Applied Economics and Finance; Vol. 13, No. 2; 2026
ISSN 2332-7294 E-ISSN 2332-7308
Published by Redfame Publishing

Searching for Optimal Fiscal Rules: The Case of Israel

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Received: October 6, 2026 Revised: November 6, 2026 Accepted: November 18, 2026

Available online: November 24, 2026 URL: https://doi.org/10.11114/aef.v13i2.9375

Abstract

Fiscal rules in Israel are considered as a favorable government tool for reducing public debt along time. In this paper Israel's fiscal rules are analyzed by using a framework with a declining debt to GDP target. This framework is used to examine two areas where fiscal policy in Israel has underperformed: government investment and discretionary statutory tax reductions. Simulations show that by allowing government investment to be excluded from the deficit definition the government achieves a more effective debt reduction compared to existing rules. Regarding discretionary statutory tax reductions, the simulations reveal that the absence of clear revenue rules results in a credibility cost, which is reflected by a high penalty, measured through the debt fee incorporated in the model. The paper concludes by providing implementable recommendations for enhancing fiscal rules in Israel.

Keywords: public debt, government investment, tax reductions

JEL classification: H30, H61, H62, H63

1. Introduction

By the end of 1991, Israel embarked on a long journey to design fiscal rules. The first rule, established by the Budget Deficit Reduction Law, introduced a schedule of progressively declining planned budget deficits starting in 1992, with the goal of achieving a balanced budget by 1995. In subsequent budget preparations, this deficit schedule was revised multiple times, making target adjustments a routine practice.[1] Nevertheless, researchers and policymakers agree that despite these amendments, the Budget Deficit Reduction Law played a crucial role in promoting fiscal discipline in Israel.

This fiscal framework became a highly valued tool for policymakers in the aftermath of the 1985 hyperinflation episode. Although this crisis was resolved following the 1985 stabilization plan, it was evident that stronger policy tools were necessary to maintain a newly stabilized economic equilibrium and prevent a return to high government deficits.

In early 2000s Israel introduced an expenditure law, reflecting the belief that fiscal imbalances primarily originate from the spending side—a viewpoint supported by Von Hagen and Harden (1995). Their work identifies two main sources of spending bias in the political budget process: ambitious ministerial agendas and the common pool problem.[2] Initially, Israel's expenditure law was quite strict, but over time it has evolved to become more flexible, culminating in the current rule based on multi-year budget planning, known as the "numerator."

It is important to emphasize that fiscal rules became pivotal in European policy under the Maastricht Treaty and the Stability and Growth Pact (SGP), supporting the shift from a few countries adopting fiscal rules to widespread use across many nations. The extensive literature on budgetary rules indicates that fiscal rules have become a kind of "business card" for countries, assisting rating agencies and investors in evaluating the self-imposed constraints on discretionary political decisions. These decisions often undervalue future generations in the budgeting process and fail to formalize multi-year budget constraints.

In Israel's case, the experience with fiscal rules is substantial and complex, warranting thorough analysis of both their strengths and weaknesses in meeting national goals. Although a detailed analysis is not undertaken here, the focus is on identifying possible ways to improve the existing fiscal framework. To this end, the declining debt-to-GDP target model proposed by Hercowitz and Strawczynski (2004a) is used to interpret Israel's fiscal rules. Two key areas deserving further

[1] See Brender (2020).

[2] This well-known failure arises because of the unawareness of individual ministers to internalize the aggregate burden of taxation.

research are highlighted: (i) the optimality of government investment, and (ii) discretionary tax reductions.

2. Drawbacks in Government Investment and Statutory Tax Reductions

While there is broad consensus among policymakers and researchers regarding the benefits of fiscal rules in Israel, two areas reveal a clear mismatch between optimal fiscal behavior and actual practice.[3]: government investment in infrastructure and discretionary statutory tax reductions.

A comparison of government capital across OECD countries is presented in Figure 1.

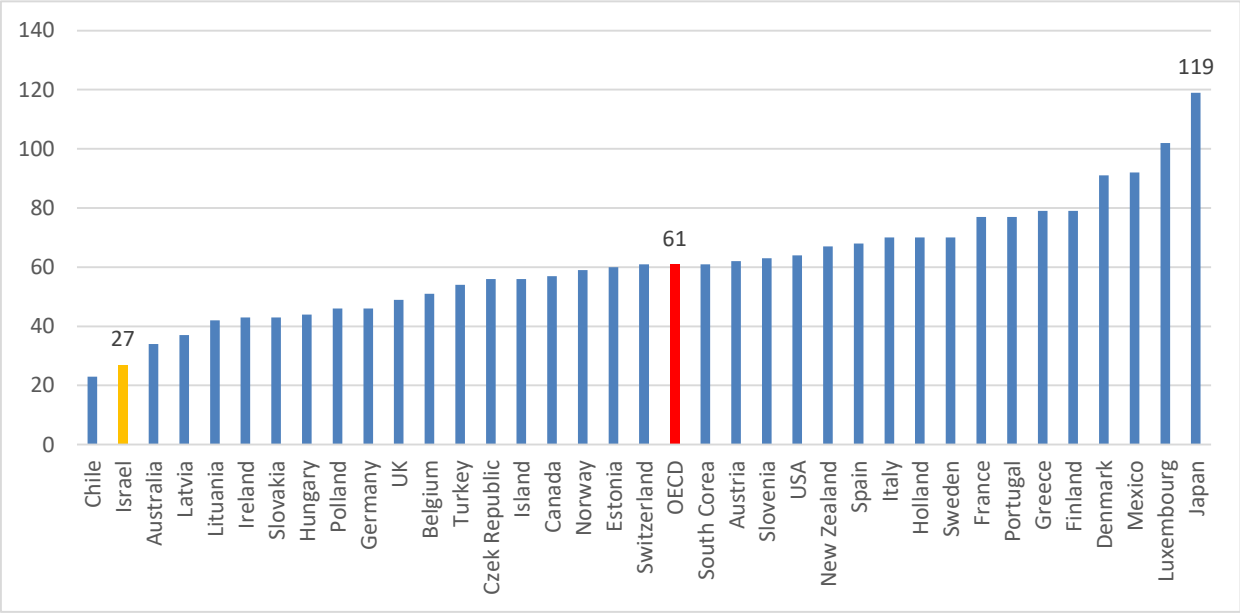


Figure 1. Government Capital as a percent of GDP

(2015, based on 2011 Purchasing Power Parity; Source: Bank of Israel)

Although Israel's status as a young country partly explains its low level of government capital, it is clear that Israel falls into a group of countries where government investment—especially in infrastructure—is notably limited. This issue was highlighted in the 2022 Bank of Israel (BOI) Report and by Bental, Eckstein, and Somkin (2022).A second area where fiscal rules have not effectively restrained a much-criticized policy decision concerns discretionary tax reductions, as illustrated in Figure 2. This figure presents statutory tax changes made by the Israeli government over different periods, weighted according to their significance in tax revenues, covering 87 percent of total tax revenues, as detailed in Strawczynski (2014).

Until 2007, statutory tax policies appeared consistent with the tax smoothing approach, which is considered a fundamental benchmark in fiscal policy. In the 1960s, when Israel was still a young country, statutory tax rates were increased. Following the 1985 successful stabilization plan and a significant reduction in defense spending as a share of GDP[4], tax rates were then lowered. Between 1990 and 2004, statutory tax rates remained largely unchanged, even as defense spending continued to decline—a sign of reduced permanent government spending. This shift culminated in a statutory tax reduction in 2004, consistent with the tax smoothing model until 2007.

However, after 2007, these tax reductions appear to have become unsustainable. A large public protest in the summer of 2011 triggered a policy reversal, leading the government to restore corporate and income tax rates to their 2007 levels.[5] These discretionary tax cuts have undermined government credibility and will be examined further in this paper.

[3] Another potential mismatch relates to social government policy. Dahan and Strawczynski (2013) show that fiscal rules can have detrimental effects in this area. Their study focused on OECD countries but did not include Israel, which only joined the organization in 2010.

[4] See Strawczynski and Zeira (1998).

[5] The expected budget mismatch was even greater due to substantial legislated tax reductions initially planned for implementation between 2011 and 2016. These reductions were canceled when the Trajtenberg Committee, appointed to address the demands of the protests, was established.

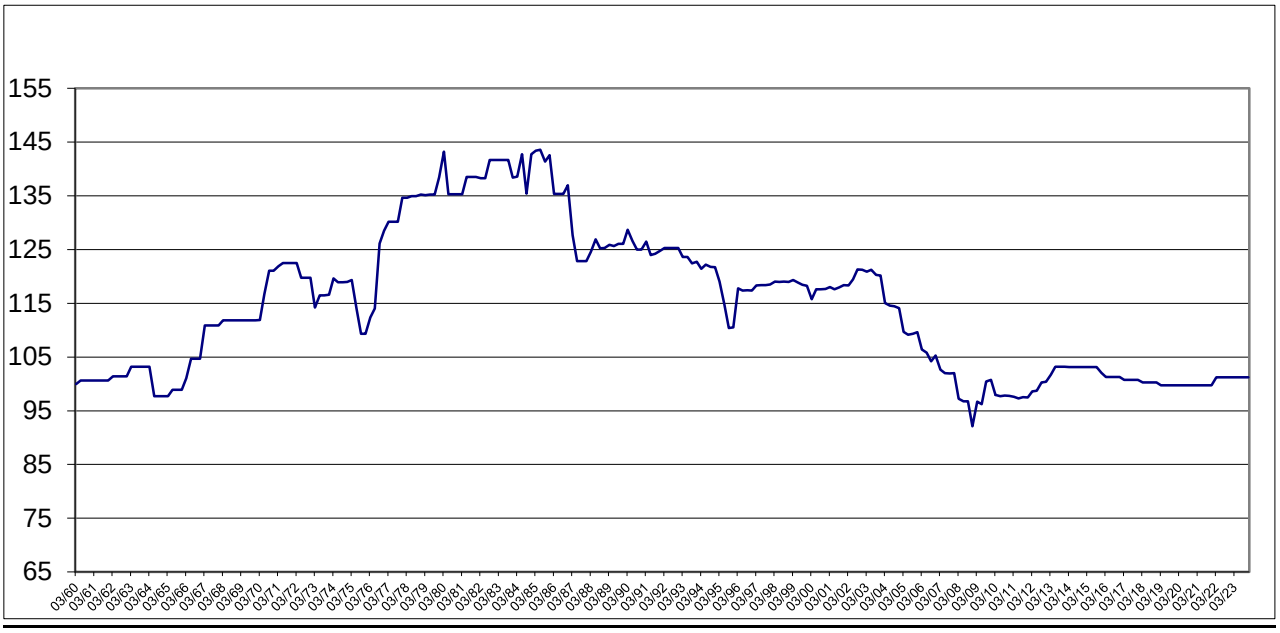


Figure 2. Statutory tax rates development in Israel: 1960 - 2023

Ex-post, one reason the government did not lose credibility following this episode was that government debt did not immediately react to these policy changes. Figure 3 illustrates the development of government debt over time. Both gross and net debt as a percentage of GDP continued to decline until 2017, when this trend halted—reflecting a high cyclically adjusted deficit (see the updated figures in the 2022 Bank of Israel Report).

After 2011, the deficit rose substantially but was partially corrected in 2013 through a government package of tax increases. Despite this, the cyclically adjusted deficit grew again, and in 2018–2019, just prior to the COVID-19 crisis, public debt began to increase slightly. As expected, government debt surged during the COVID-19 pandemic, in line with the fiscal responses seen in many other countries affected by the crisis.

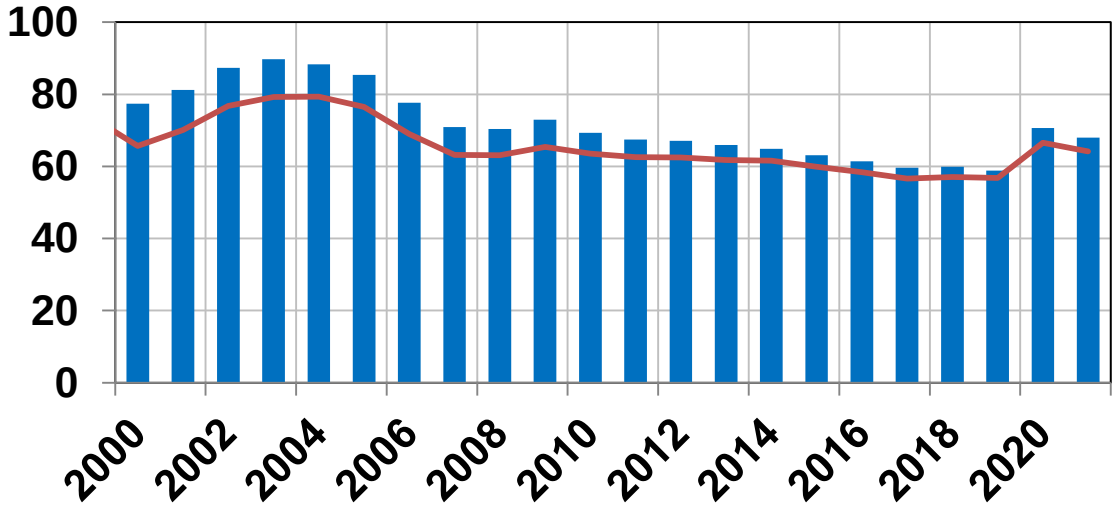


Figure 3. Israel's Government Gross Debt as a percent of GDP (line: Net Public Debt)

3. Literature Survey

Fiscal rules are widely regarded as constructive tools for bridging the gap between the fiscal policy preferences of current and future generations and the potential for misuse of decision-making power by politicians. Debrun, Moulin, Turrini, Ayuso, Casals, J., and Kumar (2008) discuss the conditions under which fiscal rules are effective, demonstrating that they have so far helped mitigate political myopia and supported fiscal solvency over time. This conclusion is supported by

Budina, Tidiane, Schaechter, and Weber (2012), as well as Dahan and Strawczynski (2013), who use econometric evidence to show that deficit rules effectively reduce deficits, while spending rules curb the growth rate of government expenditure.

Caselli, Davoodi, Goncalves, Gee, Lagerborg, Medas, Nguyen & Yoo, J. (2022) also emphasize this, analyzing necessary measures—including the establishment of independent fiscal councils—to restore fiscal consolidation after the COVID-19 crisis. Another positive aspect of fiscal rules is that developed countries appear successful in implementing counter-cyclical policies, as noted by Gali and Perotti (2003). This may be because such policies are ex-post reactions to economic cycles driven by external factors, which do not damage credibility. These findings explain why the number of countries adopting fiscal rules increased 4.5 times between 1992 and 2013 (Strawczynski, 2015).

Eyraud, Debrun, Hodge, Lledo & Pattillo (2018) emphasize several important aspects of fiscal rules, focusing on the need for simplicity, flexibility, and enforceability. Their paper demonstrates that the success of fiscal rules in achieving fiscal objectives depends on good design, aiming to minimize contradictions that can arise from overlapping laws. According to their analysis, second-generation fiscal rules are intended to address the shortcomings of first-generation rules, such as by including escape clauses. Previously, the rigidity of fiscal rules led to unnecessary conflicts, which can be avoided by increasing flexibility. The authors particularly highlight the importance of enhancing long-term fiscal sustainability while allowing for the avoidance of short-term fiscal costs. Public investment is a significant challenge in this context, as it is generally regarded as beneficial in the long run but can constrain budgetary rules in the short term.

Regarding public investment, Balassone and Franco (2000) developed a framework aimed at maintaining adequate investment levels under the Stability and Growth Pact (SGP) agreements in Europe. By examining the "golden rule" for investment, they argue that while no simple optimal solution exists, policymakers must acknowledge the risks of producing rules that lead to under-investment. Blanchard and Giavazzi (2004) have called for amending the SGP to include mechanisms preventing under-investment. Their simulations show that excluding investment from the deficit definition used in fiscal rules allows the debt-to-GDP ratio to converge to the government capital-to-GDP ratio, a desirable long-run steady-state outcome. This point is reaffirmed by Beetsma (2022) in the post-COVID-19 economic context. Furthermore, Hatchondo, Martinez & Roch (2022) stress the importance of considering existing fiscal space, while Mühlenweg and Gerling (2023) find that restrictive fiscal rules particularly impede government investment. That said, it is important to note that amending fiscal rules to exclude investment is not a miraculous solution. Milessi Ferreti (2004) points out that fiscal rules can sometimes lead governments to act with less transparency. Specifically, in the case of investment, varying accounting methods may be used to either comply with or circumvent rules related to investment reporting.

An example of a concrete investment rule decision can be seen in Germany. In March 2025, the government established a €500 billion special fund aimed at revitalizing infrastructure and promoting climate neutrality over the next twelve years. However, this initiative sparked internal debate, with several commentators pointing out that much of the fund was used for already planned projects rather than new investments. This criticism highlights the importance of establishing mechanisms to ensure that the use of such funds aligns strictly with the original objectives of the rule's implementation.

On discretionary tax reductions, Strawczynski (2015) finds they tend to be pro-cyclical in OECD countries, which contradicts IMF recommendations aimed at counteracting pro-cyclicality (see Spilimbergo, Symansky, Blanchard and Cottarelli, 2008). He states that revenue-based fiscal rules, which have become increasingly common, are effective tools for limiting pro-cyclical discretionary tax cuts. Appendix Table C.1 lists countries that have adopted a combination of rules including revenue rules.

Regarding Israel's experience, Cohen (2014) shows that fiscal rules significantly reduced the central government deficit. However, Brender (2020) argues that these rules were insufficient to prevent suboptimal fiscal policy. While counter-cyclical fiscal policy is expected during both recessions and expansions, Brender presents evidence of pro-cyclicality during economic expansions. Strawczynski (2020) highlights one particularly controversial episode: the tax cuts from 2004 to 2011, where the causal direction ran from taxes to expenditure—contrary to prior episodes governed by the tax smoothing framework. This framework advocates cutting taxes as a response to declining permanent spending, consistent with earlier phases in Israel's fiscal history. Symanski, DeBrun, and Epstein (2018) suggested that adopting a debt reduction framework could offer a solution to internalize such episodes.

4. Fiscal Rules in Israel

The first fiscal rule implemented in Israel was the Deficit Reduction Law, which set a schedule for reducing the budget deficit from 1992 to 1995. However, after just one year, the deficit target for 1994 was revised upward from 2.2 percent to

3 percent of GDP..[6] Since then, a long tradition of future deficits adjustments started. Adjustments are implemented in almost every budget preparation and are usually characterized by a rise in the present year target, which in most occasions it turns out that it was "too ambitious". It is important to note that despite these frequent adjustments, Israel successfully maintained a declining debt-to-GDP ratio over time. The next move was the expenditure law, that was introduced in early 2000s. The first generation determined a very restrictive real rate of increase for total expenditure – 1 percent.[7] This law was rapidly changed to an increase of 1.7, and in 2010 it was replaced by the following rule:

$$\frac{\dot{g_t}}{g_t} = \frac{\dot{y_{t,LR}}}{y_{t,LR}}\left(\frac{0.6}{B_t/Y_t}\right)$$

Where g and y represent real government expenditure and real GDP, respectively; B is the gross government debt. The choice of 60 percent of GDP target was related to the relative position of Israel at that time (with an 80 percent figure) taking the Maastricht Treaty as a benchmark. While this law was less restrictive than the previous one, only three years later it was changed again to the following rule:

$$\frac{\dot{g_t}}{g_t} = \frac{\dot{N}}{N} + \left(\frac{0.5}{B_t/Y_t}\right)$$

Where N represent population; i.e., the government can spend beyond population growth and the maximum addition (1 percent) is subject to achieving the new debt target of 50 percent of GDP.[8] The last move was to switch to a discretionary rate of increase in real expenditure, which is determined in the Numerator system; this system is based on middle term planning with an horizon of three years beyond the two-year budget.

In this paper Israel's fiscal rules are translated into a model in which the government aims at achieving a future low debt/GDP ratio. Following the numerical figures in rules applied in Israel, this target will be set at 50 percent of GDP. As we can see in Figure 3, COVID-19 delayed the previous debt reduction path.

5. The Model

The model presented by Hercowitz and Strawczynski (2004a) is extended to include government investment, following the proposal by Barro (1981 and 1990). However, unlike in Barro's model of endogenous growth, growth is assumed to be exogenous, consistent with Solow (1961). The following presents the basic structure of the economy:

$$Y = AK_P{}^{\alpha}K_G{}^{\varphi}L^{1-\alpha-\varphi} \tag{1}$$

Given that K represents capital and L labor; sub-indices P and G represent private and government, respectively. The change in government capital is given by:

$$K_G = K_{Gt-1} + I_{Gt} - \delta K_{Gt-1} \tag{2}$$

Where I is investment and δ is the depreciation rate. Government expenditures in non-investment items are part of utility, as will be shown next. In next equation the parameters α and φ represent the share of private and public capital, respectively. Assuming a Cobb-Douglas production function, the sum of the coefficients for capital and labor equals 1. The following set of equations relates to optimal government investment. First, the equations for GDP growth and for the government's capital rate of change are presented:

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \varphi\frac{\dot{K_G}}{K_G} + \alpha\frac{\dot{K_P}}{K_P} + (1-\alpha-\varphi)\frac{\dot{L}}{L}$$

i.e., growth will be generated by the exogenous increase in productivity, and by the increase in government and private capital + labor, weighted by their coefficients in the production function. I will assume that changes in A, K_P and L are exogenously given.

[6] The deficit targets for 1992, 1993, 1994 and 1995 were (as percent of GDP) 6.2, 3.2, 2.2 and 0. Note that the first change was performed so as to allow a reduction in the deficit – in order to conservate credibility. Note also that in those years the actual deficit was lower than target.

[7] Since population in Israel grows at 1.7 percent this implies a reduction per-capita.

[8] By that time debt was approaching the previous 60 percent target, which was finally achieved in 2017.

Concerning government capital increase, we would expect that it is enough to cover population growth (symbolized by n) and a parameter μ that is calibrated to close the gap between Israel and a desired level that is higher than the current one. Clearly it is not possible to close this gap immediately because of adjustment costs and the need for producing investment plans, which take time. The equation for desired government capital growth is:

$$\frac{\dot{K_G}}{K_G} = n + \mu \tag{3}$$

Note also the in the long-run steady state, the parameter $\mu = 0$, and the long-run growth of government's capital equals n. The underlying assumption is that the economy is on its way to the steady state.

Using equation 2 we obtain that the increase in government capital equals to:

$$\frac{\dot{K_G}}{K_G} = \frac{I_G}{K_G} - \delta \tag{4}$$

Putting together equations 3 and 4 I obtain optimal government investment, which will be symbolized by $\widetilde{I_G}$:

$$\widetilde{I_G} = (n + \mu + \delta)\, K_G \tag{5}$$

Let us now introduce government's preferences (small letters represent the ratio to GDP). Those include minimizing the deadweight loss of taxation (τ), weighted by a parameter ρ; maximizing utility from non-investment expenditure, symbolized by g and weighted by the parameter γ; performing optimal investment $\tilde{\imath}_G$ weighted by the parameter θ; and finally, as in Hercowitz and Strawczynski (2004), I assume that the government has a public debt to GDP target in the future that will be checked by rating agencies and investors in year $\bar{t}$. This includes an indicator parameter H that takes the value of 1 under two conditions: i) the debt ratio is higher than the target; ii) we are beyond year $\bar{t}$ that is the year in which government is starting to be checked regarding its debt to GDP target. Otherwise, the indicator H takes the value of 0. Equation 6 summarizes government action:

$$MIN \sum_{t=1}^{\infty} \left(\frac{1}{1+r}\right)^{t-1} \frac{Y_t}{2} \left[\rho\tau^2 + \lambda(b_t - \overline{b})^2 H_t + \gamma(g^* - g_t)^2 + \theta(\tilde{\imath}_G - i_t)^2\right] \tag{6}$$

This problem is subject to a periodical budget constraint (equation 7), and most importantly, to a multi-period budget constraint (equation 8):

$$\Rightarrow \quad \tau_t = \frac{1+r}{1+\mu} b_{t-1} + g_t - i_t - b_t \frac{1+r}{1+\mu} b_{t-1} + g_t + i_t - b_t - \tau_t = 0, t = 1,2,\dots,\infty \tag{7}$$

$$\sum_{t=1}^{\infty} \left(\frac{1}{1+r}\right)^{t-1} Y_t(g_t + i_t - \tau_t) + (1+r) Y_{t-1} b_{t-1} = 0 \tag{8}$$

The following is the Lagrange function L with a multiplier η:

$$\begin{aligned} L = & \sum_{t=1}^{\infty} \left(\frac{1}{1+r}\right)^{t-1} \frac{Y_t}{2} \left[\rho\tau^2 + \lambda(b_t - \overline{b})^2 H_t + \gamma(g^* - g_t)^2 + \theta(\tilde{\imath}_G - i_t)^2\right] \\ & + \eta \left[\sum\nolimits_{t=1}^{\infty} \left(\frac{1}{1+r}\right)^{t-1} Y_t(g_t + i_t - \tau_t) + (1+r) Y_{t-1} b_{t-1}\right] \end{aligned} \tag{9}$$

A clear formulation for understanding the detailed solution to the problem is provided in Appendix A. The solution follows the F.O.C., based on government's decisions about four variables ($\tau, g, i \; and \; b$):

$$\begin{gathered} \rho\tau_t - \eta_t = 0 \\ -\gamma(g^* - g_t) + \eta_t = 0 \\ -\theta(\tilde{\imath} - i_t) + \eta_t = 0 \\ \lambda(b_t - \bar{b})H_t - \eta_t + \eta_{t+1} = 0, t = 1,2, \dots, \infty \end{gathered} \tag{11}$$

Note that if the indicator H equals 0 (i.e., we turn to the tax smoothing framework), the optimum is obtained for smoothed values of government variables according to its tastes parameters (which shall resemble the ones of the public). When H is equal to 1, a framework similar to that of Hercowitz and Strawczynski (2004a) is obtained, which involves establishing an optimal government plan aimed at maximizing social welfare.

5.1 The Impact of Budget Rules on Investment

The model is now simulated to examine the impact of a restrictive budget rule on government investment. Currently, Israel's expenditure rule uses a broad definition of expenditure that includes investment. Additionally, the government's budget deficit target incorporates investment, meaning the government cannot increase debt beyond the legal limit to finance investment projects. In the model, the fiscal rule is represented by adding a penalty term to the objective function based on the debt-to-GDP target, where λ represents the cost of failing to meet this target. To reflect Israel's current situation, there are two alternative scenarios:

(i) A scenario where investment is included in the deficit calculation, as is currently the case—meaning investment competes with other spending to meet the budget target.

(ii) A scenario where investment is excluded from the deficit and expenditure definitions, allowing for optimal investment aimed at achieving a long-run steady state.

In the benchmark scenario productivity and population growth equal 1 and 1.7 percent at the departure point, respectively; later, following existing trends, these rates of increase decline gradually. This approach is based on findings presented in a long-run scenario by the BOI Annual Report of 2018. One contribution of the model is by signaling the optimal government capital ratio to GDP; in the long run. as long as a 34 percent government capital ratio to GDP is not achieved[9], the golden rule path is applied under a positive μ. In the benchmark simulation this parameter will reflect an investment over GDP ratio of 2.5 percent of GDP.

Another key parameter for the purpose of estimating the contribution of increased government investment to growth is φ, the coefficient of government capital in the production function. A comprehensive meta-analysis of 578 estimates related to OECD countries was conducted by Bom and Ligthart (2014). They found that the long-run elasticity of output with respect to public capital is 0.122. This elasticity doubles when focusing exclusively on core infrastructure at the core/regional level.[10] In my simulations The empirical estimates of Table 6 in Aschauer (1989) is used, which is roughly consistent with the analysis performed by Barro (1981). According to his estimates $\varphi = 0.16$. Let us further assume the $\alpha = 0.24$, completing a coefficient of 0.4 for total capital and 0.6 for labor (Jones, 2003).[11]

A simulation is run where $H_t = 1$after year $\bar{t}$ (the 9th year) and debt is higher than the target.; this means that taxes will be smooth and high until $\bar{t}$ and "liberated" (i.e., reduced) afterwards, and that government non-investment and

[9] We see in Figure 1 that the departure level is 27 percent of GDP. Achieving a 34 percent figure will drive Israel to the 2015 level in Australia.

[10] This finding is challenged by Evans and Karras (1994), who checked the impact of public capital on output across 48 US states. They found that educational investment plays a productive role, while other types of investment have a limited - even negative - effect.

[11] Based on a sample of OECD countries, Kamps (2006) estimated a coefficient of 0.22 and 0.26 for government and private capital, respectively.

investment expenditure will be both low until $\bar{t}$ and "liberated" (i.e., increased) afterwards.

Note that since business cycles are difficult to forecast, it is assumed that GDP growth is according to potential. In Figures 4a to 4c the results of the different variables that are set by the government are shown. As explained above, optimal behavior implies a smooth path until the year of compliance and afterwards the variables are free to converge toward long-run steady state.

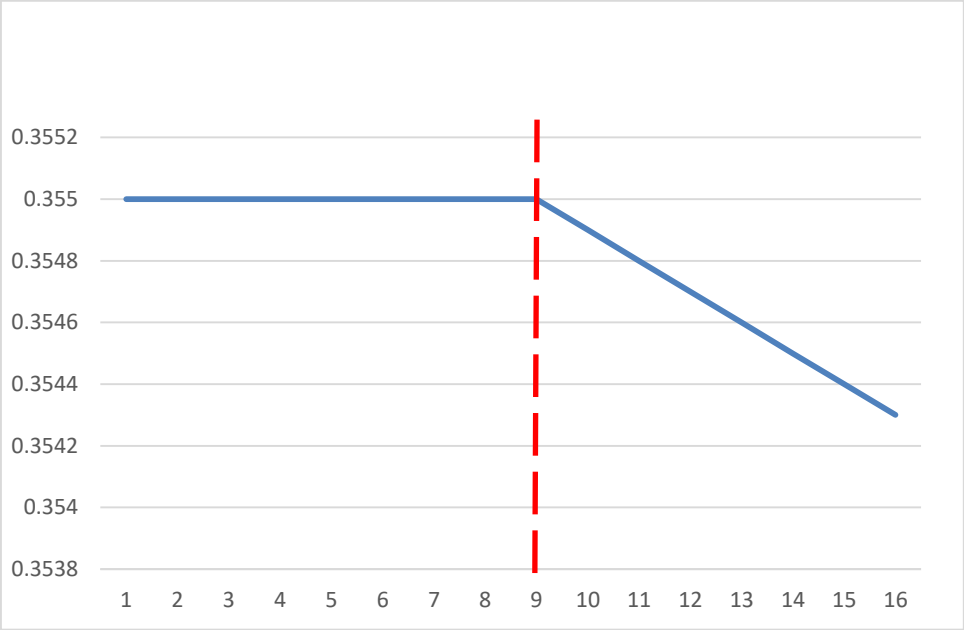


Figure 4a. Taxes/GDP

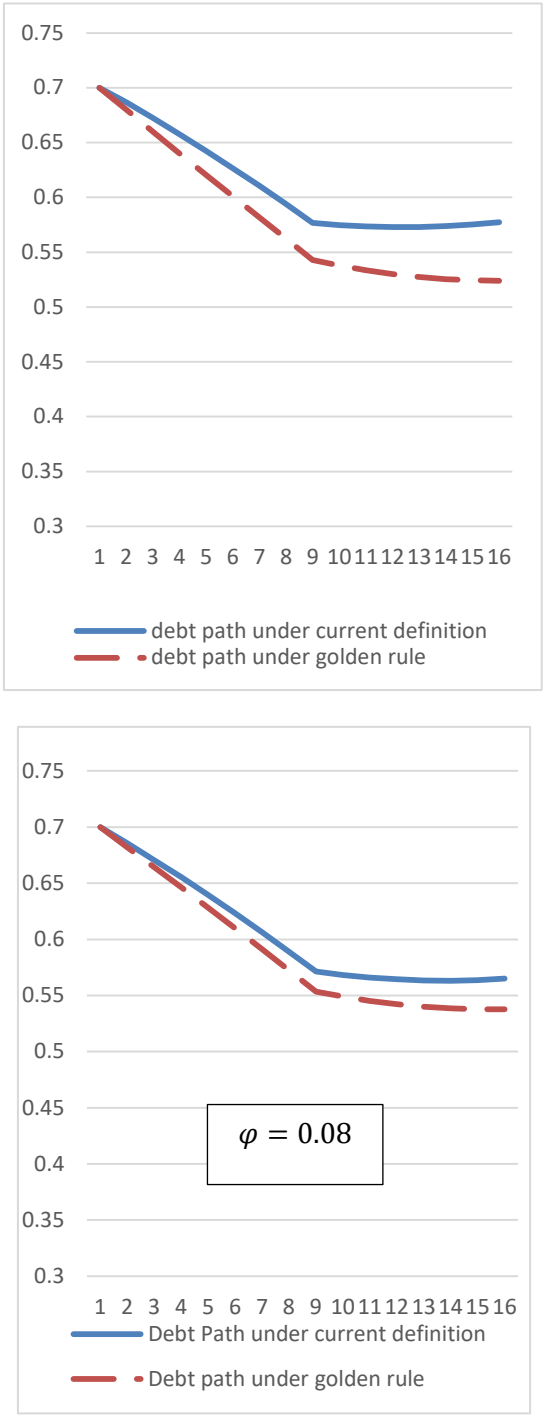


Figure 4b. Government Debt to GDP Ratio

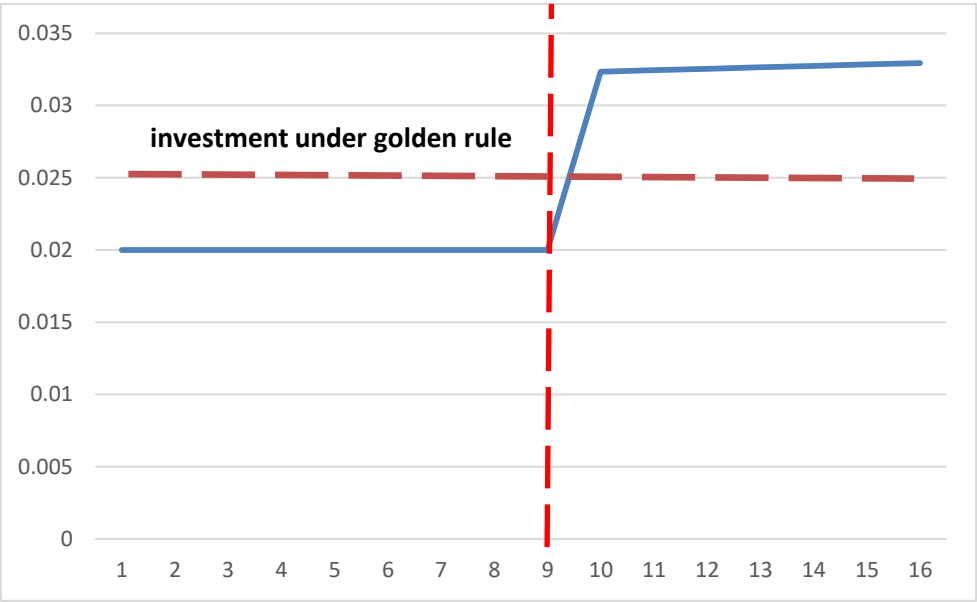


Figure 4c. Government Investment to GDP Ratio

5.2 The Impact of Discretionary Tax Reductions

The reduction of statutory tax rates between 2004 and 2011 was justified by the government enumerating two explanations: i) reducing labor taxation, to be partially substituted by a new tax on savings; ii) incentivizing economic activity. Strawczynski (2020) shows that this reduction was unusual, since it implied Granger causality from taxes to expenditure; this pattern is at odds with all previous tax reductions, which had been implemented after a previous reduction in expenditure. The second explanation stresses the importance of considering the endogenous reaction of GDP to tax rates.

Hercowitz and Strawczynski (2004a) show in an Appendix that as long as tax reductions are implemented at the correct side of the Laffer curve, the model used in this paper is implementable. Brender and Politzer (2018) show that tax reductions affect GDP. Note, however, that they conclude that during their sample period aggregate tax revenues in Israel are located at the correct side of the Laffer curve. In the simulations below I will use their estimation to correct the flows of the used variables so us to account for the endogenous reactions of GDP components to statutory tax rates.

In this paper, it is argued that if the government had implemented a revenue fiscal rule similar to that of the Netherlands (see Appendices B and C), a substantial credibility fee could have been avoided. This is because applying such a rule would have guided the government toward a smooth taxation path, preventing the penalty associated with the gap between the declared debt reduction policy and the actual outcome, which was influenced by tax cuts. This analysis will be conducted through simulations considering both exogenous and endogenous GDP responses to tax reductions.

5.2.1 Exogenous GDP

Figure 1 (above) described the tax reductions in the period 2004-2011. It is evident that the reductions until 2007 are in line with tax smoothing, while the ones from 2008 and 2011 are not. This is so because the weighted statutory tax rate performed a U-turn that brought back tax rates to the level prevailing in 2007, and remained afterwards at this level.

A similar discretionary tax reduction is simulated when the government's tax path is smooth, adhering to fiscal rules strengthened by a revenue fiscal rule that requires adjusting the tax rate according to the tax smoothing framework. This tax policy reduces government tax revenues from 35.5 to 33 percent at the beginning of the simulation. Subsequently, an optimal government policy is applied to satisfy the multi-period budget constraint. Over time, the tax rate is gradually increased to regain control over the debt, returning it to the planned reduction path as defined by the original maximization. This results in taxes rising back to 37.5 percent of GDP, where they remain for a period to support a declining debt trajectory.

Figures 5a to 5c show the dynamics of main variables.

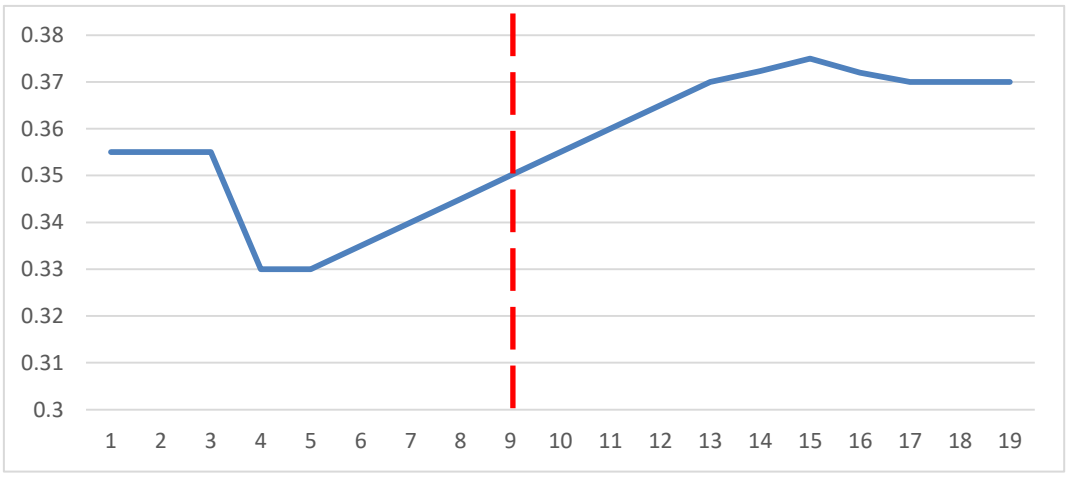


Figure 5a. tax revenues/GDP

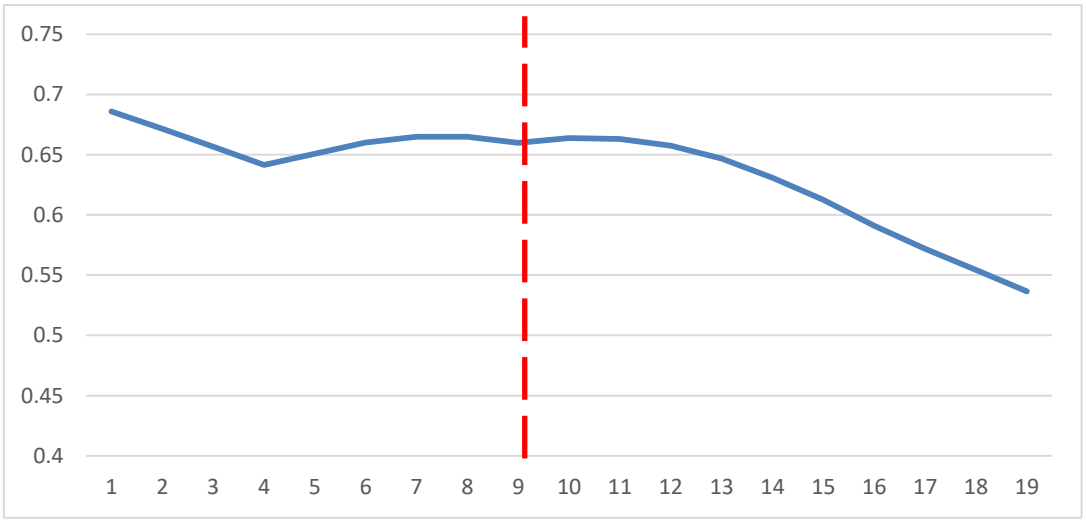


Figure 5b. Debt to GDP ratio

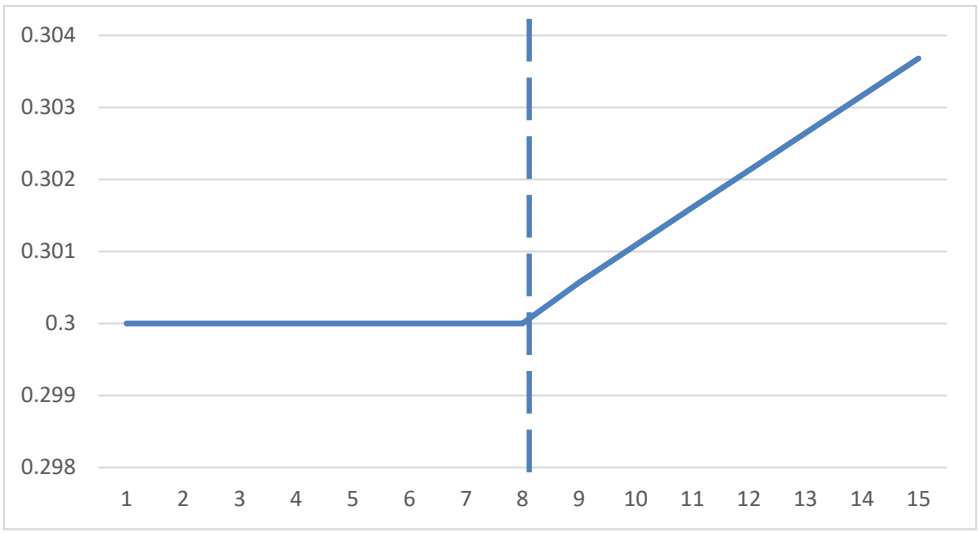


Figure 5c. Government Spending (excluding investment and interest payments) to GDP ratio

Results show that six additional years of tax hikes are required to return to previous path for reducing the debt. In terms of government debt, the statutory tax reductions generate a period of 9 years in which debt remains at a high level, and only three years after compliance date $\bar{t}$ the debt path returns to the original dynamics of debt reduction. In fact,

government credibility is damaged when analyzed against government goals. Assuming a 0.5 value for λ, the damage to the objective function can be calculated by comparing the path with and without tax reductions. This calculation, including sensitivity tests, will be performed in the next sub-section.

Using the function for the deadweight loss, the loss caused by tax increases can be computed. It turns out that this cost increases by 26 percent in a calculation that lasts until the end of the planning period.

These results suggest that considering revenue rules can be an effective tool to avoid discretionary policy. This becomes especially relevant when we recall that additional discretionary tax rates (up to 2016) were approved by parliament but not implemented due to the 2011 protests and the recommendations of the Trajtenberg Committee.

5.2.2 Endogenous GDP

Brender and Politzer (2018) estimate the endogenous response of GDP to tax reductions. According to their estimates the impact varies according to the type of tax. For income taxation their estimate implies that a reduction of taxes implies a 65 percent loss of revenue (instead of 100 percent), due to an increased GDP caused by the tax reduction. The parallel figure for corporate tax is 90 percent (instead of 100 percent).

Given that statutory tax reductions in Israel were based on these two types, the simulation assumes a 70 percent loss of revenues (instead of 100 percent).. The following two figures show the results.

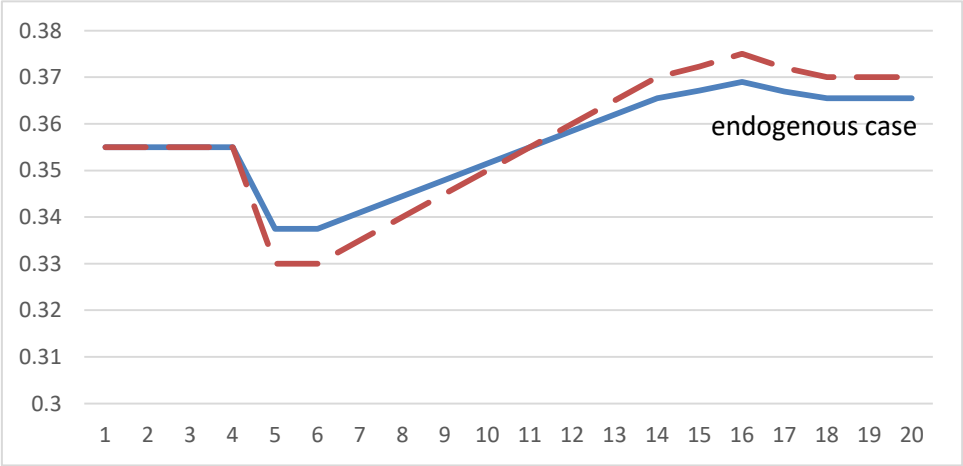


Figure 6a. Tax revenues / GDP

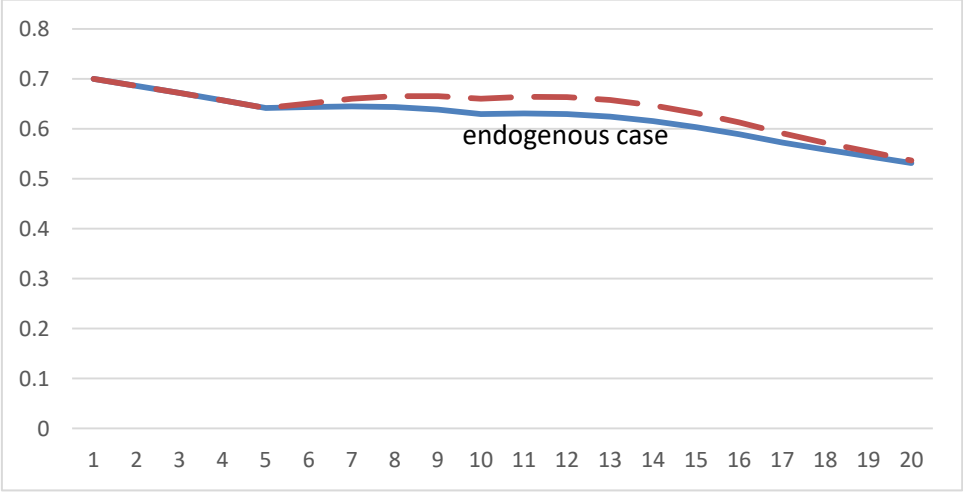


Figure 6b. Government Debt / GDP

Results show that the endogenous response moderates the impact on tax revenues and on the ratio of debt to GDP compared with the results shown in the previous sub-section (Figures 6a and 6b). The following rise in taxes is less extreme, and the reduction of Debt to GDP ratio is more accelerated. Having said that, we still see that discretionary tax reductions substantially delay the achievement of the debt target compared to the path obtained without tax reductions Moreover, since debt increased relative to my benchmark scenario, the government was compelled to raise statutory taxes by a greater amount to cover the additional interest payments. Higher statutory tax rates result in increased deadweight

loss, which reduces overall economic efficiency.

It is important to emphasize that the results are closely linked to the significance of the debt fee, a crucial parameter for government credibility in the eyes of both local and foreign investors, as well as rating agencies. These agencies consider government debt to be one of the most important factors in determining a country's credit rating. In Table 1, the sensitivity of debt credibility (measured by the penalty term that appears in the loss function) to variations in the debt fee parameter is shown.

Table 1. Reduction of the debt fee when adopting an Income Rule

Parameter	$\lambda = 0.5$	$\lambda = 0.25$	$\lambda = 1$
Debt Fee applying a Revenue rule	0.84	0.42	1.69
Fee Reduction relatively to no revenue rule scenario	0.27	0.14	0.55

As expected, the fee increases as the parameter λ rises, indicating that the government's cost for failing to meet the target in the infinite horizon model becomes higher. In every case, adopting a revenue rule reduces the debt fee by one-third, marking a significant improvement in government credibility. This enhanced credibility could positively affect the country's credit rating and encourage greater private investment.

6. Summary and Conclusions

This paper simulates binding fiscal rules like those applied in Israel to compare optimal fiscal paths with actual policy outcomes. Two areas are especially prone to suboptimal behavior: government investment and discretionary tax cuts. Simulations indicate that strict budget constraints on investment play a major role in causing delays, which in turn lead to substantial costs in efforts to reduce the government debt-to-GDP ratio. Two clear patterns emerge: (i) Investment follows a suboptimal path, starting later than ideal and accelerating only once fiscal constraints are eased. (ii) Implementing a "golden rule" that excludes productive investment from the budget constraint facilitates an earlier investment path and a more effective reduction of debt relative to GDP. The 2022 Bank of Israel Report (page 195) recommends establishing an investment fund to support multi-year investment planning. This fund would allow financing of projects immediately, even if implementation occurs several years later. Building on this, a clear recommendation is that investment projects with a positive and substantial Internal Rate of Return (IRR) should not be constrained by restrictive budget limits. While political economy concerns arise—since other expenditures, like education, may also seek exclusion from deficit calculations—it is argued that governments can justify this distinction given the empirically proven high IRR of infrastructure investments.

Regarding discretionary tax reductions, the analysis shows they can seriously undermine government credibility. The Bank of Israel Report (2022, page 196) advises that discretionary tax cuts should be deducted from cyclically adjusted deficit targets. This paper also presents an easily implementable mechanism that Israel could adopt. Such rules would prevent policymakers from reducing taxes independently of the prevailing fiscal environment. Further oversight by a fiscal council, currently absent in Israel's institutional framework, could help enforce these constraints.

The credibility costs shown by the simulations make a strong case for amending fiscal rules to strengthen fiscal discipline and enhance long-term economic stability.

Acknowledgments

I am thankful to Benny Bental and participants at the Macro Seminar at Taub Center. I am grateful to two anonymous referees and to the Editor of the Journal for very helpful remarks.

Author Contributions

Not applicable.

Funding

Not applicable.

Competing Interests

The author declare that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed Consent

Obtained.

Ethics Approval

The Publication Ethics Committee of the Redfame Publishing.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and Peer Review

Not commissioned; externally double-blind peer reviewed.

Data Availability Statement

Data is public.

Data Sharing Statement

No additional data are available.

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Appendix A – Model's Solution

The Lagrange equation is:

$$L = MIN \sum_{t=1}^{\infty} \left(\frac{1}{1+r}\right)^{t-1} \frac{Y_t}{2} \left[\rho\tau^2 + \lambda(b_t - \overline{b})^2 H_t + \gamma(g^* - g_t)^2 + \theta(\tilde{\imath}_G - i_t)^2\right]$$

$$+ \eta_{t+i} \left[\sum_{i=0}^{\infty} \left(\frac{1}{1+r}\right)^{t+i} Y_t(g_t + i_t - \tau_t) + (1+r)Y_{i-1}b_{i-1}\right]$$

By substituting equation 2 into the second term we obtain:

$$\sum_{i=0}^{\infty} \left(\frac{1}{1+r}\right)^{t+i} \frac{Y_t}{2} \left[\rho\tau_t^2 + \lambda(b_t - \overline{b})^2 H_t + \gamma(g^* - g_t)^2 + \theta(\tilde{\imath}_G - i_t)^2\right]$$

$$+ \eta_{t+i} \left[\sum_{i=0}^{\infty} \left(\frac{1}{1+r}\right)^{t+i} Y_t(g_t + i_t - \frac{1+r}{1+\mu} b_{t-1} - g_t - i_t + b_t) + (1+r)Y_{i-1}b_{i-1}\right]$$

Assuming $\mu = r$ we obtain:

$$\sum_{i=0}^{\infty} \left(\frac{1}{1+r}\right)^{t+i} \frac{Y_t}{2} \left[\rho\tau_t^2 + \lambda(b_t - \overline{b})^2 H_t + \gamma(g^* - g_t)^2 + \theta(\tilde{\imath}_G - i_t)^2\right]$$

$$+ \eta_{t+i} \left[\sum_{i=0}^{\infty} \left(\frac{1}{1+r}\right)^{t+i} Y_t(b_t - b_{t-1}) + (1+r)Y_{i-1}b_{i-1}\right]$$

The meaning of the second term in this equation is that the government finances all future deficits (reflected in the increase in debt) plus the initial debt. From a maximization perspective, in the parentheses of the second term appear $b_t$and b_{t-1}. As explained, the government solves the problem anew in every period—that is, $t = 1,2,\ldots,\infty$, by deriving this equation with respect to each of the four decision variables. Therefore, when the government solves the maximization problem in period t, it knows that the debt it decides on will appear in the maximization of the next period $(t+1)$. Thus, the derivative with respect to $b_t$also includes the Lagrange multiplier for period $t+1$.

The assumptions used in the simulations are described in the text and in Appendix C.

Appendix B – Simulation Assumptions and Sensitivity Analysis

The implementation of the model requires selecting an appropriate definition of government debt, based on the long-run net debt-to-GDP ratio. Under a budget rule, investment is reduced in the years leading up to period $\bar{t}$, as the rule restricts investment from reaching the desired level. Once period $\bar{t}$I s reached, the budget rule is relaxed, allowing investment to catch up. In the golden rule scenario, the government sets the desired investment level from the start, financing it through higher debt, which results in increased interest payments. However, by excluding investment from the budget deficit constraint, higher investment in infrastructure early on leads to gains that raise GDP levels. Overall, these gains outweigh the higher interest costs, enabling a more rapid decline in the debt-to-GDP ratio.

Since government infrastructure capital is characterized by a low depreciation (for example – highways) we take depreciation rate at 2 percent. The parameter μ translates to 0.0833 in terms of i/k, and I assume it remains constant until the government capital/GDP of 34 percent is achieved.

Concerning assumptions about population growth and productivity, the assumptions shown at the Bank of Israel Report of 2019 (Chapter 1, pages 20-28) are used. According to these assumptions there will be a drop in workers rate of increase of about 1 percent in the long-run; we also expect a drop in productivity due to expected population composition which is tilted toward less human capital.

To be in line with the more optimistic scenario presented at the Bank of Israel I also present simulations under more optimistic assumptions concerning productivity (see below). The rates of growth in the long-run resembles those presented by the BOI team. The following Figures show the expected development of real GDP and the exogenous rate of growth in the long-run in my benchmark scenario. I also show the development of the government capital ratio to GDP after 40 years.

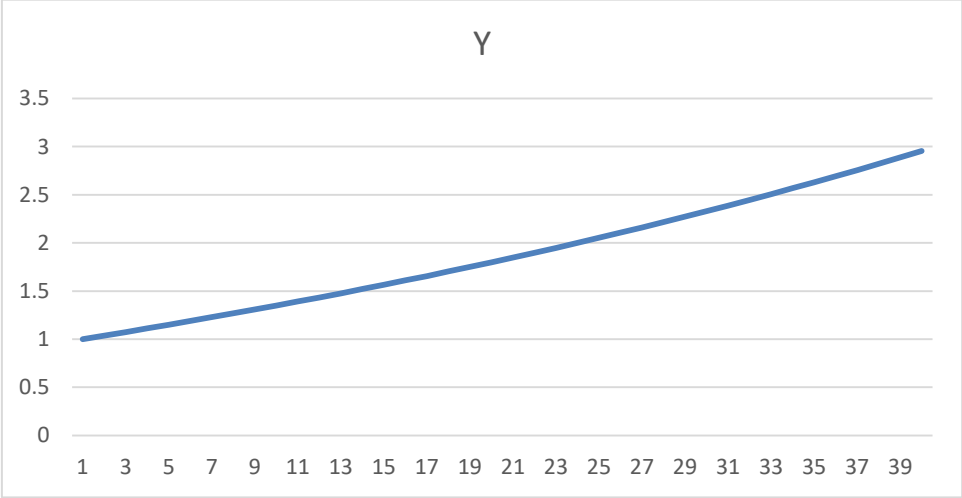


Figure B.1. Real GDP over a 40 year period (initial value = 1)

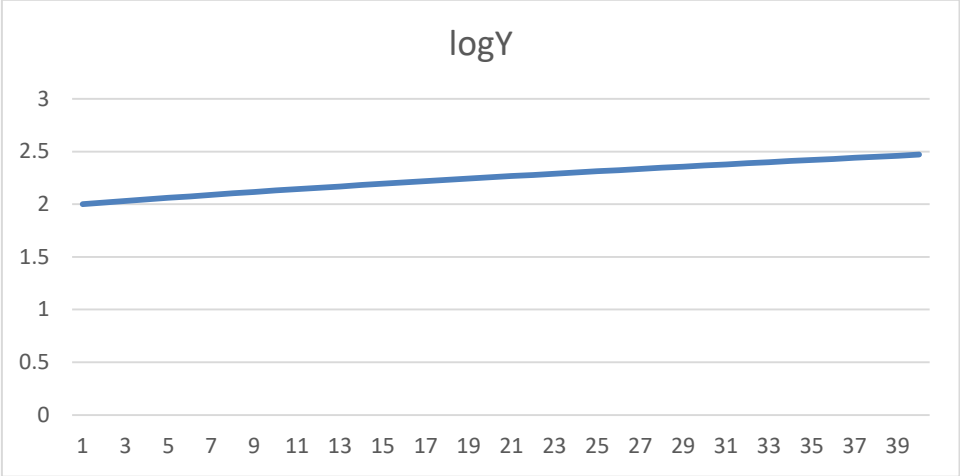


Figure B.2. Log of Real GDP

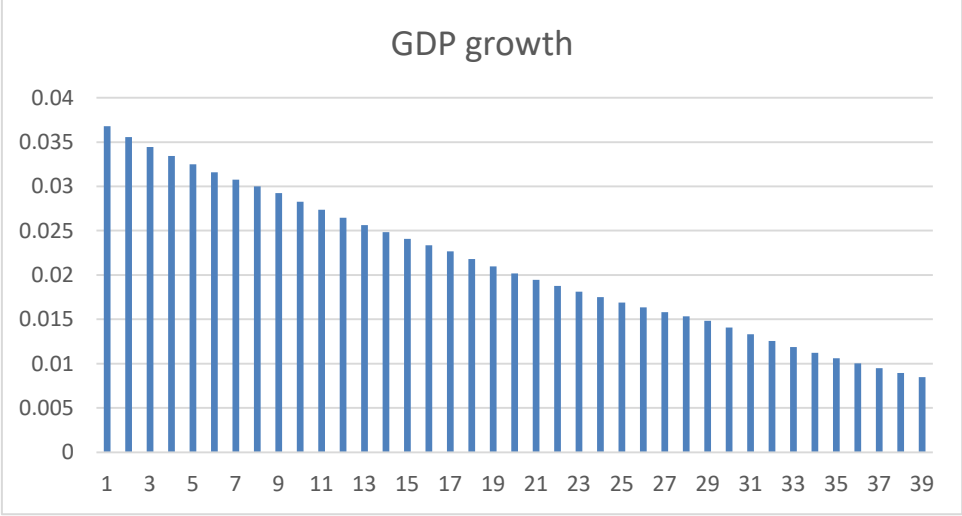


Figure B. 3. Real GDP growth

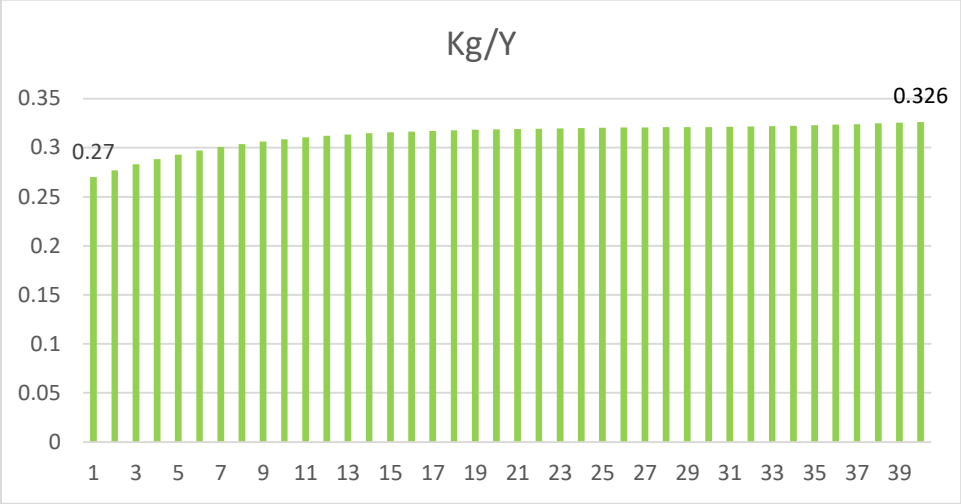


Figure B.4. Government capital ratio to GDP at the Golden Rule Scenario

Assumptions concerning the discretionary tax reductions simulation

Note that the following relationship holds at the optimal smoothed solution:

$$g = g^* - \frac{\rho\tau}{\gamma}$$

The value of government spending, excluding investment, tends to g^*as the taste parameter γapproaches infinity, and it tends to zero as the deadweight cost parameter ρincreases without bound. Therefore, selecting appropriate values for these unobservable parameters in the simulation requires a qualitative analysis.

On one hand, the large-scale protests during the summer of 2011 justify selecting a high value for γ, as demonstrated by public participation. This sentiment was further reinforced by subsequent political decisions to implement an unprecedented tax increase package. It is important to note that g includes both civilian spending—such as health and education—and defense spending, which is roughly three times higher than the average among OECD countries.

The following parameters are used in the simulation:

$$\rho = 1;\ \gamma = 2;\ \theta = 1; g^* = 0.32;\ \tilde{\imath} = 0.04$$

Assumptions concerning Revenue Rule

In the simulation related to statutory tax reductions it is assumed that Israel adopts a similar rule as the one adopted in Netherlands. According to this rule it is assumed in the simulations that the government abolishes tax expenditures related to income tax and to corporate tax.

Sensitivity Analysis: Improved Productivity

In the benchmark scenario it is assumed that a reduction in long-term population growth and a reduction in productivity brings out a low rate of growth in the long run. It is assumed that forecasted pessimistic trends are milder – consistent with the 2018 BOI Report in the scenario of active policy reaction. Following this assumption allows obtaining higher population growth and higher productivity.

Since the government maintains its capital level to catch population growth, the main effect of enhanced productivity growth is on the ratio of government capital to GDP, that decreases in the long run because of the rise in GDP generated by the exogenous productivity improvement (see Figure B.6).

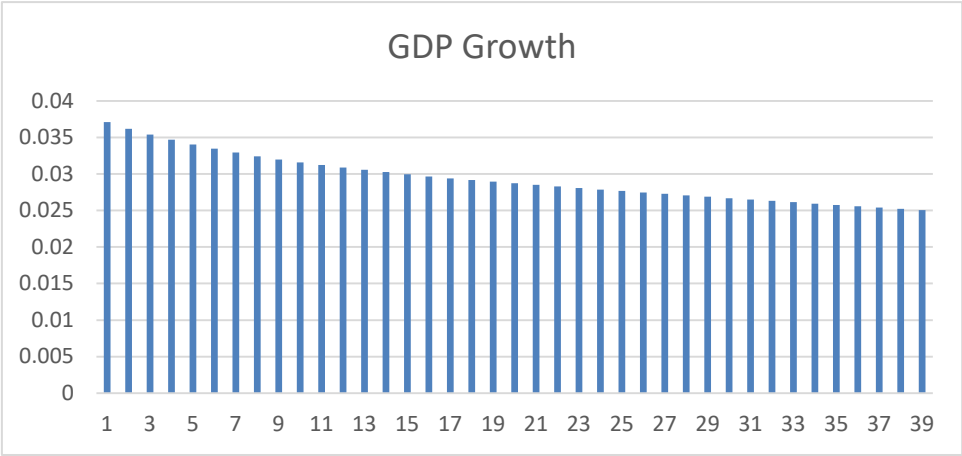


Figure B.5. GDP growth with enhanced productivity

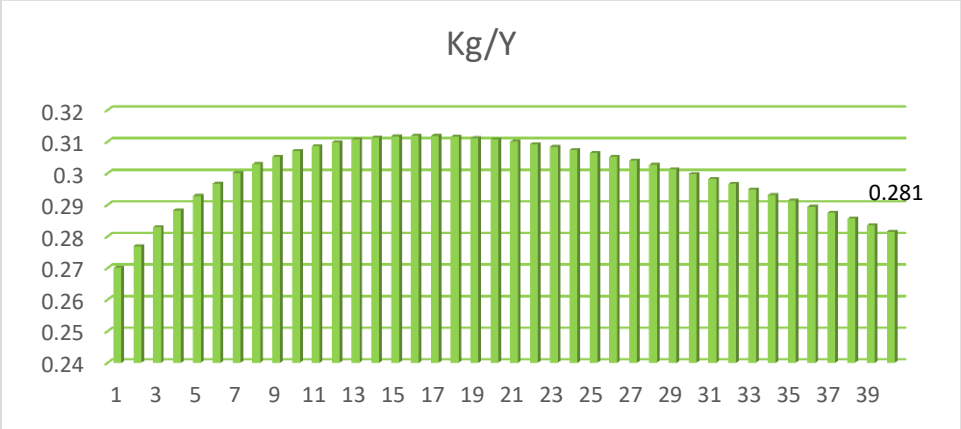


Figure B.6. Government capital over GDP ratio in the enhanced productivity scenario

Appendix C – Revenue Rules

The following table shows the rules applied by countries that adopted Revenue Rules (except Israel).

Table C.1. Rules in countries with Revenue rules + Israel

Country	Balanced Budget Rule	Expenditure Rule	Revenue Rule	Type of Revenue Rule
Australia	1985	1985	1985	Not raise tax revenues as a % of GDP
Belgium	1992	1993	1995	Growth of revenues in line with GDP growth
Denmark	1992	1994	2001	Direct and Indirect taxes cannot be raised
France	1992	1998	2006	Define ex-ante allocation of revenues higher than expected
Lithuania	2004	2008	2008	Excess revenues must be used to reduce the deficit
Netherlands	1992	1994	1994	A tax relief must be compensated by a tax increase
Israel	1992	2007	-	