deficit** relative to GDP has been on a downward trend since the early 2000s as a result of the falling interest rate. In 2019, the primary deficit amounted to about 3.5% of GDP. It rose to about 11.2% of GDP in 2020 and fell to about 3.4% of GDP in 2021 (Table 8).

³⁴ See Ministry of Finance (2021a).

The average **nominal interest rate**, which reflects Israel's nominal cost of raising capital, stood at about 1.5% in 2019. Despite the dramatic increase in the debt-to-GDP ratio in 2020, the total nominal interest rate paid on the debt that year fell to its lowest level in recent years (about 0.8%). In 2021, the nominal interest rate stood at about 1.2% (Table 8).

Nominal (real) growth of GDP in Israel was about 5.5% (4.2%) between 2010 and 2019.³⁵ In 2020, nominal (real) growth of GDP in Israel was -1.2% (-2.2%) (Table 8).

Table 8: The debt-to-GDP ratio and its components

Variable	2017	2018	2019	2020	2021 ³⁶
Debt-to-GDP ratio	60.6	60.9	60.0	72.6	69.0
Fiscal deficit to-GDP ratio	2.1	4.3	4.5	11.8	4.5
Debt burden to GDP ratio	2.2	2.4	2.2	2.0	2.3
Out of this:					
Debt burden to GDP without pension subsidy ratio	1.7	1.9	1.6	1.4	1.7
Pension subsidy to GDP ratio	0.5	0.5	0.6	0.7	0.6
Primary deficit to GDP ratio	-0.1	1.8	2.3	9.8	2.2
Primary deficit with pension subsidy to GDP ratio	0.9	2.9	3.5	11.2	3.4
Average nominal interest rate	1.9	2.0	1.5	0.8	1.2
Nominal GDP growth	4.4	4.9	5.7	-1.2	9.5

Source: Bank of Israel and authors' calculations.

³⁵ According to the revised data of the CBS.

³⁶ Bank of Israel (2022).

6.2 The growth trajectory

We examined two scenarios for the effect of increased investment on growth. In both of them, public investment raised the level of public capital without reducing private capital.³⁷ In the conservative scenario, we assumed that additional public investment of 2% of GDP will increase the rate of growth in GDP by 0.5 percentage points beginning in 2025.³⁸ In the main scenario, which is presented below, we assumed that an increase in public investment by 2% of GDP will be accompanied by additional measures to support growth, including a reduction in the regulatory burden and bureaucratic costs, increased efficiency and quantity of vocational training, etc., causing the GDP growth rate to increase by 0.8 percentage points starting in 2027.³⁹ We assume that the increased public investment by 2% of GDP will begin in 2023, but its effect on the GDP growth rate will occur with a lag of two years and only gradually: an increase of 0.5 percentage points in 2025–2026 and 0.8 percentage points from 2027 onward.⁴⁰ In contrast to the Bank of Israel, we adopted a more cautious approach to the “basic” rate of economic growth. In particular, our starting point with regard to the rate of growth without additional investment in public capital **does not include** the CBS revision of the National Accounts for the previous decade. To sum, our assumptions in the main scenario are as follows.

Assumptions regarding the trajectory of nominal growth for 2021 to 2030:

- For the years 2021 and 2022, we adopt the Bank of Israel assumptions, according to which nominal growth is about 8.0% in 2021 and about 7.3% in 2022.
- For the years 2023 and 2024, we assume that nominal growth will be about 5.5% in 2023 and about 5.2% in 2024. These growth rates are calculated according to long-term trends of real growth in Israel (2000 to 2019) — 3.7% prior to the CBS revision, with the addition of the Bank of Israel’s expected inflation: 1.8% in 2023 and 1.5% in 2024.
- With regard to the years 2025–2026, we assume that as a result of the 2% of GDP increase in public investment during the previous two years, real growth will increase by about 0.5 percentage points.

³⁷ Such a scenario essentially assumes that public capital is imported and does not compete with the resources channeled to increasing private capital.

³⁸ Appendix IV lists the assumptions regarding the trajectory of growth in the conservative scenario. The assumption regarding the primary deficit trajectory and the interest rate trajectory are identical in the two scenarios, i.e., the main scenario and the conservative scenario.

³⁹ Transportation, energy, and digitization infrastructure. The assimilation of advanced technologies in the interface between the public sector and the business sector (ICT public capital of the Public Administration Branch). For further details see Eckstein, Menahem-Carmi and Sumkin (2021).

⁴⁰ Based on the assumption that the elasticity of GDP with respect to public capital is 0.17, the upper value of Devadas and Pennings (2018) for the elasticity of GDP with respect to public capital.

- With regards to the years 2027–2030, we assume that real growth will rise by about an additional 0.3 percentage points as a result of the increase in productivity and the return of the economy to full employment (an outcome of reducing the regulatory burden and bureaucratic cost, increasing the efficiency and quantity of vocational training, etc.).

Table 9 presents the trajectory of real growth, the expected inflation and nominal growth in the main scenario that we consider.⁴¹

Table 9: The main scenario — forecasted real and nominal growth and inflation

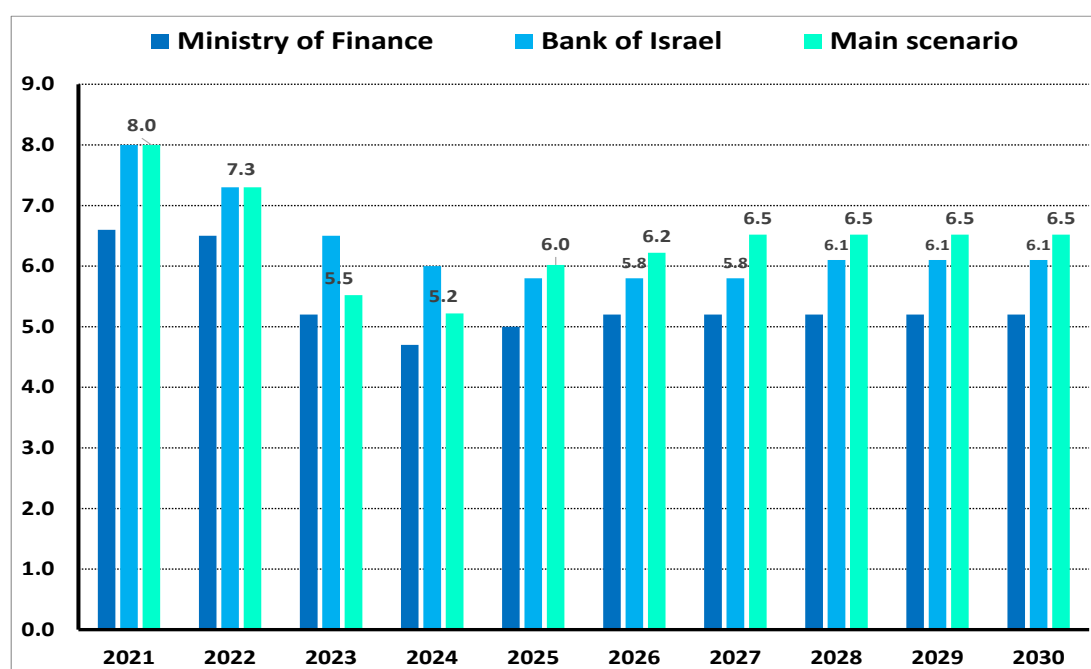
Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Real GDP growth	6.5	5.5	3.7	3.7	4.2	4.2	4.5	4.5	4.5	4.5
Inflation	1.5	1.8	1.8	1.5	1.8	2.0	2.0	2.0	2.0	2.0
Nominal GDP growth	8.0	7.3	5.5	5.2	6.0	6.2	6.5	6.5	6.5	6.5

Source: Bank of Israel, Ministry of Finance and authors' calculations.

Relative to the projections of the Bank of Israel and the Ministry of Finance, our projection for nominal economic growth between 2027 and 2030 is higher as a result of the direct effect of the increased public investment on GDP growth (Figure 9).

⁴¹ Appendix IV lists the assumptions regarding the trajectory of growth in the conservative scenario. The assumption regarding the primary deficit trajectory and the interest rate trajectory are identical in the two scenarios, i.e., the main scenario and the conservative scenario.

Figure 9: Forecast of nominal growth, 2021–2030



Source: Bank of Israel, Ministry of Finance and authors' calculations.

6.3 The trajectory of the nominal interest rate

The average nominal interest rate, which reflects Israel's nominal cost of raising capital, stood at 1.5% in 2019. Despite the dramatic rise in the debt-to-GDP ratio in 2020, nominal interest paid on the debt in that year fell to its lowest level in recent years (about 0.8%).

We assume that between 2021 and 2030, the nominal interest rate on the debt will be 1.7%–2.0%, according to the Bank of Israel estimates, as a result of the drop in the debt-to-GDP ratio starting in 2026 and the macroeconomic conditions in Israel and worldwide.

Table 10: The main scenario — the forecasted nominal interest rate

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Forecasted nominal interest rate	1.3	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.9	2.0

Source: Bank of Israel.

6.4 The trajectory of the fiscal deficit and the primary deficit⁴²

In the scenario, we assume that the adjustment of the tax system in order to achieve the deficit target will be carried out, if necessary, beginning in 2025.⁴³ The need to carry out such an adjustment depends on the size of the tax revenues that result from the accelerated growth and also from the additional adjustments that will be made to tax policies between 2022 and 2024. We also assume that:

- Between 2023 and 2024, the fiscal deficit will be 2% of GDP higher than in the Bank of Israel scenario, and no expenditure reductions or tax increases will be undertaken.⁴⁴
- Starting in 2025, there will be a gradual return to a fiscal deficit of 2.5% of GDP in 2028. The tax system will be adjusted as needed. It should be remembered that increasing GDP by 1% each year will also raise tax revenues by about 1% of GDP.

Table 11: The main scenario — the trajectory of the fiscal and primary deficits

Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Fiscal deficit to-GDP ratio	4.5	3.6	5.5	5.5	3.5	3.5	3.5	2.5	2.5	2.5
Primary deficit to-GDP ratio	3.2	2.5	4.4	4.4	2.5	2.5	2.5	1.5	1.5	1.5

Bank of Israel's estimate of interest payments — about 2.2%; pension subsidy — about 1%. The primary deficit (including pension subsidy) is obtained as the fiscal deficit less interest payments plus pension subsidy.

Source: Bank of Israel and authors' calculations.

⁴² Appendix I presents the forecast for 2021 through 2030 for the primary deficit.

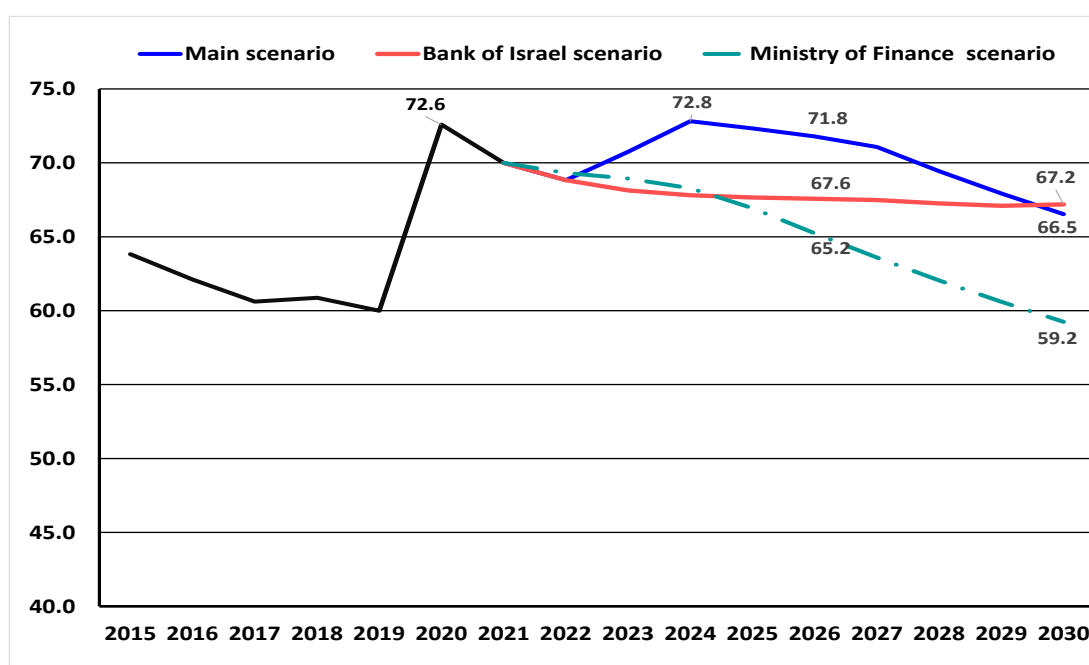
⁴³ We assume that tax adjustments will not have any significant negative effect on growth. This is an optimistic assumption but a reasonable one if most of the adjustments focus on the various exemptions, on pro-environmental taxes, the expansion of the tax base and a small increase in VAT.

⁴⁴ Civilian expenditure in Israel is lower than in the OECD countries. Accordingly, it is not desirable to reduce it further as a source of financing for public investment.

6.5 Results of the main scenario

Figure 10 presents the debt-to-GDP ratio in the main scenario relative to the Bank of Israel and Ministry of Finance scenarios. According to the main scenario, a fiscal policy that raises public investment by about 2% of GDP, to about 6% of GDP by 2030 in growth-oriented projects, **without raising taxes during the next three years** and without reducing expenditure, will keep a debt-to-GDP ratio below 75%, which is well under the threshold of 85% which we consider to be dangerous. More precisely, **the debt-to-GDP ratio in the main scenario will reach about 73% in 2024** and in 2025 will start declining to about 66% in 2030.⁴⁵

Figure 10: Debt-to-GDP ratio scenarios, 2021–2030



Source: Authors' calculations.

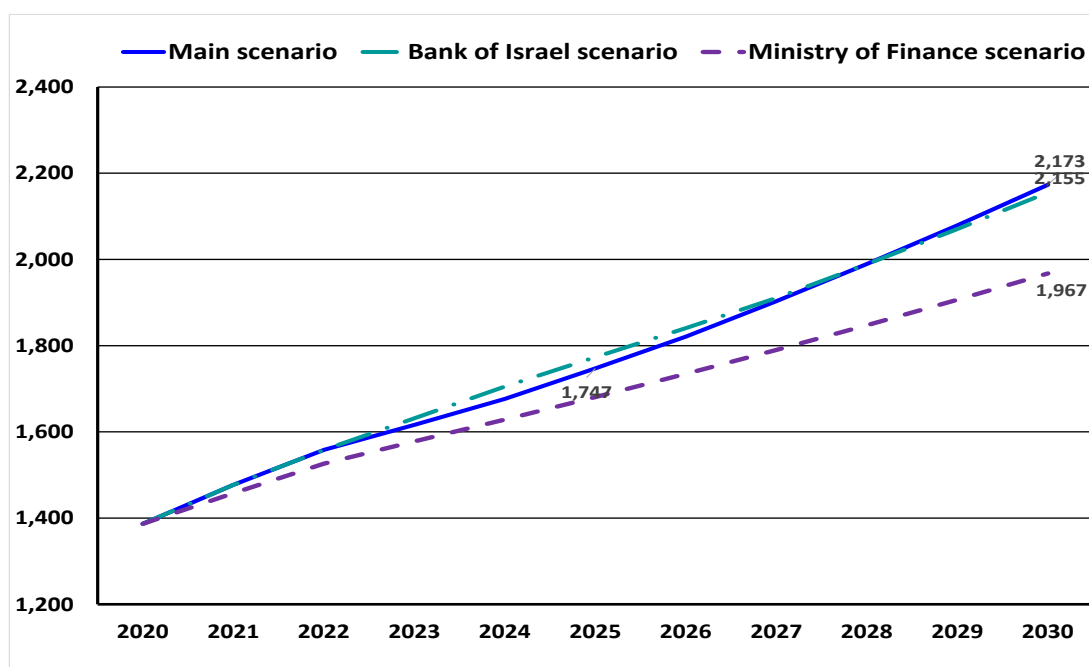
⁴⁵ If about 45% of public investment in infrastructure is carried out by the private sector, then the path of the debt-to-GDP ratio will be lower than in the main scenario, reaching about 69% in 2024 and dropping to about 61% between 2025 and 2030.

The path of the debt-to-GDP ratio indicates that in 2024 it will be somewhat higher in the main scenario than in the Ministry of Finance scenario (67%) and the Bank of Israel scenario (68%). The Ministry of Finance scenario relies on the (more extreme) assumption that starting in 2026 Israel's fiscal deficit will be 1.5% of GDP. As mentioned, achieving the low debt-to-GDP ratio involves significant policy measures: enlarging the tax base, reducing public investment in terms of GDP from about 2.9% of GDP in 2022 to about 2.6% in 2025, and a smaller increase in public investment to finance sustainable growth-oriented projects. As a result, the Ministry of Finance's forecast of GDP growth for 2025 to 2030 is about 3.2% lower than that in the main scenario.

In the Bank of Israel scenario, a gradual increase in public investment beginning in 2023 to a level of 3% of GDP will bring about lower real growth in GDP than in our scenario. In contrast to the Ministry of Finance and Bank of Israel scenarios, **our scenario recommends making the necessary investment already in 2023 without raising taxes until 2025; its advantage is that it exploits the period of low interest rates in order to create the foundation for higher growth from 2026 onward.** In 2030, the debt-to-GDP ratio in the main scenario (66.5%) is similar to that in the Bank of Israel scenario (67.2%), where the investment in infrastructure based on debt will contribute to higher growth, namely about 4.5% real growth starting in 2027 as opposed to 3.2% in the Ministry of Finance scenario and about 4.1% in the Bank of Israel scenario. It should be recalled that as a result of the CBS revision, the average growth that is assumed by the Bank of Israel is 0.5 percentage points higher than that underlying the main scenario, in which conservatively the CBS revision was not taken into account. **As a result, according to the main scenario, GDP in 2030 will be higher by 1% (NIS 17 billion) relative to that expected by the Bank of Israel. At the same time, the debt burden (interest payments) in the main scenario is close to that in the Bank of Israel scenario and in 2030 will only be 1.3% of GDP** (Figure 11).

If we were to adopt the updated series of the CBS for GDP growth and add 0.5 percentage points to the basic growth in the main scenario, we would accept that in 2030 the GDP (at 2020 prices) would be about NIS 2,222 billion and **would be higher by 5% (NIS 101 billion) relative to that expected by the Bank of Israel.** In this case, the cumulative increase in interest payments between the main scenario and that of the Bank of Israel is about 11 billion NIS. Compared to this increase, the increase in GDP is about 290 billion NIS.

Figure 11: Forecasted GDP for 2021–2030, in billions of NIS, 2020 prices



Source: Bank of Israel, Ministry of Finance and authors' calculations.

6.6 Sensitivity Tests

We carried out two sensitivity tests of the main scenario's assumptions. The first eliminates the effect of public investment on growth while the second raises the nominal interest rate by 2 percentage points.

In the first sensitivity test, the real rate of growth will be 3.7% between 2023 and 2030 while the debt-to-GDP ratio will rise by about 0.6 percentage points in 2026 relative to the results of the main scenario and in 2030 by about 2.5 percentage points.

In the second, the interest rate will rise by 1 percentage point between 2022 and 2025 beyond the assumptions of the main scenario and by 2 percentage points between 2026 and 2030, but the increase in public investment will raise growth as in the scenario. Consequently, the debt-to-GDP ratio will rise by about 2 percentage points (to about 75%) in 2024 and by about 9 percentage points (to about 75%) in 2030.⁴⁶

⁴⁶ The global interest risk is rising as a result of the high rate of inflation in the developed countries, particularly the US. Furthermore, Israel faces unique geopolitical risk. These risks affect the "tail" of the distribution and are difficult to estimate.

The results point to a low level of risk that the debt-to-GDP ratio will rise to levels that will provoke a response by the global capital market and a lowering of Israel's credit rating. Furthermore, the government certainly has the ability to use taxation in order to make adjustments if it turns out that the assumptions of the scenario are overly optimistic.

In the opposite direction, the scenario that was examined assumes that the financing of the additional investment in public capital will originate completely from the State budget. However, it appears that, in reality, about 45% of public investment in infrastructure is carried out by the private sector as part of public-private partnerships (PPP). **Under this assumption, the path of the debt-to-GDP ratio will be lower than in the main scenario, reaching about 69% in 2024 and falling from 2025 onward to about 61% in 2030. Accordingly, the risk implicit in raising public investment falls to a significant extent.**

7. Conclusion

This policy paper is based primarily on two of the points in Blanchard (2022) that were noted previously concerning fiscal policy in an era of low interest rates (points 11 and 17):

The fact that $r < g$ has important implications for debt dynamics. Put simply, it gives countries more fiscal space. They can run (some) primary deficits and keep their debt ratios (the ratio of debt-to-GDP) constant, or even decrease them.

Public investment spending, to the extent that it generates future increases in fiscal revenues, can be partly financed by debt without threatening debt sustainability, something that any rule should reflect. Too often, the application of simple rules has led to inefficient cuts in public investment.

These comments relate to all developed countries and first and foremost the US.⁴⁷ They are even more applicable to Israel for two main reasons: (a) the Israeli economy's rate of growth is significantly higher than that of other developed countries; (b) the level of infrastructure in Israel is substantially lower than in the other developed countries, and, in the absence of massive investment in public infrastructure, the rapid growth of the population widens the gap even further. These two factors are complementary: the high growth rate and the low interest rate significantly reduce the risk that the debt-to-GDP ratio, together with the debt burden, will increase, while investment in infrastructure will produce a high return in terms of productivity and acceleration of economic growth. A necessary condition for reducing the risk is the maintenance of a low ratio of the primary-deficit-to-GDP. The calculations we carried out reflect these two facts. **Accordingly, we recommend increasing public investment already in the coming year by 2% of GDP and finance the increase by enlarging the national debt. We also recommend returning the level of the primary deficit to 1.5% of GDP within a few years in order to facilitate a reduction in the debt-to-GDP ratio to about 65% at the end of the decade.** As a byproduct of the proposed policy, the increased investment will lead to increased import of capital goods and thus will create a counterweight against forces that are working to strengthen the shekel.⁴⁸

⁴⁷ The gap between the rate of growth and the interest rate in the US is significantly smaller than in Israel and it may be that the path which the US economy is on is not sustainable in the long run. For further details, see Eichenbaum (2021).

⁴⁸ In this context, the preference given to domestically produced products and the offset purchases that are required in the case of investment by the public sector should be cancelled.

Despite the objectively low risk implicit in raising the debt in a low-interest environment, there are risks originating from the expectation-generating mechanism. As shown in the theoretical literature, a situation in which the interest rate is lower than the rate of economic growth will allow, at least in theory, for the creation of a “rational bubble” in which an asset without intrinsic value (such as currency) is nonetheless traded at a positive price.⁴⁹ Alongside such a situation, which can support an efficient equilibrium, there are cyclical and chaotic equilibrium paths, as well as those with “sunspots” (events that have no economic significance that can nonetheless affect equilibrium since the market believes that they do). These paths represent instability in the economic system and may lead to major crises. These theoretical results represent a warning light for policy makers and require constant monitoring of developments in the financial market. In particular, there is a need to identify developments in which asset prices seem to depart from their fundamentals. If that situation is identified, policy makers can take preventative measures, such as raising the short-term interest rate. Nonetheless, the existence of such a price bubble cannot always be identified which is a potential source of systemic risk.⁵⁰

Finally, we are of course aware of the concern expressed both inside and outside the government bureaucracy that allowing the deficit to be increased will lead to an increase in expenditure that is not growth-oriented and does not raise productivity. Obviously, we oppose such a development. Accordingly, it appears that the adoption of a policy to increase the debt and the expenditure ceiling needs to be accompanied by measures that will ensure the use of these resources for the purpose of investment in infrastructure only and will prevent the exploitation of the capital raised for other purposes. It is possible to create mechanisms that will “ earmark ” the resources and will permit their allocation only to growth-oriented infrastructure projects. If such mechanisms are put in place, then faith in Israel’s fiscal resilience will not be harmed. Moreover, in case of abuse, the reaction of the market to the wasteful use of resources will be quick and unambiguous. This threat itself is enough to impose discipline.

⁴⁹ Blanchard (1979) coined the term “rational bubble.”

⁵⁰ See Chapter 5 of the book by Blanchard and Fisher (1989). We thank Prof. Danny Tsiddon who brought this point to our attention.

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Appendix I: The forecast for growth, the deficit, the interest rate and inflation — the Aaron Institute, Bank of Israel, and the Ministry of Finance

Table A1: The forecast for real and nominal growth and the fiscal and primary deficits

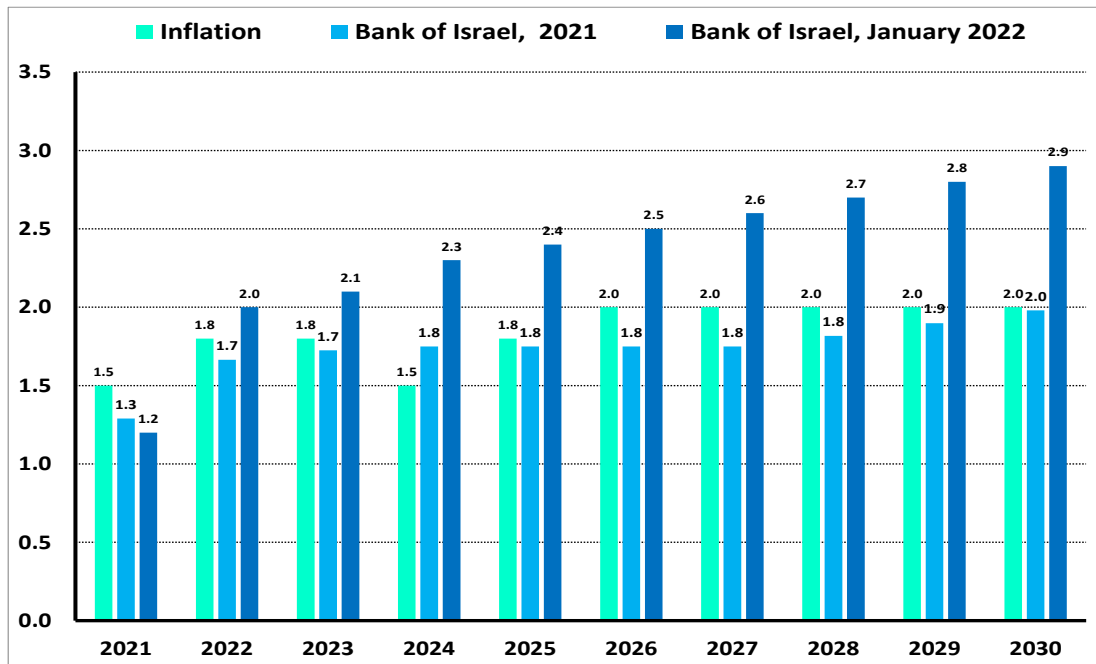
Year	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	Real Growth									
Aaron Institute	6.5	5.5	3.7	3.7	4.2	4.2	4.5	4.5	4.5	4.5
Bank of Israel	6.5	5.5	4.7	4.5	4.0	3.8	3.8	4.1	4.1	4.1
Ministry of Finance	5.1	4.7	3.4	3.2	3.2	3.2	3.2	3.2	3.2	3.2
	Nominal Growth									
Aaron Institute	8.0	7.3	5.5	5.2	6.0	6.2	6.5	6.5	6.5	6.5
Bank of Israel	8.0	7.3	6.5	6.0	5.8	5.8	5.8	6.1	6.1	6.1
Ministry of Finance	6.6	6.5	5.2	4.7	5.0	5.2	5.2	5.2	5.2	5.2
	Fiscal deficit to-GDP ratio									
Aaron Institute	4.5	3.6	5.5	5.5	3.5	3.5	3.5	2.5	2.5	2.5
Bank of Israel	4.5	3.6	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.7
Ministry of Finance	4.5	3.4	3.0	2.4	1.8	1.5	1.5	1.5	1.5	1.5
	Pimary deficit with pension subsidy to GDP ratio*									
Aaron Institute	3.2	2.5	4.4	4.4	2.5	2.5	2.5	1.5	1.5	1.5
Bank of Israel	3.2	2.5	2.4	2.4	2.5	2.5	2.5	2.5	2.5	2.7
Ministry of Finance	3.2	3.2	1.9	1.3	0.8	0.5	0.5	0.5	0.5	0.5

*The Bank of Israel estimated interest payments at about 2.2%; the pension subsidy at about 1%. The primary deficit (including pension subsidy) is obtained as the fiscal deficit less interest payments plus pension subsidy.

Red and blue are used to emphasize the difference between the assumptions of the main scenario and those of the Bank of Israel.

Source: Bank of Israel, Ministry of Finance and authors' calculations.

Figure A1: The Bank of Israel forecast of the nominal interest rate and inflation



Source: Bank of Israel, Ministry of Finance and authors' calculations.

Appendix II: The dynamic equation for the debt-to-GDP ratio

Since our goal is to calculate the debt-to-GDP ratio for a period of several years, we focus on a schematic calculation of the national debt's dynamics. We assume that the current market interest rate on this debt remains unchanged throughout the relevant period.

We construct the following simplified equation for the development of the national debt:

$$B_t = B_{t-1} + rB_{t-1} + P_t$$

where B_t is the nominal debt in period t , r represents the nominal interest rate on the debt (which we treat as fixed) and P_t is the primary deficit in period t (the difference between government expenditure less interest payments on the debt and government revenues) in nominal terms.⁵¹ This equation implicitly assumes that in every period the government recycles all of its debt and therefore only interest payments on the existing stock of debt are added. In addition, the government raises new debt to finance the surplus of expenditure over revenue.

In order to avoid calculating the **debt level** in terms of nominal money, it is common practice to examine the development of the **debt-to-GDP ratio**. Accordingly, if we denote nominal GDP in period t as Y_t , then we obtain the following equation:

$$b_t = \frac{1+r}{1+g} b_{t-1} + p_t$$

Where lower-case letters denote the ratio between the period's nominal value, which is denoted by the corresponding upper case letter, to nominal GDP in that same period (for example: $b_t = \frac{B_t}{Y_t}$). g denotes growth in nominal GDP between $t-1$ and t . The ratio $\frac{1+r}{1+g}$ is obtained by dividing the equation by Y_t , as well as dividing the first expression on the right by Y_{t-1} and multiplying it similarly. We denote the expression as $\beta = \frac{1+r}{1+g}$.

⁵¹ As mentioned, risk considerations and the effect of interest rate risk are relevant primarily in relation to the value of the debt in a long-run calculation.

The development of the debt-to-GDP ratio from the initial point (denoted by “0”) for a given period t is obtained by resubstitutions:

$$b_t = \beta^t b_0 + \sum_{k=1}^t \beta^{t-k} p_k$$

where b_0 denotes the debt-to-GDP ratio in the initial period. The equation shows that if the primary deficit is positive and remains fixed relative to GDP, and if the nominal interest rate is larger than the rate of growth in nominal GDP (in other words $\beta > 1$), then the debt-to-GDP ratio rises without limit. This path is of course not sustainable and therefore the primary deficit must be reduced and even be made negative (in other words, a primary surplus is necessary) in order to stabilize the debt-to-GDP ratio.

In contrast, as long as the nominal interest rate r is less than g , i.e. the rate of growth in nominal GDP, the debt-to-GDP ratio converges to a finite amount.⁵² On the assumption that the deficit remains fixed relative to GDP at a rate of p , the debt-to-GDP ratio converges to $\frac{1+r}{g-r} p$. Under reasonable assumptions for the parameter values, the debt-to-GDP ratio will attain values larger than 1 and the interest payment burden will be high. In order to prevent this, it is generally assumed that the debt-to-GDP ratio must be significantly less than 1. For example, the Maastricht Treaty imposed a constraint of 0.6 on this ratio. Nonetheless, if the rate of interest is lower than the rate of economic growth, the deficit can be increased and the debt can be allowed to grow temporarily, up to a reasonable threshold of the debt-to-GDP ratio (which we set at 0.85 in the Israeli context, as mentioned above). Accordingly, only when the debt-to-GDP ratio arrives at that threshold is there a need to reduce it by lowering the primary deficit (whether through a tax increase or by lowering government expenditure or both). These are the scenarios that we examine in the simulations presented in the paper.

⁵² This situation is possible because the State only has to finance the interest on the debt, while the principal is fully rolled over in every period. In terms of the economic modeling, this is a kind of Ponzi game that is made possible as a result of the State’s infinite horizon, in contrast to the finite horizon of its citizens.

Appendix III: The effect of public investment on economic growth

Assume the following aggregate production function:

$$Y_t = A_t \left(\frac{Kg_t}{L_t} \right)^{\alpha_g} Kp_t^{\alpha_p} (H_t L_t)^{\alpha_L}$$

where Y denotes production, A is total factor productivity (TFP), K_g is the level of public capital, K_p is the level of private capital, H is the level of human capital per worker and L is the number of workers. The exponents $\alpha_g, \alpha_p, \alpha_L$ denote the elasticities of output with respect to public capital, private capital and the effective labor force, respectively. All of them are positive and less than one.

For the purposes of our discussion, we focus only on the level of public capital. To this end, we gather all of the rest of the factors within an aggregate factor:

$$\Psi_t = A_t Kp_t^{\alpha_p} (H_t L_t)^{\alpha_L}$$

and accordingly:

$$Y_t = \Psi_t \left(\frac{Kg_t}{L_t} \right)^{\alpha_g}$$

This relationship can provide the period rate of change in GDP, γ_Y , which is (approximately) a combination of the periodic rate of change in the integrated factor, γ_Ψ , and the periodic rate of change in public capital, γ_g , less the rate of change in the labor force n , as follows:⁵³

$$\gamma_Y = \gamma_\Psi + \alpha_g(\gamma_g - n)$$

In order to calculate the periodic change in public capital, we will assume that it accumulates according to the standard accumulation formula:

$$Kg_{t+1} = Ig_t + [1 - \delta_g]Kg_t$$

where I_g denotes public investment and δ_g denotes the rate of depreciation of public capital.

This implies that the periodic rate of change in public capital is:

$$\gamma_g = \frac{Ig_t}{Kg_t} - \delta_g$$

Finally, we assume that the rate of public investment relative to GDP is σ_g . If we denote the ratio of public capital to GDP by κ_g , then we obtain the periodic rate of increase in public capital:

$$\gamma_g = \frac{\sigma_g}{\kappa_g} - \delta_g$$

⁵³ The time index was omitted from the rates of change for the sake of clarity.

Given the fixed rate of public investment relative to GDP, as long as $\frac{\sigma_g}{\kappa_g} > \delta_g + n$ then investment in public capital will contribute to economic growth. Similarly, as long as the rest of the variables remain fixed, increasing the rate of public investment relative to GDP by $\Delta\sigma_g$ percentage points will increase the growth in GDP by $\Delta\sigma_g$ percentage points, where:

$$\Delta\gamma_Y = \alpha_g \frac{\Delta\sigma_g}{\kappa_g}$$

In particular, the lower is the level of public capital relative to GDP, κ_g , and to the extent that investment is made in the components of public capital that have a greater effect on GDP (α_g is higher), so investment will have a greater effect on growth.

In order to quantitatively estimate the contribution of public investment to the growth of GDP in Israel in coming years, we need an estimate for reasonable values of the parameters κ_g, α_g . We take the value of α_g from the literature: we assume that an increase in public capital in a given year increases GDP that year according to the elasticity of GDP with respect to public capital.⁵⁴ We adopt the range of 0.10–0.17 used by the aforementioned authors for the value of α_g (the elasticity of GDP with respect to public capital). The low value relates to total public capital while the high value relates to “core” capital which includes roads, railways, airports and water and electricity infrastructure.⁵⁵ The second factor, κ_g , is set according to OECD and CBS data.

Ramey (2020) finds that, based on her representative household model, the optimal ratio of public capital to GDP in the economy’s equilibrium state is:

$$\kappa_g^* = \frac{1}{\beta^{-1} + 1 + \delta_g} \alpha_g$$

And the rate of optimal investment in public capital is:

$$\sigma_g^* = \frac{\delta_g}{\beta^{-1} + 1 + \delta_g} \alpha_g$$

Where here β denotes the household’s discount rate.

There is no population growth in Ramey’s model. She chose the values $\beta = 0.96, \delta_g = 0.04$ in annual terms, which yields that the first coefficient is about 12 and the second is close to 0.5. For the value $\alpha_g = 0.05$ which Ramey chose, we get $\kappa_g^* \approx 0.6, \sigma_g^* \approx 0.025$.

⁵⁴ During the first two years, we assume that the additional public investment does not add to GDP.

⁵⁵ Eckstein and Lifshitz (2017) assumed that the elasticity of GDP with respect to public capital is 0.10.

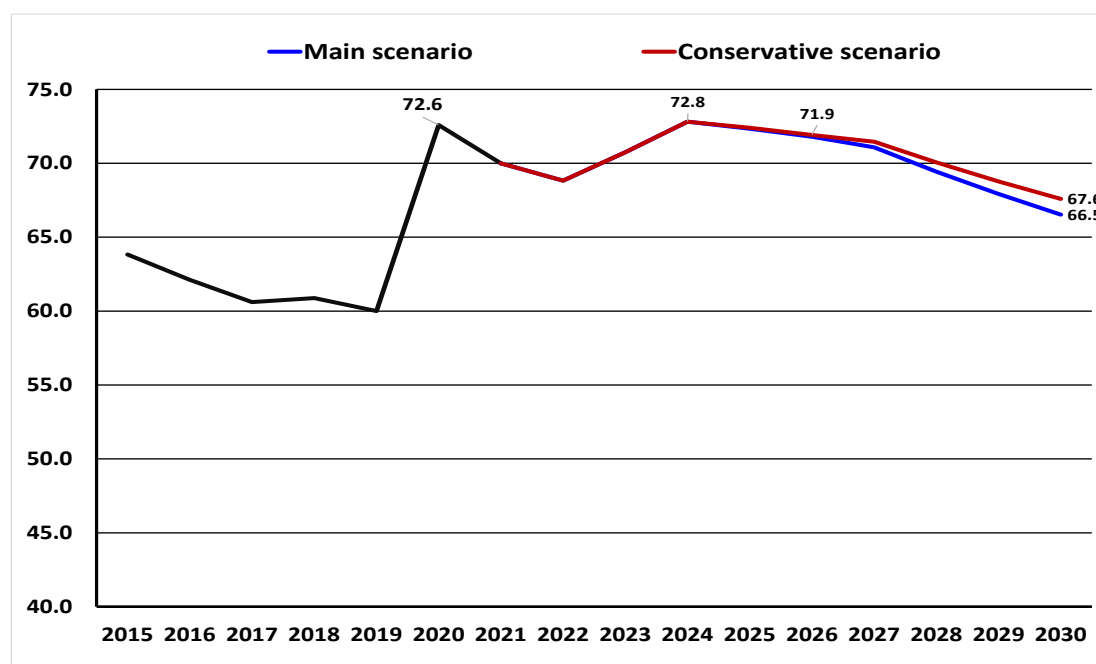
Following Devadas and Pennings (2018) we set $\delta_g = 0.02$. Nonetheless, increasing the population by a rate of 2% per year is like increasing the rate of depreciation of public capital by additional 2 percentage points from the viewpoint of the representative individual in Ramey's model. Accordingly, if we assume that $\alpha_g = 0.1$ (as do Devadas and Pennings), we obtain the optimal values $\kappa_g^* \approx 1.2$, $\sigma_g^* \approx 0.05$, namely, the Israeli public-capital -to-GDP ratio needs to at least be doubled.

Appendix IV: The path of the debt-to-GDP ratio – the conservative scenario

The conservative scenario proposes that public investment in core infrastructures be increased by 2% of GDP but assumes that this increase will raise the rate of growth in GDP by **0.4 percentage points**. The scenario is based on an elasticity of GDP with respect to public capital of 0.1, the lower value given by Devadas and Pennings (2018). Following is a description of the growth path in this scenario:

- With respect to the years 2021 and 2022, we adopt the Bank of Israel’s assumptions that nominal growth will be about 8.0% in 2021 and about 7.3% in 2022.
- With respect to the years 2023 and 2024, we assume that growth will be about 5.5% and 5.2%, respectively. These rates of growth are identical to the long-term trend (2000–2019) of real growth in Israel, i.e., 3.7%, with the addition of the Bank of Israel’s expectations of inflation: 1.8% in 2023 and 1.5% in 2024.
- **With respect to the period 2025–2030, we assume that as a result of the increase in public investment by 2% of GDP in 2023 and 2024, real growth will increase by about 0.4 percentage points and nominal growth will stand at about 6.1% (as in the case of the Bank of Israel model).**

Figure A2: The main and conservative scenarios for the debt-to-GDP ratio, 2021–2030



Source: Authors’ calculations.