

CYCLICALITY OF TAX EXPENDITURES: THE CASE OF ISRAEL¹

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Abstract

Tax expenditures have seldom been studied internationally, primarily due to limited data availability. This paper examines the cyclicity of tax expenditures in Israel, a country that has steadily expanded its reliance on this fiscal tool, which now constitutes a significant share of GDP relative to other OECD countries. Using quarterly data from 1986 to 2016, a notable shift is found in the cyclicity of government decisions on tax expenditures after 1997, coinciding with a substantial reduction in government deficits and debt levels. Specifically, tax expenditures became procyclical during economic expansions and countercyclical during recessions. This latter conduct mirrors patterns observed in the literature on government spending in certain developing economies, which have recently "graduated" to implementing countercyclical spending policies during economic downturns.

Key Words – Tax Expenditures, Cyclical Policy.

JEL Numbers– H24, H25 and H62.

¹ I am thankful to Omer Eini and Tagil Tal for superb research assistance; to an anonymous referee of the Journal, to Momi Dahan and David Gliksberg for excellent remarks; and to the IIPF Iceland Conference session organizers (2020) and participants at seminars at the Bank of Israel Research Department and the Law and Public Policy Schools at the Hebrew University of Jerusalem. It is important to stress that one of the reasons for lack of research on tax expenditures at different countries is related to difficulties of calculating them, which requires many detailed assumptions. This research heavily relies on these assumptions, which are carefully explained in the different reports published by the State Revenue Administration at the Ministry of Finance. I am especially thankful to Avi Lavon, who contributed in generating data estimations during the sample, and gently explained to me tax expenditures calculations. All remaining errors are my sole responsibility.

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1. INTRODUCTION

Tax expenditures refer to tax exemptions or benefits provided in specific situations, often tied to addressing market failures—such as short-sightedness in long-term saving—or tackling social welfare and income distribution issues. For example, exemptions in indirect taxation are frequently used to reduce the prices of socially important goods, such as food or fruits and vegetables. In some cases, tax expenditures are part of labor arrangements, such as the advanced training fund, which has been in place in Israel for decades. Additionally, they serve as a vital tool for achieving government objectives, ranging from supporting peripheral populations and fostering the development of new industries to advancing political goals. These features have made tax expenditures an essential instrument of government policy. In fact, data indicate that in OECD countries, tax expenditures have become a quantitatively significant tool (see Figure 1). However, unlike decisions concerning statutory tax rates or direct government spending, tax expenditures are not systematically reported to the public as part of the budget process. This lack of transparency highlights the importance of economic research to evaluate the advantages and drawbacks of using tax expenditures.

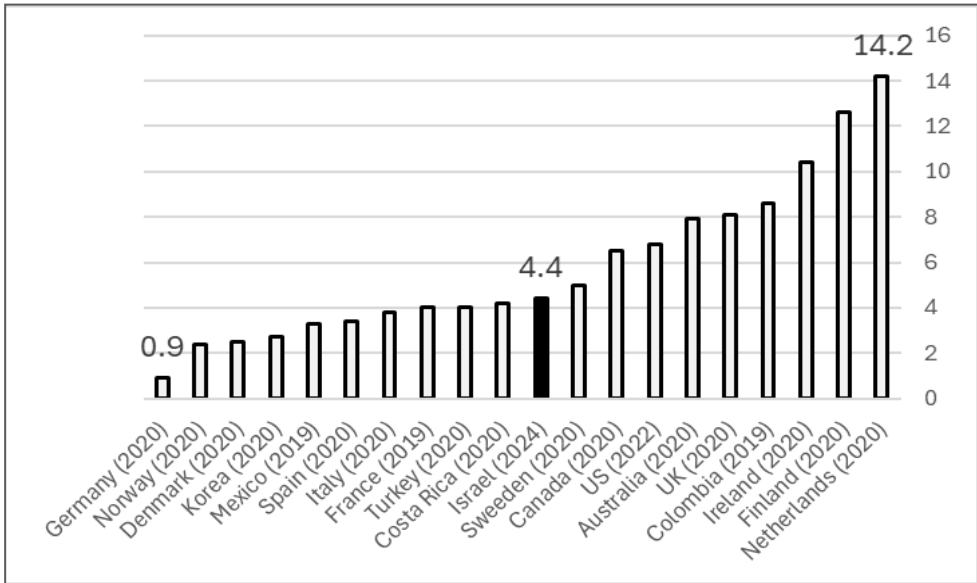
The lack of up to date information and transparency within the budget framework, combined with the absence of a formal commitment to publish and track tax expenditure data, has resulted in a scarcity of empirical research on this issue at the international level. Moreover, governments' failure to commit to transparent reporting of tax expenditures creates an incentive to use them as tools for achieving political economy objectives. Ministers, often influenced by the "common pool" problem, may prefer utilizing tax expenditures to fulfill political commitments discreetly.

This lack of transparency is closely tied to economic cycles. Governments may favor implementing tax expenditures during periods of economic expansion when rising revenues make it easier to obscure the loss of tax income associated with such measures.

Figure 1 illustrates actual total tax expenditures in Israel as a percentage of GDP compared to OECD countries. While the use of tax expenditures varies across nations, Israel stands out as one of the 10 countries that appear in this graph with relatively high reliance on this tool. Countries that use tax expenditures more intensively than Israel include the Netherlands, Finland, Ireland, Colombia, the UK, Australia, the US, Canada, and Sweden. Ten other countries use them less than Israel: Germany, Norway, Denmark, Korea, Mexico, Spain, Italy, France, Turkey and Costa Rica.

This paper is among the first to investigate the cyclicity of tax expenditures on a country-specific basis, utilizing reliable data published by Israel's Ministry of Finance. To analyze this cyclicity, a variable called "decisions on tax expenditures" (TAX_EXP_TOT) is constructed. This variable captures government decisions across five categories of tax expenditures: capital markets, factors of production, and others. For each decision, I adjust the previous level of tax expenditures by adding or subtracting the estimated impact, starting from a baseline of 100 in the first quarter of 1986 (see Figure 2). A detailed explanation of the data and the definition of cycles is provided in Appendix A.

Figure 1
Tax Expenditures in OECD Countries (percent of GDP)

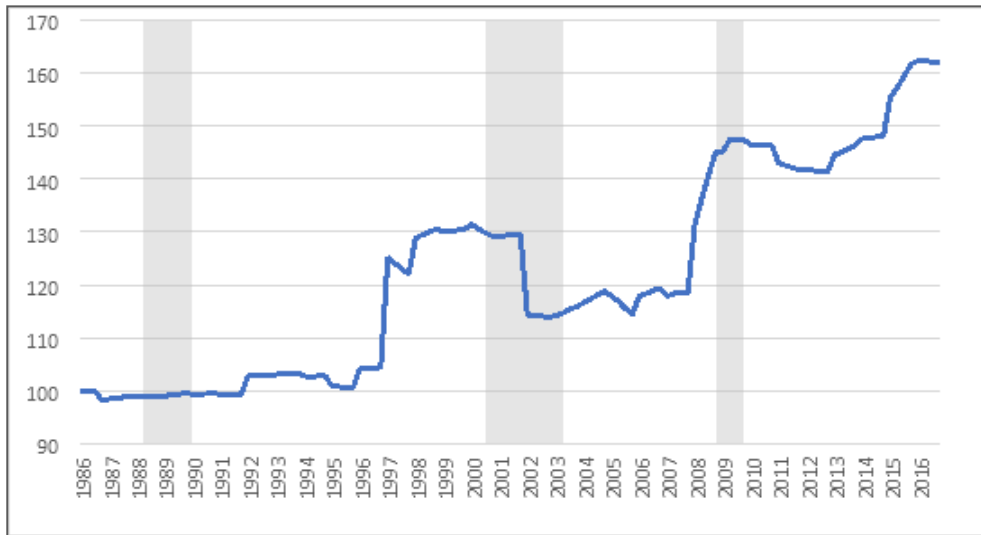


Source: Government Revenues Report (2024), Ministry of Finance.

One clear pattern of total tax expenditures is that during the 2000s, tax expenditures gradually increased in expansions. Thus, beside other reasons that may explain the increase in tax expenditures (like the rise of using them as a tool for achieving political goals or the pressure for correcting externalities), the cyclical reaction of government for using this policy tool needs to be characterized.

To make a characterization of the decisions on tax expenditures along the business cycle, it is necessary to control for explaining factors – as shown in Section 3.

Figure 2
Changes in Tax Expenditures in Israel
(Shaded Areas: Recession Periods²; Index value in 1986=100)



Source: Author calculation based on various issues of Government Revenues Report.

2. LITERATURE SURVEY

a. Tax Expenditures

Swift (2006) presents the basic benchmark of tax expenditures, including the concept and definition, size, effects, and the framework for fiscal accountability and transparency. The basic conclusion of his analysis is that current practices in tax expenditures do not fulfill the desired principles of fiscal accountability and transparency according to the Campos/Pradhan (1996) fiscal accountability model and the IMF's fiscal transparency code. His main finding is that the practices related to tax expenditures in most countries should be strengthened when the main problem is at a very basic level: publication of current decisions and implications.

Redonda and Neubig (2018) present a detailed description of tax expenditures in different countries (G20 and OECD countries). They document that a list of advanced economies report in a current and systematic basis the developments on tax expenditures – including Australia, Austria, Canada, France, Germany, Italy, Netherlands, Korea and Sweden. On the opposite situation, i.e., no systematic report, we find a heterogeneous list of countries including China, Czech Republic, Indonesia, Japan, Luxembourg, Russia, Saudi Arabia and Slovenia. Finally, the vast majority of countries report tax expenditures in a Basic Report

² The dates of cycles follow Flug and Strawczynski (2009).

which does not necessarily have a fixed periodicity. This list of countries includes Belgium, Chile, Iceland, Ireland, Norway New Zealand, UK, US, and many other OECD countries. Israel, which is at the center of the present study, belongs to this group. These authors stress the importance of transparency on this subject, including the need of reassessing tax expenditures in retrospective.

An analysis of the general equilibrium impact of tax expenditures on employers and employees is presented by Zax (1988). He shows that the impact differs according to the decision of the social planner, depending on the implementation that can be or cannot be budget balanced. Lenjosek (2004) analyzes with explicit formulas the distortions created by tax expenditures. One notable distortion comes from market diversion, since the tax expenditure implies an increase in consumption of the benefited product at the expense of a reduction in demand of the substitutes (close or far). This author shows explicit formulae for calculating the distortion. The main formula shows that the distortion increases for products that cause market diversion and is directly related to the ratio between the adopted tax expenditure and the relevant general tax rate. This aspect will be present in the model introduced below as well.

Listokinn (2012) is one of the single papers that investigated qualitatively the relationship between tax expenditures in the US and the business cycles. His analysis differentiates between destabilizing tax expenditures (exclusion for employer-provided health insurance, tax deductibility of mortgage interest, tax expenditure for charitable giving, deductibility of state income tax payments and tax expenditures for investment), tax expenditures with stabilizing or neutral effects (countercyclical expenditures, 401 (k) saving plans and other saving incentives) and standard tax expenditures with phase-outs (standard deduction of income tax, phasing out of programs like EITC). His analysis stresses that tax expenditures belonging to the first group are expected to be exacerbated in expansions, since many of the tax expenditures are subject to the cycle.

Mare, Porcelli, and Bidolli (2024) recently studied the impact of tax expenditures among Italian municipalities, developing a composite indicator that captures dimensions of progressivity, relevance, and territorial equity. Their findings highlight significant potential for rationalizing both the number and size of tax expenditures, as well as a notable correlation between the geographical distribution of certain tax expenditures.

Similarly, Aliu and Redonda (2024) analyzed social tax expenditures in both advanced and developing economies. They emphasize the importance of integrating tax expenditure transparency into the budget cycle, and advocate for fostering active discussions on social tax expenditures to ensure a sustainable and well-informed decision making process.

b. Cyclicity of Fiscal Policy: Spending and Statutory Taxes

Over the past two decades, significant research has focused on the cyclicity of fiscal policy, primarily examining government spending and budget deficits. This body of work documents an asymmetric pattern in OECD countries, characterized by increased spending during

recessions that is not reversed during economic expansions (Hercowitz and Strawczynski, 2004a). Lane (2003) further demonstrates that fiscal policy in many advanced economies tends to be counter-cyclical. In contrast, developing economies often exhibit highly procyclical spending patterns, with expenditures rising during expansions and contracting during recessions (Gavin and Perotti, 1997; Strawczynski and Zeira, 2011). Brender (2021) corroborates this pattern for Israel, showing that the cyclically adjusted budget deficit operated procyclically between 1998 and 2016. However, recent studies have highlighted an improvement, or "graduation," in spending policies among developing countries, with reduced procyclicality (Frankel, Vuletin, and Vegh, 2013).

Regarding taxation, research has historically been limited due to the lack of data on statutory tax changes, tax exemptions, and tax expenditures. Recently, however, several studies have explored this topic. Vegh and Vuletin (2015) find that taxation policy in advanced economies is generally acyclical, except for indirect taxes, which are adjusted procyclically. Strawczynski (2015) supports this conclusion, using detailed data on various taxation channels in Israel. Interestingly, similar to the trends observed in deficits and spending, there appears to have been an improvement in the procyclicality of statutory tax rates after the 2000s. Srebrnik and Strawczynski (2014) show that, in a sample of developing economies, the procyclicality of tax rates decreased in nations with high external debt. They propose that high external debt provides a possible mechanism driving more prudent fiscal policy implementation.

c. Political Economy Considerations

Cyclical biases arise from increasing deficits driven by tax reductions, higher government spending, or growth in tax expenditures. According to the literature on cyclical bias, this phenomenon is often associated with weak governments. Since the seminal work of Roubini and Sachs (1989), it has been widely recognized that weak coalitions tend to raise debt, particularly during favorable economic cycles. Subsequent studies, such as Von Hagen and Harden (1995), have developed frameworks to explain how political forces incentivize ministers to create deficit biases.

Two points from this literature are particularly relevant to this paper:

- i) Political variables will be included as explanatory factors for tax expenditures.
- ii) All three budgetary tools—tax expenditures, government spending, and taxation—will be incorporated into the empirical analysis, with government spending used as a control variable.

Another related issue is the tendency of politicians to overlook the importance of long-term considerations when designing fiscal policy. International credit rating agencies play a critical role in addressing this issue by rating governments worldwide and constraining politicians' attitude to disregard future generations. These agencies emphasize the

significance of deficits and debt, as these variables reflect how the consequences of current policies are transferred to future generations.³

3. TAX EXPENDITURES IN ISRAEL

There are several categories of tax expenditures that were mostly historically created and rarely abolished. Tax expenditures in Israel can be classified into four categories (beside "other"):

- i) Capital Market Tax Expenditures (TAX_EXP_CAP) – including Pension Funds (exemptions at deposit and funding with further tax exemptions with withdrawal); Advanced Training Funds (6 years savings that benefit from income tax exemptions); Interest payment exemptions; Workers' options in capital savings program. This category is shown in Appendix C.
- ii) Factors of Production Tax Expenditures (TAX_EXP_FOP) – Capital Investment Stimulus Law (general program in the periphery and an alternative program that stimulates employment); Research and Development exemptions; Oil Discoveries; Movies; Security Workers; Accelerated Capital Depreciation.
- iii) Indirect Tax exemptions (TAX_EXP_VAT) – Custom duties and VAT exemptions; historically the first group includes exemptions for immigrants, Returning Home Program, safety parts for cars, tourist exemptions; VAT exemptions includes VAT in Eilat (vacation city), fruits and vegetables, tourism, Internet purchases.
- iv) Welfare Tax expenditures (TAX_EXP_WELFARE) – exemptions for NGOs, Exemptions for National Institute allowances, income tax exemptions for immigrants, income tax exemptions for the disabled, income tax reductions for workers living in the periphery, income tax reductions for workers in the Defense Sector and others.

By looking at the development of all four categories, it is possible to see that the development in the different items is quite heterogeneous, and in many cases (such as welfare) they were determined historically, remaining relatively constant since then. A common factor for all categories is that during recessions the tax expenditures were not increased, while most jumps occurred during expansions.

In Appendix C, I show the number of decisions taken in each of the categories and the specific decisions taken under the category TAX_EXP_CAP.

Tax expenditures and expected cyclical behavior

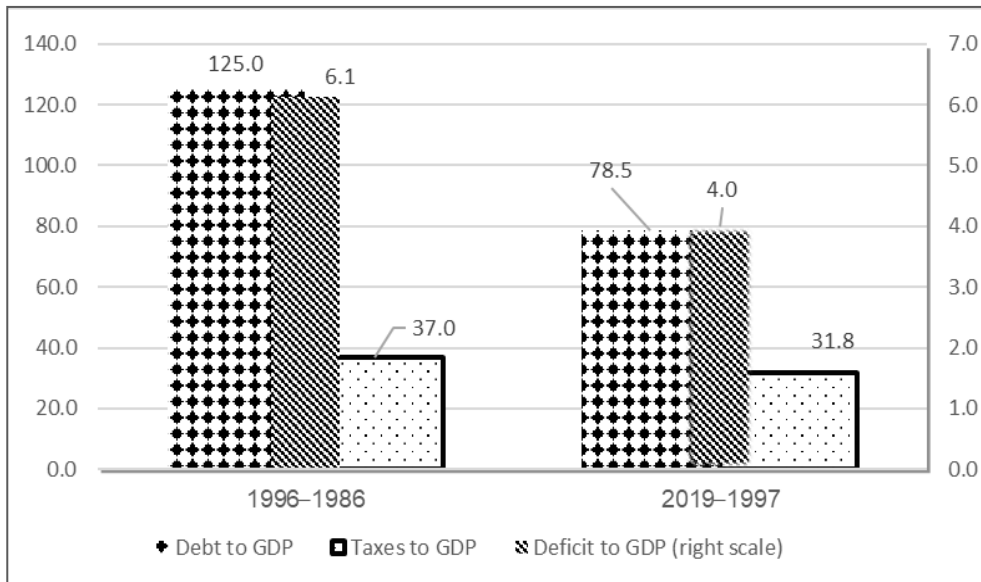
In the 1980s, Israel faced an economic crisis marked by large deficits in both the balance of payments and the government budget, along with hyperinflation, which peaked in 1985.

³ A recent analysis that is focused on the case of Israel is presented by Michelson and Stein (2021).

Strawczynski and Zeira (1999) show that following the 1985 Stabilization Plan, there was a reduction in procyclicality. Later, using a more recent dataset, Mehl (2017) finds that fiscal policy became progressively less procyclical after 1985, eventually becoming acyclical after 2009. This finding aligns with the results of Frankel, Vegh, and Vuletin (2013) for developing economies.

In Appendix D, a formal test is conducted, following the methodology of Gregory and Hansen (1986), to examine whether there was a shift in fiscal policy regime after the 1985 Stabilization Plan. The results suggest that the conduct of tax expenditures in response to GDP changed after 1997. As shown in Figure 3, both the domestic deficit and total debt significantly decreased from 1997 to 2016 compared to the period from 1986 to 1996. It is important to note that in this figure, the domestic deficit is used, as the total deficit includes US defense aid, which, according to existing rules, must be spent primarily on US defense products and is therefore considered exogenous. Additionally, taxes to GDP were substantially reduced from 37 percent of GDP to 32.2 percent.

Figure 3
Fiscal Aggregates after 1997



Source: Bank of Israel Annual Report (statistical appendix).

In the years immediately following the 1985 Stabilization Plan, and to a lesser extent during the 1990s, there was little awareness among governments of the need for fiscal consolidation. This created a situation in which politicians were reluctant to reduce tax expenditures. As shown in Table 1, before 1997, the number of tax expenditure reductions

was relatively low (10 during expansions and 0 during recessions) compared to the period after 1997 (22 during expansions and 7 during recessions), when there was greater awareness of the need for fiscal consolidation.

Regarding tax expenditure additions, it is important to note that when the government's deficit and debt are high, rating agencies threaten to downgrade the country's credit rating, limiting the government's ability to make policy decisions. Before 1997, when Israel's deficit and debt were high, this constraint influenced government decisions during recessions. In these periods, the budget deficit and debt increased as tax revenues declined, making it difficult to implement counter-cyclical policies. Therefore, after 1997, we expect to see more tax expenditure additions during recessions than before, as shown in Table 1. This shift provided the government with an opportunity to pursue countercyclical fiscal policies, a point that will be further examined in the next subsection after controlling for all relevant variables.⁴

Table 1
Tax expenditure additions and reductions along the business cycle

		ADDITIONS	REDUCTIONS
Expansions	Before 1997	4 (15)	10 (31.2)
	After 1997	23 (85)	22 (68.8)
	TOTAL	27	32
Recessions	Before 1997	1 (33)	0 (0)
	After 1997	2 (67)	7 (100)
	TOTAL	3	7

Source: Government Revenues Report, Ministry of Finance.

During expansions, while a low deficit "covers" fiscal misconduct⁵, there is an opportunity to correct the deficit bias and consequently in the period when debt and deficits were high – the government was forced to reduce tax expenditures. In contrast, after 1997, when government deficits and debt decline, there is a political opportunity to increase tax expenditures.

A possible interpretation for the change in behavior after 1997 is that when the government decides to go for a fiscal consolidation—the task is achievable.⁶ This also means avoiding high expenditure increase in expansions, order to avoid an increase in the structural

⁴ Frankel, Vegh and Vuletin (2013) show that developing economies "graduated" after improving institutional quality and reducing their debt. In expansions, a low deficit and a low debt actually allow for procyclical behavior.

⁵ For a characterization of government conduct in advanced economies during the cycle see Hercowitz and Strawczynski (2004a). Balassone, Francese, and Zotteri (2010). and Strawczynski (2015).

⁶ See Brender (2007).

deficit that would jeopardize its ability to control deficits.⁷ The increased desire of keeping the deficit low after 1997 (surely compared to the period before 1985)⁸ allows me to think a priori about a possible change in conduct after 1997. In fact, Appendix E shows a model that characterizes such a policy framework. In order to check the viability of these thoughts, we turn in Subsection 4 to an econometric analysis, which controls for all relevant variables.

4. ECONOMETRIC ANALYSIS

a. Data

The data used is for the period 1986:Q1 until 2016:Q4. Concerning tax expenditures, I build an index that rises or declines each time a government's decision on tax expenditures takes place. The quantification of such change is based on the weight of the specific item that reflects the decision (the categories shown in figures 2 to 6, including also "other") and the item being changed. A detailed description is available at Appendix A.

The explained variable in the econometric analysis will be denominated `tax_exp`. This variable is built in the following way: each time that a tax expenditure decision is taken (abolished) we add (reduce) the proportional amount of this decision as estimated by the Ministry of Finance to the series level, which is fixed at 100 at the beginning of the sample. Since we apply the weight of the relevant category, `tax_exp` evolves according to actual decisions.

b. Granger Causality

I aim to examine the causality between tax expenditures and GDP under different cyclical conditions, with a particular focus on the short run, using rates of change (`dlog`). As explained below, the analysis will differentiate between two periods: before and after 1997. In the first part of Table 2, I assess whether there is causality before 1997 between `dlog(GDP)`, denoted as `GDP_FP`, and `dlog(tax expenditures)`, denoted as `TAX_EXP_TOT`. The results show a distinct pattern of causality when comparing recessions (symbolized by `1-D_CH_GDP`) and expansions (symbolized by `D_CH_GDP`), with causality running from GDP to tax expenditures in both cases. However, during recessions, causality is observed over a very short span, with significance only for two lags. In contrast, during expansions, significance is found only for 9 lags, or approximately 2 years and 1 quarter. This finding is consistent with the fact that expansions typically last longer than recessions.

In the second part of Table 2, the causality tests are repeated for the period after 1997. As in the earlier period, we observe better outcomes for short lags during recessions, while long lags are necessary during expansions. Although the results for recessions are significant, for

⁷ For a description of this point see Hercowitz and Strawczynski (2004b).

⁸ On the change that happened after 1985 see Strawczynski and Zeira (1999).

expansions, no significance is found at the 10 percent level. While the causality tests provide partial evidence of cyclical relationships, in the next subsection, I perform regressions that control for additional factors, allowing a more comprehensive examination of the correlation between tax expenditures and the explanatory variables.

Table 2
Granger Causality Tests

Total Tax Expenditures Decisions, Before 1997				
	Dlog(gdp_fp)*(1-d_ch_gdp); 2 Lags		Dlog(gdp_fp)*d_ch_gdp; 9 Lags	
Variable	This Variable does not cause log(Tax_Exp_Tot)	dLog(Tax_Exp_Tot) does not cause this Variable	This Variable does not cause dlog (Tax_Exp_Tot)	dLog(Tax_Exp_Tot) does not cause this Variable
Probability	0.044**	0.83	0.053*	0.32
Total Tax Expenditures Decisions, After 1997				
	Dlog(gdp_fp)*(1-d_ch_gdp); 2 Lags		Dlog(gdp_fp)*d_ch_gdp; 9 Lags	
Variable	This Variable does not cause dlog(Tax_Exp_Tot)	Dlog(Tax_Exp_Tot) does not cause this Variable	This Variable does not cause dlog(Tax_Exp_Tot)	Dlog(Tax_Exp_Tot) does not cause this Variable
Probability	0.016**	0.18	0.38	0.61

c. Empirical evidence

The following regression reflects the main question asked in this paper for obtaining empirical evidence (expressed in rates of change):

$$(1) \text{dlog}(\text{tax exp}) = \alpha_0 + \alpha_1 \text{cycle} + \alpha_2 \text{cycle} * \text{after} + \alpha_i X_i + \varepsilon$$

Where, as explained above, cycle will be symbolized by D_CH in expansions and (1-D_CH) in recessions; after represents a possible change in behavior during the 2000s; X represents several control variables that can be seen in the tables presented in Appendix B; and ε is the residual. Note that according to this setup we are interested in the sign and in the size of α_1 , as compared to α_2 . In particular, we will check whether α_1 in expansions (D_CH) is negative and α_2 is positive. In regressions that are run for recessions (1-D_CH) we expect that α_1 is positive and α_2 is negative. According to the theoretical model, we do not have a specific hypothesis about the sum of these coefficients. It is important to stress that the government has different tools for performing cyclical policy: tax expenditures, statutory tax rates and expenditure items. Thus, it is crucial to control for all other tools—namely, statutory taxes and government spending. Note that these variables are part of X: statutory taxes appear both as a composite tax rate and through the corporate tax rate; government expenditure

appears through the most accepted exogenous variables, as used in many papers that cope with cyclicity of government tools: education and defense expenditure, population increase, population under 15 years old and beyond 65 years old, political variables and immigration.⁹ Empirical evidence will be checked in the following subsections under alternative frameworks. Through the different columns I will show regressions that gradually conduce to full implementation of equation 1. In order to choose the right year for the variable I check in Appendix E all relevant years, by looking at the ADF of a possible change in the cointegration relationship.¹⁰

4.1 *A Plain Cointegration Approach*

In this section, I analyze the cyclicity of tax expenditures using a model that accounts for long-run relationships with the explanatory variables. Appendix B presents the definitions and ADF tests for unit roots of the variables included in the analysis. The long-run regressions are also detailed in Appendix B, where different specifications for explaining $\log(\text{tax expenditures})$ are considered.

Following Engle and Granger, I test whether the lagged residual is significant in the short-run regressions, which are presented in Tables 3 and 4. In Table 3, a straightforward approach is used to examine the short-run behavior based on the simplest specification of equation 1. The results show that the residual is significant in all specifications, supporting the conclusion of a cointegration relationship. The regressions exhibit a substantial R-squared in the preferred specification (column 3), and the Durbin-Watson (DW) statistic indicates no serial correlation.

Regarding cyclicity, the only regression with statistically significant results is shown in column 3. The findings indicate that, during expansions, tax expenditures were countercyclical before 1997 and became more procyclical afterwards (i.e., the sum of the coefficients is positive). During recessions, tax expenditures were procyclical after 1997 and countercyclical prior to that, a result consistent with the "graduation" story.

⁹ For a paper about Israel see Strawczynski (2014); and for papers using international data, see Ilzetski and Vegh (2008). For immigration I follow the approach of Flug and Strawczynski (2009).

¹⁰ This approach is explained in Strawczynski and Zeira (1999).

Table 3
Cointegration approach

Explaining Variables	Explained variable: dlog(TAX_EXP_TOT)		
	(1)	(2)	(3)
C	0.02 (0.02)	0.03 (0.02)	0.006 (0.02)
DLOG(GDP_HPTREND)	1.9** (0.7)	1.91** (0.8)	3.1** (1.3)
DLOG(EDUCATION)	-0.25*** (0.09)	-0.25*** (0.09)	-0.28** (0.1)
DLOG(DEFENSE)	0.11 (0.09)	0.11 (0.09)	0.09 (0.07)
DLOG(IMMIGRATION)	-0.004 (0.02)	-0.01 (0.02)	0.003 (0.01)
DLOG(POP_UNDER15_ABOVE64)	-3.9** (1.7)	-3.7** (1.7)	-3.5* (2.0)
DLOG(POP_THOUSAND)	-2.4 (1.6)	-2.6 (1.6)	-2.8* (1.6)
COALIT_LISTS	0.005** (0.002)	0.005** (0.002)	0.005** (0.002)
COALIT_MEMBERS	-0.0006** (0.0002)	-0.0006** (0.0002)	-0.0005** (0.0002)
DLOG(GDP_FP)*(D_CH_GDP)		-0.14 (0.11)	-0.4** (0.15)
DLOG(GDP_FP)*(1-D_CH_GDP)		0.04 (0.27)	0.63** (0.3)
DLOG(GDP_FP)*(D_CH_GDP)*AFTER_1997			0.54*** (0.2)
DLOG(GDP_FP)* (1-D_CH_GDP)*AFTER_1997			-0.85** (0.35)
TTT_TOT(-1)	-0.2*** (0.06)	-0.21*** (0.06)	-0.23*** (0.09)
Adj R ²	0.11	0.11	0.15
Durbin-Watson	1.94	1.98	1.89

4.2 *TSLS Analysis*

Given possible endogeneity between GDP and tax expenditures we repeat the analysis using the world trade as an instrumental variable for GDP.¹¹ Since Israel is a small open economy, I expect the world trade to be correlated to GDP but not with tax expenditures. Thus, I include world trade as an instrumental variable for GDP. Appendix B shows the long-run regressions where $\log(\text{world trade})$ acts as an instrumental variable for $\log(\text{GDP})$. While that table shows that ADF is not always significant, note that lagged residuals in the short-run regressions are significant (Table 4), and the R squared and DW statistic show normative values. Again, results are significant only in column 3—under a similar pattern: counter- and procyclical tax expenditures in expansions and recessions respectively before 1997; and pro and countercyclical in expansions and recessions, respectively, after 1997.

4.3 *Deviations from HP-filtered trend*

It is well-known that an analysis of cyclical effects shall consider two alternative definitions of GDP cycles: GDP rates of change and GDP levels. This is because the transition from a negative to a positive GDP growth reflects transition from a recession to an expansion under GDP changes definition; in contrast, in levels we shall wait for additional positive GDP changes until it is above the GDP trend, which may take many additional quarters.¹² Table 5 shows results for deviations from HP-filtered trend. The pattern of cyclicity before and after 1997 remains similar.

4.4 *A Pseudo-Panel*

Following the methodology explained by Strawczynski (2014), I build a pseudo-panel for both statutory taxes and tax expenditures, with the purpose of comparing the strength of the use of these tools along the cycle. Results are reported in Appendix E. I found a stronger response of statutory taxes, which respond procyclically to the cycle, as found by Strawczynski (2014). This result was significant for expansions before 1997 and for recessions after 1997. For tax expenditures I found procyclicality in recessions before 1997 and a countercyclical reaction after 1997—similarly to the results above. However, the strength of the reaction is much lower than the one for statutory taxes, a result that survives a Wald test with 1 percent significance.

¹¹ Ilzetski and Vegh (2008) stress the importance of considering endogeneity as a possible drawback of an OLS regression. They recommend using the income of trade partners as an instrumental variable.

¹² For a graphical explanation see Flug and Strawczynski (2009).

Table 4
TOLS approach

Explaining Variables	Explained variable: dlog(TAX_EXP_TOT)		
	(1)	(2)	(3)
C	0.05** (0.02)	0.04*** (0.016)	0.03 (0.02)
DLOG(GDP_HPTREND)	1.42 (1.34)	1.6 (1.2)	2.3** (1.1)
DLOG(EDUCATION)	-0.11*** (0.04)	-0.12** (0.04)	-0.1** (0.05)
DLOG(DEFENSE)	0.06 (0.09)	0.03 (0.07)	0.09 (0.09)
DLOG(IMMIGRATION)	0.09*** (0.03)	0.08*** (0.03)	0.07** (0.03)
DLOG(POP_UNDER15_ABOVE64)	-6.0* (3.1)	-4.7** (2.1)	-3.5* (2.0)
DLOG(POP_THOUSAND)	-3.3 (2.1)	-3.5* (1.8)	-3.7** (1.7)
COALIT_LISTS	0.006* (0.003)	0.005* (0.0027)	0.005** (0.002)
COALIT_MEMBERS	-0.0006** (0.0002)	-0.0006*** (0.0002)	-0.0005*** (0.0002)
DLOG(GDP_FP)*(D_CH_GDP)		-0.24** (0.12)	-0.43*** (0.16)
DLOG(GDP_FP)*(1-D_CH_GDP)		0.16 (0.25)	0.72** (0.3)
DLOG(GDP_FP)*(D_CH_GDP)* AFTER_1997			0.35** (0.18)
DLOG(GDP_FP)* (1-D_CH_GDP)*AFTER_1997			-0.7* (0.4)
TTT_TOT(-1)	-0.39** (0.18)	-0.35*** (0.17)	-0.3* (0.17)
Adj R ²	0.11	0.11	0.13
Durbin-Watson	2.0	2.0	2.0

* including AR terms (not reported) that were included to avoid autocorrelation.

Table 5
Short run regression under TSLS approach – deviations from trend

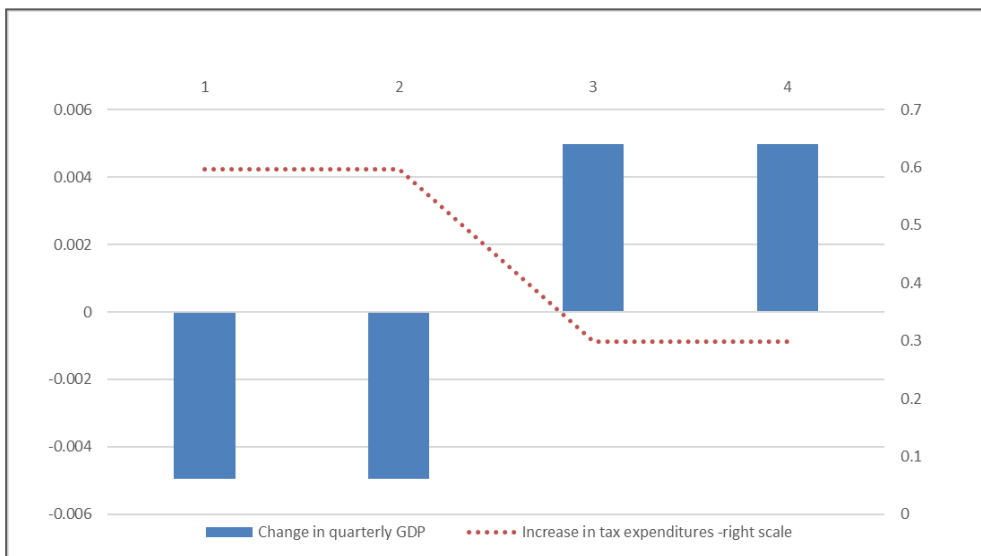
	dlog(TAX_EXP_TOT)		
	(1)	(2)	(3)
C	0.003* (0.14)	0.03*** (0.01)	0.02** (0.01)
GDP_dif	0.0002 (0.0005)		
DLOG(EDUCATION)	-0.05 (0.06)	-0.12 (0.08)	-0.11 (0.09)
DLOG(DEFENSE)	-0.03 (0.08)	0.01 (0.07)	0.004 (0.08)
DLOG(IMMIGRATION)	0.004 (0.02)	0.02 (0.02)	-0.07** (0.04)
DLOG(POP_UNDER15_ABOVE64)	-2.3 (1.6)	-2.1 (1.5)	-1.1 (1.4)
DLOG(POP_THOUSAND)	0.3 (0.8)	-0.23 (0.9)	-1.6 (1.0)
COALIT_MEMBERS	0.0002* (0.001)	-0.0003*** (9.6E-05)	-0.0003*** (0.0001)
(GDP_dif)*(GDP_D)		-0.01 (0.0008)	-0.002** (0.001)
(GDP_dif)*(1-GDP_D)		0.002*** (0.0006)	0.003** (0.016)
(GDP_dif)*(GDP_D)*AFTER_1997			0.002** (0.001)
(GDP_dif)*(1-GDP_D)*AFTER_1997			-0.004** (0.002)
Adj R ²	0.02	0.04	0.03

The instrumental variables include the variables with a lag; the instrumental variable for GDP is WT (deviations from trend). Auto-regressive terms are included as far as we get significant contribution (4 terms).

4.5 A simulation

One question that arises in the practical implications of the model is: how is it possible to have a policy that increases the deficit in both phases of the cycle? Is this pattern explosive? To check this issue, I run a full-cycle simulation, which includes a representative recession and expansion, according to data in Israel for the period after 1997. The following is the result of the simulation:

Figure 4
A Full-Cycle Simulation of Changes in Tax Expenditures (in NIS billion)



It turns out that a full-cycle increases expenditure by NIS 1.8 billion, which is equivalent to NIS 180 million per year, given that a full cycle takes place once in every 10 years. The average cut in spending by the government in the period 2007–16 was NIS 1.7 billion¹³, which implies that the needed cut is 10.6 percent of a typical yearly decision. In other words, the quantitative impact of this policy is quite moderate. As an example, I describe the cut performed in 2011 for increasing funds to the Fireguards Division in Israel: NIS 125 million cut in Defense, NIS 55 billion in the Ministry of Interior, NIS 30 million at the Prime Minister Office, and NIS 66 million and NIS 19 million in Education and Foreign Affairs, respectively. In other words, the needed cut is equivalent to the cut performed in security (defense and interior). These figures testify that the needed cut to re-balance the budget is affordable.

¹³ See Bank of Israel Report of 2018, Figure 6.5 in Chapter 6.

5. SUMMARY AND CONCLUSIONS

This paper analyzes tax expenditures in Israel from 1986 to 2016. The literature generally indicates that many countries, particularly in developing economies, tend to adopt procyclical fiscal policies during both expansions and recessions. Additionally, it documents that the nature of cyclical policy during recessions depends on the fiscal space available for implementing counter-cyclical measures. Due to a significant reduction in external debt in developing economies, Frankel, Vuletin, and Vegh (2013) show that certain developing economies shifted their fiscal policy pattern, achieving what they call "graduation", a move from highly procyclical spending to a more balanced policy during recessions.

To examine the pattern of tax expenditure implementation in Israel across economic cycles, four different frameworks are employed to assess cyclicity: a simple cointegration analysis using GDP growth rates, a two-stage analysis using world trade as an instrumental variable, a framework that separately analyzes four categories of tax expenditures, and an analysis of the sensitivity of cyclicity to GDP levels (deviations from trend). The results consistently show procyclical behavior during expansions after 1997, as well as signs of countercyclical behavior during recessions—an important shift compared to the predominant pattern observed between 1986 and 1996. These findings align with the documented cyclicity in statutory tax rates policy observed in developed economies. Furthermore, the transition from procyclical to countercyclical policy in recessions has been mainly documented for developing countries in the literature.

APPENDIX A – DATA

TAX EXPENDITURES

Tax expenditure data is based on the yearly data provided by the Ministry of Finance. It is important to understand that the computation of tax expenditures has a complicated methodology, and it is not trivial to estimate them. For example, a benefit on a personal tax on pensions requires a counterpart in order to calculate the benefit amount. This means that in this example there is a need to choose the relevant marginal rate to compare – which requires a detailed methodology. Moreover, from time to time the Ministry of Finance adds a previously uncovered exemption to the database.¹⁴

In order to build the explained variable, we start with a value of 100 at the basis quarter (1986:Q1). Then, this index changes according to decisions about tax expenditures taken by the government. In quarters where such decisions are not taken, the index remains constant. The computed change is based on the items where the decision took place – using the weight of this item. This method assures that our explained variable is related straightforward to the government decisions. Note that the jump that occurred in 2008 is related to the category "other", which includes various tax exemptions that are not included in the categories described below (see explanation in Appendix C).

CYCLES

I follow the conventional approach in cycles literature and use two alternative definitions: I) based on rates of change of GDP - higher than sample average rate of change in expansions and lower than sample average rate of change in recessions; and II) based on GDP levels – higher than GDP HP filtered trend in expansions and lower than HP-Filtered trend in recessions.

Since cycles can be endogenous to changes in tax expenditures, I follow Ilzetski and Vegh (2008) methodology using the world trade as an instrumental variable.

Concerning the dependent variable, I always keep the rates of change approach, since we are interested on checking the short-term government's behavior.

¹⁴ For example, in 2007 the Administration started to compute fringe benefits given by employers to employees. Note that this decision does not affect the analysis, since this change does not affect the dependent variable in our analysis. Having said that, a dummy variable was constructed that takes the value of 1 when such change was performed and 0 otherwise (CALC_CH_TOT). I tried including this variable in the regressions (unreported) and as expected it was not significant in any regression.

APPENDIX B – UNIT ROOT TESTS AND COINTEGRATION EQUATIONS

Table B.1
Unit Root Tests

Variable	Definition	ADF Test – Akaike Criterion			ADF Test – Schwartz Criterion		
		Level (P-Value %)	1st Difference (P-Value %)	Conclusion	Level (P-Value %)	1st Difference (P-Value %)	Conclusion
TAX_EXP_TOT_IND2	Total tax expenditures index in constant prices	18.7	0.0	I(1)	28.8	0.0	I(1)
GDP_FP	Total GDP in constant prices	100.0	1.8	I(1)	99.9	0.0	I(1)
EDUCATION	Education Spending as a percent of GDP ¹⁵	59.9	0.0	I(1)	77.8	0.0	I(1)
DEFENSE	Defense expenditure as percent of GDP	93.3	0.049	I(1)	89.0	0.0	I(1)
POPULATION	Total Population	99.5	0.0	I(1)	99.5	0.0	I(1)
WT	World Trade Index	100.0	51.0	I(2)	100.0	51.0	I(2)
IMMIGRATIO N ¹⁶	Immigrants Effective Human Capital Stock	59.2	0.0	I(1)	59.2	0.0	I(1)
POP_UNDER15_ABOVE64	Share of Population above 64 years old	100.0	78.0	I(2)	100.0	78.1	I(2)

¹⁵ For a paper that explains education spending in Israel see Strawczynski and Zeira (2003).

¹⁶ See Flug and Strawczynski (2009).

GDP_HP	Share of population below 15 years old	100.0	69.0	I(2)	100.0	89.0	I(2)
COALIT_LISTS	Number of Coalition lists	0.0	0.0	I(0)	0.0	0.0	I(0)
COALIT_MEMBERS	Number of members in the coalition	0.0	0.0	I(0)	0.0	0.0	I(0)

Source: Bank of Israel Report (statistical appendix) and Knesset report on government.

Table B.2
Cointegration Analysis: Plain Approach

Explanatory Variables	Dependent Variable: log(TAX_EXP_TOT_IND2)		
	(1)	(2)	(3)
C	20.6*** (7.25)	18.87*** (6.78)	24.1*** (7.3)
LOG(GDP_HPTREND)	0.98*** (0.35)	1.22*** (0.45)	1.3*** (0.37)
LOG(IMMIGRATION)			0.05*** (0.01)
LOG(POP_UNDER15_ABOVE64)	-2.15*** (1.03)	-2.27** (1.1)	-5.33*** (1.45)
LOG(POP_THOUSAND)			1.66** (0.71)
LOG(EDUCATION)	-0.48*** (0.16)	-0.28* (0.15)	-0.2 (0.14)
LOG(DEFENSE)	-0.17 (0.12)	-0.1 (0.12)	0.24 (0.15)
@TREND(1986Q1)	0.05 (0.03)	-0.03 (0.05)	-0.09 (0.06)
@TREND(1986Q1)^2		3E-05 (1.9E-05)	0.0001*** (2.7E-05)
Adj R ²	0.36	0.38	0.51
ADF	-3.45	-3.3	-4.13

The following is an explanation for the use of the explaining variables:

GDP_FP: GDP measured in real terms. This variable serves for assessing the economic cycles.

Education: As education in Israel is provided in the form of a public good (with freely provided education until high school), it is considered as a basic explanation for enhancing the revenue side of the budget. This side is affected by decisions on tax expenditures.

Defense: It is considered in Israel as the purest example of a public good; thus, it is considered as a basic explainer for enhancing the revenue side of the budget, which is affected by decisions on tax expenditures.

Population: Many government expenses are related to population—such as the number of classes, the number of police agents, and the number of doctors.

World Trade: It is considered an exogenous variable related to the economic cycle.

Immigration: As immigration waves in Israel is characterized by discrete jumps, it acts as a good candidate for a successful exogenous variable that explains expenditure, with the correspondent impact on the revenue side.

POP_UNDER15_ABOVE64 – These populations are characterized by intensive government spending, which implies the need for enhanced revenue side.

COALIT_LISTS – This variable picks the strength of government coalition. According to Roubini and Sachs (1989), the higher the number of lists that takes part of the coalition, the weaker is the coalition.

COALIT_MEMBERS – It is considered as an alternative measure of government strength.

Table B.3
Cointegration Analysis: 2SLS*

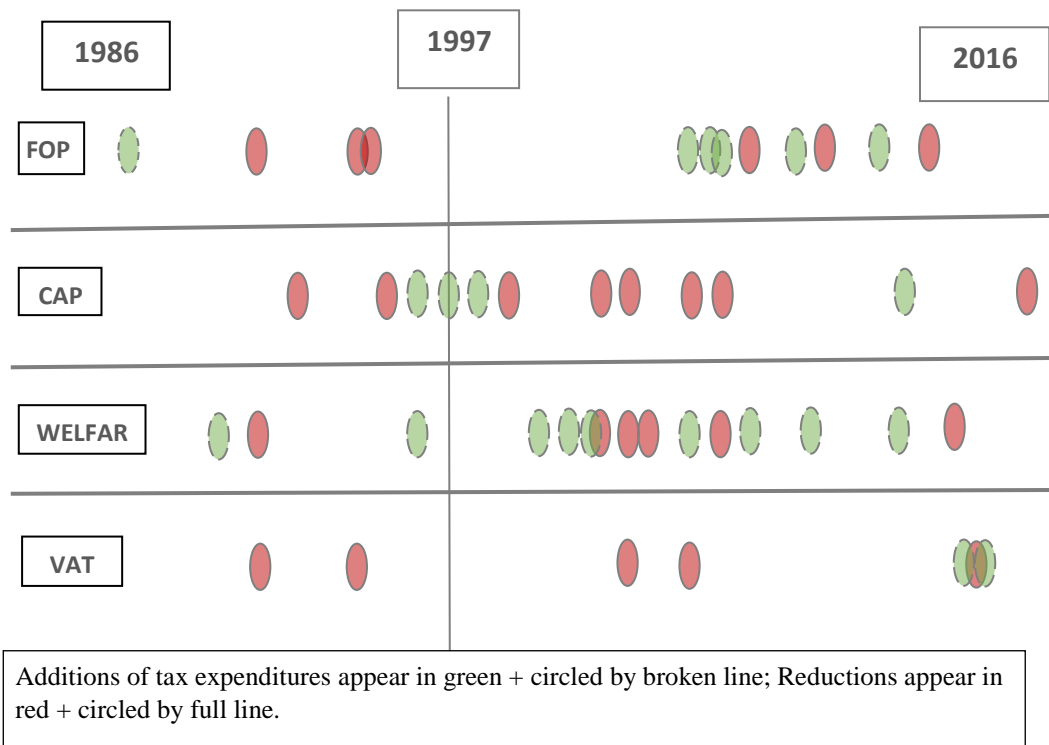
Explanatory Variables	Dependent Variable: log(TAX_EXP_TOT_IND2)		
	(1)	(2)	(3)
C	25.8*** (7.4)	26.0*** (7.5)	28.3*** (7.5)
LOG(GDP_HPTREND)	1.2*** (0.37)	1.21 (0.37)	1.29 (0.36)
LOG(IMMIGRATION)	0.05*** (0.02)	0.05*** (0.015)	0.06*** (0.01)
LOG(POP_UNDER15_ABOVE64)	-4.98* (1.57)	-4.5*** (1.6)	-5.8*** (1.5)
LOG(POP_THOUSAND)	-1.3 (0.8)	1.06 (0.9)	1.6* (0.8)
LOG(EDUCATION)	-0.25 (0.14)	-0.25* (0.13)	-0.26* (0.14)
LOG(DEFENSE)	0.16 (0.15)	0.16 (0.15)	0.2 (0.14)
@TREND(1986Q1)	-0.004* (0.006)	-0.004 (0.006)	-0.005 (0.006)
@TREND(1986Q1)^2	8.6E-05*** (2.7E-05)	8.1E-05*** (2.8E-05)	9.8E-05*** (2.6E-05)
Adj R ²	0.53	0.53	0.54
ADF	-4.0	-4.01	-4.15

* The difference upon specifications is related to instrumental variables.

APPENDIX C – TAX EXPENDITURE CHANGES

	Addition of Tax Expenditures	Reduction of Tax Expenditures
Total (after 1997)	30 (25)	39 (29)
FOP	6 (5)	4 (3)
CAP	4 (3)	8 (6)
WELFARE	10 (8)	6 (5)
VAT	2 (2)	6 (3)
OTHER	8 (7)	15 (12)

* The "other" category includes exemptions in real estate, family tax expenditures and other non-classified items.



Tax expenditures additions before 1997

- 1989Q2 (expansion) – Starting in this quarter there is an exemption for income tax paid on 2nd and 3rd child allowance.
- 1990Q4 (recession) – Cancellation of indirect taxes exemptions for immigrants and switch to direct compensation.
- 1996Q1 (expansion) – Advanced Training Funds exemption extended to independent workers.
- 1996Q1 (expansion) – Raise in income tax exemption for boarder frontier settlements from 10 to 15 percent (20 percent in Kiryat Shmona).

Tax expenditures abolitions before 1997

- 1990Q3 (recession) – Tax exemption of 25-35 percent of medical expenses for family relatives were fixed at 35 percent of expenses that are over 12.5 percent of liable income; temporary abolition of credit points to working women.
- 1994Q1 (expansion) – Abolition of Tabac indirect tax exemption in Eilat.
- 1995Q1 (expansion) – Abolition of complete exemption of capital gains tax on securities under a newly imposed tax rate of 10 percent on real capital gain.

Selective Tax expenditures additions after 1997

- 1997Q1 (expansion) – exemption rate of income tax at training funds for independent workers was raised to 3 percent for deposits until 4.7 percent of income.
- 1998Q1 (expansion) – exemption rate of income tax at training funds for independent workers was raised to 4.5 percent for deposits until 7 percent of income.
- 2000Q1 (expansion) – 15 percent income tax credit for residents in Akko.
- 2002Q1 (recession) – New income tax exemption for foreign sport players and trainers.
- 2005Q1 (expansion) – "Green Channel" adopted for industries (ammendment number 60).
- 2005Q3 (expansion) – 100 percent accelerated depreciation for industries, agriculture and tourism between july 2005 and dember 2006.
- 2012Q1 (expansion) – the exempted part of income for pensions rose from 35 to 42 percent.

Selected tax expenditures abolition after 1997

- 1998Q1 (expansion) – abolition of purchase tax exemption of security tools in private cars.
- 2002Q1 (recession) – Abolition of income tax exemption for Negev residents and other localities.
- 2005Q1 (expansion) – Gradual abolition of security spare parts; rise of preferential rates for purchasing new cars by olim (new immigrants); abolition of purchase tax exemption of furniture for new immigrants and returning home citizens, but at the same time there was an increase in the exemption years from 2 to 6.
- 2006Q1 (expansion) – New limits for income tax credits in Eilat.
- 2013Q1 (expansion) – Tax exemptions reductions in the framework of the Investment incentives law; abolition of Improvement tax exemption for apartments not owned by private owners.
- 2016Q1 (expansion) – Reduction of threshold for receiving training funds exemptions from 4 times the average wage to 3 times.

APPENDIX D

In this appendix I check a change in the cointegration relationship starting at a particular year by the end of the nineties/beginning of 2000s (based on Gregory and Hansen, 1996). Each dummy variable takes the value of 1 starting at the year dummy, and 0 before that. I run two regressions assuming a change in the cointegration relationship: i) in the two variables that are the center of the present study (GDP and a political variable – COALITION LIST); ii) in all explaining variables (not shown). Given the low number of degrees of freedom in the second exercise, I choose the first regression as the most relevant (Table D1).

Table D1
Cointegration break

Explanatory Variables	Year					
	1997	1998	1999	2000	2001	2002
C	15.09*** (4.83)	22.14** (6.26)	24.35*** (6.49)	21.9** (8.8)	12.84*** (4.86)	18.17** (7.74)
LOG(GDP_FP)	0.15 (0.15)	0.39* (0.23)	0.42** (0.21)	-0.04 (0.21)	-0.41* (0.23)	-0.25 (0.22)
LOG(IMMIGRATION)	0.06*** (0.01)	0.05*** (0.01)	0.04** (0.02)	0.034** (0.016)	-0.04** (0.02)	0.0009 (0.02)
LOG(POP_UNDER15_ABOVE64)	-3.63** (0.77)	-4.67*** (1.11)	-5.21*** (1.31)	-4.01*** (1.4)	-2.02** (0.94)	-2.93** (1.28)
LOG(POP_THOUSAND)	1.87*** (0.44)	1.85*** (0.57)	2.08*** (0.68)	1.69** (0.69)	1.25** (0.54)	1.3* (0.7)
LOG(EDUCATION)	-0.11* (0.07)	-0.45** (0.19)	-0.45*** (0.19)	-0.60*** (0.24)	-0.62*** (0.2)	-0.6*** (0.24)
LOG(DEFENSE)	-0.01** (0.10)	-0.13 (0.13)	0.20 (0.12)	0.14 (0.12)	-0.13 (0.14)	-0.07 (0.13)
@TREND(1986Q1)	-0.009** (0.004)	-0.02 (0.006)	0.004 (0.006)	0.005 (0.007)	0.018** (0.007)	0.014* (0.08)
@TREND(1986Q1)^2	0.0001*** (1.8E-05)	0.0001*** (2.7E-05)	0.0001*** (3.7E-05)	3.4E-05* (2E-05)	9.3E-05 (4.7E-05)	5.5E-05 (2E-05)
LOG(GDP_FP)* (AFTER_YEAR)	-0.82*** (0.17)	-1.22*** (0.86)	-1.07*** (0.35)	0.0002 (0.03)	0.5* (0.33)	0.56* (0.32)
AFTER_YEAR	4.24*** (0.86)	6.19*** (1.56)	5.33*** (1.81)	0.013 (0.16)	-3.0* (1.68)	-2.95* (1.63)
Adj R ²	0.75	0.59	0.59	0.39	0.55	0.44
ADF	-6.31***	-5.81**	-5.63**	-4.63	-5.24*	-4.49

Using results in Table D1 we conclude that 1997 is the year that best represents the change in the cointegration relationship (significant at 5 percent). Note that in this year the highest ADF is obtained. Note also that the residual in the short run is significant in the regressions shown in the paper, representing—according to Engle and Granger theorem—a further proof that cointegration exists.

APPENDIX E

In this appendix I check a pseudo-panel that considers the main sources of statutory taxes (see Strawczynski, 2014) and the four categories of tax expenditures. The pseudo-panel is built by using the same explanatory variables as explained as explaining variables for each of the categories composing the broad fiscal tool (statutory taxes and tax expenditures, respectively). Results are shown in Table E.1.

For statutory taxes results I show significance (at 5 percent) in expansions before 1997, implying procyclical policy: taxes are reduced in good times. Also after 1997, the policy is procyclical: since the average GDP growth is negative, a negative coefficient (significant at 5 percent) means a positive reaction—i.e., an increase in taxes. Procyclicality of statutory taxes is consistent with the results shown by Strawczynski (2014).

For tax expenditures results are similar to the ones shown above: during recessions tax expenditures were reduced before 1997, and increased afterwards; this pattern implies procyclical policy before 1997, and countercyclical after 1997. Note that the strength of the response is higher for statutory taxes (with a significant Wald test).

TABLE E.1
A Pseudo Panel *

	Statutory Taxes	Tax Expenditures
DLOG(GDP_FP)*(D_CH_GDP)	-0.13** (0.06)	-0.02 (0.06)
DLOG(GDP_FP)*(D_CH_GDP) *AFTER_1997	0.05 (0.08)	0.04 (0.05)
DLOG(GDP_FP)*(1-D_CH_GDP)	0.20 (0.17)	0.13*** (0.01)
DLOG(GDP_FP)*(1-D_CH_GDP)*AFTER_1997	-0.53** (0.25)	-0.17* (0.11)
Residual (-1)	-0.05*** (0.01)	-0.11** (0.04)
Number of Observations	1,078	450

* Source of statutory taxes: Strawczynski (2014). The first step is a 2SLS regression from which we transfer the residual to the short-run regression. Control variables include Coalition lists, defense, population under 15 and above 64, injured by terror and immigration. I used cross-section weights for the panel and White period coefficient covariance method. The instrumental variable for the GDP is the world trade.

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