Research Department **Bank of Israel**

Persistent Growth Episodes and Macroeconomic Policy Performance in Israel[1]

by

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Abstract

This paper presents an analysis of growth episodes in Israel during the years 1961-2006. The analysis uses, in addition to the standard variables, an index of the quality of macroeconomic management along the lines presented by Sirimaneetham and Temple (2005). The quality of macroeconomic management turns out to have a significant impact on growth episodes. However, our quantitative analysis shows that exogenous variables like world trade and security events had a larger impact on growth episodes than did the policy variables. We also found that forces that enhance supply, like the labor market experience of immigrants, are insufficient to explain persistent growth episodes in Israel; demand variables are also needed in order to explain these episodes. Using our analytical framework, we quantify the contributions of the different forces to the transition from the 2001-2003 recession to the present growth episode; we found that two-thirds of this transition is explained by exogenous variables—mainly the world trade and the security situation—and one-third is explained by policy variables, i.e., better macroeconomic performance and the reduction of tax rates.

צמיחה מתמשכת ומדיניות מקרו-כלכלית בישראל

קרנית פלוג ומישל סטרבצ'ינסקי

תמצית

עבודה זו מציגה ניתוח של אפיזודות הצמיחה בישראל בין השנים 1961-2006. בנוסף למשתנים הסטנדרטיים, מוצג בעבודה מדד של איכות הניהול המקרו-כלכלי, בעקבות Sirimaneetham and Temple (2005). מתברר כי לאיכות הניהול המקרו-כלכלי השפעה מובהקת על אפיזודות הצמיחה. אולם, הניתוח הכמותי שלנו מראה כי השפעתם של משתנים אקסוגניים על אפיזודות הצמיחה, כמו הסחר העולמי ואירועים ביטחוניים, גדולה מזו של משתני המדיניות. כמו כן מצאנו כי אין די בכוחות מגדילי היצע, כמו ניסיון העולים בשוק העבודה, כדי להסביר את אפיזודות הצמיחה המתמשכת בישראל; דרושים גם משתני ביקוש כדי להסבירן. באמצעות המסגרת האנליטית שלנו ערכנו אומדן כמותי של תרומתם של כוחות שונים למעבר מהמיתון לאפיזודת הצמיחה הנוכחית. מצאנו כי שני שלישים מן המעבר לצמיחה מוסברים על ידי משתנים אקסוגניים – ובראשם הסחר העולמי והמצב הביטחוני – ושליש אחד מוסבר על ידי משתני מדיניות – ביצועים משופרים ברמה המקרו-כלכלית והקטנת שיעורי המס.

"The return of sustainable growth in the business sector, as opposed to a temporary increase in economic activity, depends on the liberation of resources by the public sector, on the stock of available labor force, on the stabilization of the level of wages vis-à-vis labor productivity, and on a reduction of the tax rate."

Michael Bruno, 1989.

1. Introduction

One of the well-known empirical findings is that periods of growth are highly influenced by exogenous shocks, like changes in the terms of trade. Easterly, Kremer, Pritchett and Summers (1993) found that exogenous shocks are responsible for a large fraction of growth variation in industrial countries. Hausmann, Pritchett and Rodrik (2005) found that changes in the terms of trade have a high probability of being the engine for a transition to an acceleration ("persistent growth") period.[1]

Given that, unlike exogenous shocks, macroeconomic policy variables are controlled by Economic Policy-Makers, policy variables have drawn a great interest in economic research (Fischer, 1993). In a recent paper, Sirimaneetham and Temple (2005) found that high-quality macroeconomic policy is a necessary but not sufficient condition for economic growth. By constructing an index of the quality of macroeconomic policy, these authors found that bad macroeconomic policy can be offset by other factors (like shocks), but the fastest growing countries in their sample all shared high-quality macroeconomic management.

This paper calculates an index of quality of macroeconomic management for the case of Israel, during the period 1961-2006, and estimates the effect of this index on Israel's growth episodes. By running regressions that account for the main exogenous variables that had an impact on growth episodes in Israel, like world trade, waves of immigration and shocks to the security situation (such as the Intifada), we estimate

[1] Their definition of sustainable growth is based on growth rates of per capita GDP. Acceleration is defined as an increase of 2 percent in the growth rate for 8 consecutive years (with sensitivity analysis for 5 and 10 years), a growth rate higher than 3.5 percent and a time gap of at least five years between two consecutive acceleration episodes. An additional requirement is that the per capita GDP level after the episode is higher than the peak before the acceleration.

the contribution of macroeconomic management to the probability of having such periods. The analysis is based on the periods of growth in Israel, which were classified into periods of persistent growth, growth, and recession. In the appendix we discuss other definitions by looking at per capita GDP levels, instead of growth rates.

The paper is organized as follows: in Section 2 we characterize the different growth periods in Israel and the quality of macroeconomic management; in Section 3 we introduce a linear probability model, with the purpose of assessing the quantitative impact of the exogenous and policy variables on growth episodes; this framework is used to quantify the contribution of the various variables to the transition from the recession in 2001–03 to the present growth episode; in Section 4 we present the conclusions. In two appendices we show a sensitivity analysis for the definition of persistent growth episodes and a cointegration analysis for per capita business sector GDP and total factor productivity.

2. Growth and macroeconomic management in Israel: the facts

2.1 Business cycles and sustainable growth episodes

Table 1 shows the business cycles in Israel.[2] The table distinguishes between periods of growth characterized by a high per capita growth rate and a long duration (persistent growth periods),[3] periods of growth characterized by a high per capita growth rate but short duration (growth periods), and periods characterized by a low or negative per capita growth rate of GDP (recession periods).

[2] For a documentation of business cycles in Israel see Melnick (2002) and Marom, Menashe and Suchoy (2003). In this table we show Melnick's (2002) classification, except for persistent growth periods where we apply our own definition.

[3] These periods are defined as 5 consecutive years of positive quarterly bussiness sector per capita growth with pauses that last for one quarter (with sensitivity analysis for the duration criterion - 4 and 6 years). We also require a per capita GDP growth annual rate of 3 percent or more, with per capita GDP in the last quarter of the episode being higher than the per capita GDP peak before that quarter.

It is important to note that there are only a few episodes of persistent growth in Israel's economic history. Two out of the three periods of persistent growth occurred in the 1960s, while the country was relatively young. After 1973, growth periods were scarce and short, one of the most remarkable examples being the 2000 episode, with a sharp increase in 1999 and an abrupt fall in the last quarter of 2000 as a consequence of the bursting of the high-tech bubble and the outbreak of the second Intifada. The surge in growth rates in the mass-immigration period during the 1990s fits our definition of a persistent growth period, but the per capita growth rate in this period was significantly smaller than in the growth episodes of the 1960s.

It is of particular interest to understand the forces behind periods of persistent growth. It seems quite evident that the growth periods in Israel were driven by exogenous factors. However, as mentioned by Hausmann, Pritchett and Rodrik, also reforms and policy variables play a role. As documented in the literature, it is difficult to measure reforms for a given country in a time-series framework. A possible explanation is that the impact of reforms is gradual and therefore difficult to trace via econometric analysis. This is not the case for the quality of macroeconomic management and other policy variables, which are easier to quantify and analyze, and were stressed in the literature as significant contributors to growth.[4]

Table 2 summarizes important exogenous and policy variables during the different periods. Note that the average increase of world trade and the number of immigrants are higher in growth than in recession periods, and that inflation and government budget deficit are lower in growth periods. Note also that the timing of the changes in these variables make them natural candidates for explaining business cycles in Israel. However, in order to assess their effect, a whole model that controls for the different factors is needed. Such a model is presented in section 3.

[4] A different view is presented by Easterly (2005), who attributes growth to institutions rather than policies.

Table 1 – Growth episodes and Recessions in Israel

	Period	Cycle	Busi-ness Sector GDP Growth	GDP Grow-th	Per capita GDP Growth	From	Until	Busi-ness sector produc-tivity	Indus-trial Produc-tivity	Dura-tion (mon-ths)
1.	Young economy	**Persistent growth**	10.3	9.7	5.6	01.1960	06.1965	0.5	1.1	**66***
2.	Immigration exhaustion	Recession	1.1	0.0	-3.2	07.1965	06.1967	0.1	0.5	24
3.	Post-Six-Day War	**Persistent growth**	12.7	13.5	9.9	07.1967	12.1972	0.7	0.1	**66**
4.	Post-Yom-Kippur War	Recession	3.2	3.5	0.8	01.1973	12.1976	0.0	-0.5	36
5.	Erlich's period	Growth	4.8	4.5	2.1	01.1977	04.1979	0.2	0.3	28
6.	Horowitz's period	Recession	3.5	2.9	0.5	05.1979	07.1980	1.0	-1.5	14
7.	Aridor's period	Growth	4.2	3.0	1.1	08.1980	09.1983	-0.1	-0.3	37
8.	Banking crisis	Recession	7.2	5.2	3.6	10.1983	10.1985	1.5	0.3	24
9.	Stabilization period	Growth	8.5	4.8	3.2	11.1985	08.1987	2.2	1.5	21
10.	Post-stabilization	Recession	1.4	2.0	0.2	09.1987	12.1989	0.3	0.8	27
11.	Immigration	**Persistent growth**	8.7	6.8	3.1	01.1990	09.1996	0.3	0.4	**69**
12.	Immigration exhaustion + contractionary policy	Recession	4.0	3.7	1.2	10.1996	07.1999	-0.5	0.6	33
13.	Hi-tech boom	Growth	11.7	9.2	6.3	08.1999	09.2000	2.3	4.0	13
14.	Intifada	Recession	-2.0	-1.1	-3.3	10.2000	03.2003	-1.8	-1.5	29
15.	World trade acceleration	**Persistent growth?**	6.5	5.0	3.2	06.2003	12.2006	1.1	1.0	**42****
	Growth periods		**8.5**	**7.1**	**4.9**			**0.9**	**1.0**	
	Recession periods		**2.7**	**2.3**	**-0.3**			**0.1**	**-0.2**	

* Persistent growth in this period was clearly longer than 66 months, but we do not have quarterly data for the years before 1960. By looking at annual data, it is likely that this period started at 1954. Hausman, Pritchett and Rodrik (2005) report this period starting at 1957.

** Until the last quarter of 2006. In the meanwhile, the national accounts for the first quarter have shown that also in this quarter there was a high per capita GDP growth.

Table 2 – Growth episodes, exogenous shocks and policy variables

	Period	Cycle	Security events	Immigra-tion (quarterly average, as a % of population)	World trade (% of change)	Annual Inflation (%)	General Govern-ment Budget Surplus (% of GDP)
1.	Young economy	Persistent growth		0.5	9.7	7.4	5.0
2.	Immigration exhaustion	Recession	Six-days War	0.2	7.6	4.6	0
3.	Post-Six-Day War	Persistent growth		0.3	13.3	7.7	-8.3
4.	Post-Yom Kippur War	Recession	Yom Kipur War	0.2	7.8	38.0	-15.8
5.	Erlich's period	Growth		0.2	5.8	49.5	-15.1
6.	Horowitz's period	Recession		0.2	6.6	128.6	-10.8
7.	Aridor's period	Growth	Lebanon War I	0.1	0.4	124.3	-11.7
8.	Banking crisis	Recession		0.1	6.9	390.6	-7.2
9.	Stabilization pperiod	Growth		0.1	8.8	19.3	2.0
10.	Post-stabilization	Recession	First Intifada	0.1	9.3	18.7	-3.3
11.	Immigration	Persistent growth		0.5	8.7	13.0	-4.2
12.	Immigration exhaustion + contractionary policy	Recession		0.3	10.6	6.5	-4.5
13.	Hi-tech boom	Growth		0.3	13.7	1.1	-3.0
14.	Intifada	Recession	Second Intifada	0.1	4.9	3.0	-4.6
15.	World trade acceleration	Persistent growth?	Lebanon War II	0.1	9.3	0.6	-3.6
	Growth periods			**0.3**	**8.8**	**27.9**	**-4.9**
	Recession periods			**0.2**	**7.6**	**84.4**	**-6.6**

2.2 Macroeconomic performance in Israel

In this sub-section we construct an index of the quality of macroeconomic performance for Israel, built along the lines of Sirimaneetham and Temple (2005). According to their methodology there are five components that measure the quality of macroeconomic management:

- General Government Surplus (SURP), measured by the annual surplus of the general government (as a percent of GDP). In our calculations we used both this definition and the cyclically adjusted deficit, as calculated at the Bank of Israel Annual Report.[5]

- The rate of Inflation (INFL), measured by the annual rate of inflation, which is the variable chosen as the target for monetary policy in Israel. We use a log transformation.

The following three variables are related to the exchange rate management regime, which has changed during Israel's economic history. The variables are:

- Black market premium (BMP), which reflects departure of a market-determined exchange rate from the official one. This variable is widely used in cross-section studies (Barro and Lee, 1999), and for Israel it makes the distinction between the pre-liberalization period and the post-liberalization one.

- Currency overvaluation (OVERVAL), as introduced by Dollar (1992) and extended by Easterly and Sewadeh (2002), reflects possible departure of the exchange rate from a purchasing power parity equation. We adopted the Easterly and Sewadeh estimates, and extended it forward to the present by looking at the disparity between actual depreciation and the one arising from a purchasing power parity equation, as calculated by the World Bank.

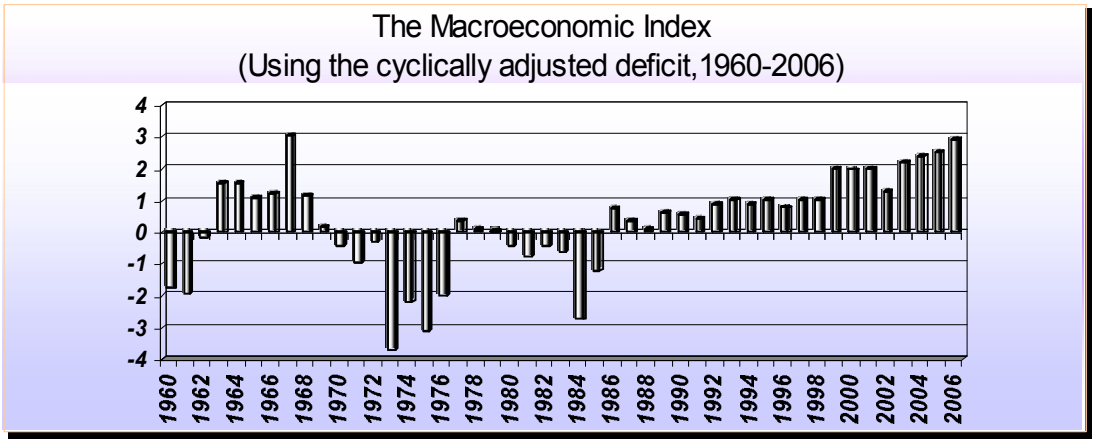
- The variability in the overvaluation index (ERATE), reflects the coefficient of variation of the OVERVAL variable, and is considered as a relevant variable for estimating the quality of the exchange rate management.

Finally, as stated above, we adopted the basic formula of Sirimaneetham and Temple (2005), which is a weighted average of the above variables, to calculate the macroeconomic index.[6]

[5] Historical data is based on Dahan and Strawczynski (1999).

[6] The formula is: macro_index=0.334*surp-0.447*infl-0.585*bmp-0.347*overval-0.475*erate. In the econometric analysis shown in Table 6 we will consider variations of this definition.

The following figure shows the development of the quality of macroeconomic management index for Israel in the period 1960-2006:



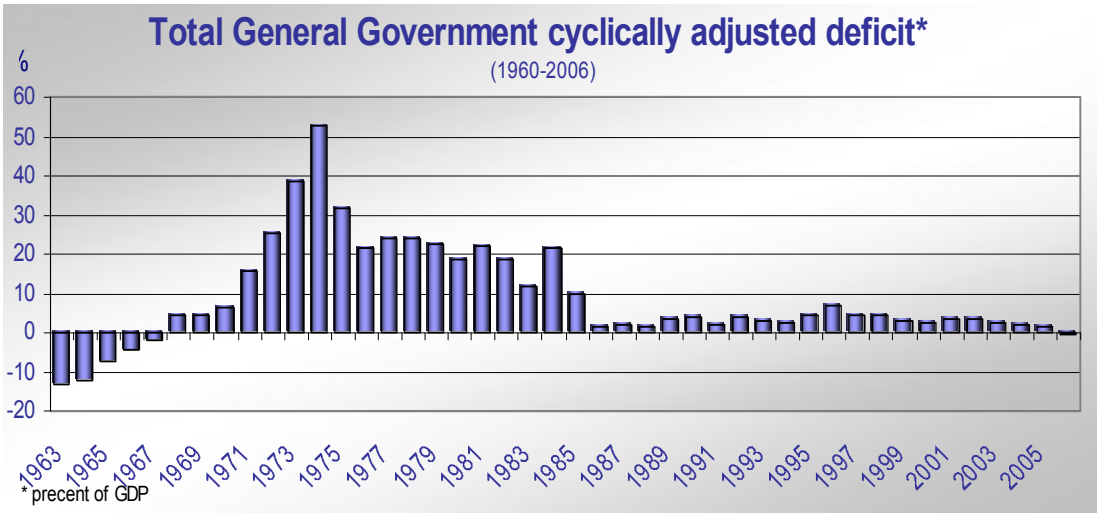
During most of the early period of the sample which was characterized by persistent growth, the quality of macroeconomic management as measured by the index was good (except for 1960 and 1961 when the exchange rate was strongly overvalued).[7]

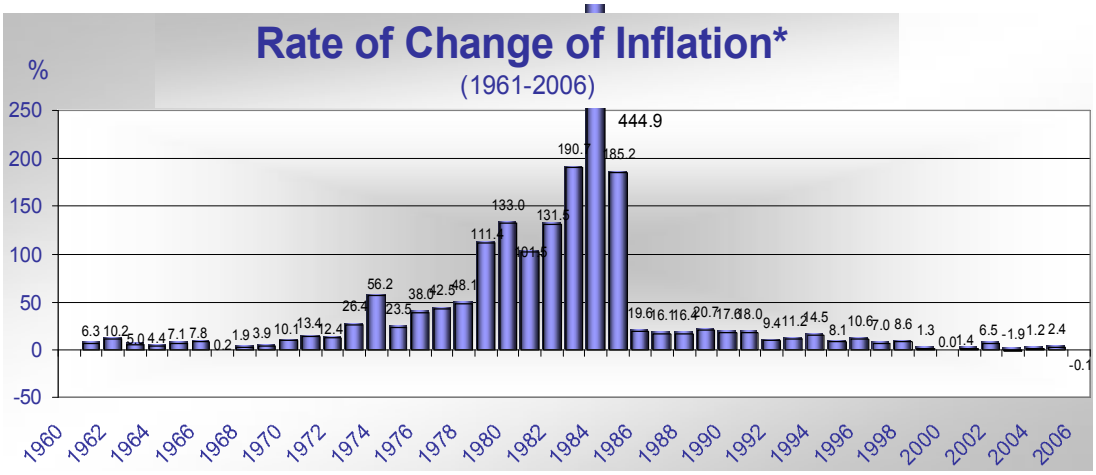
During the "lost decade" the index became negative, mostly as a consequence of the deterioration in the budget deficit and exchange rate management, and it was only after the success of the stabilization plan that the index became positive.

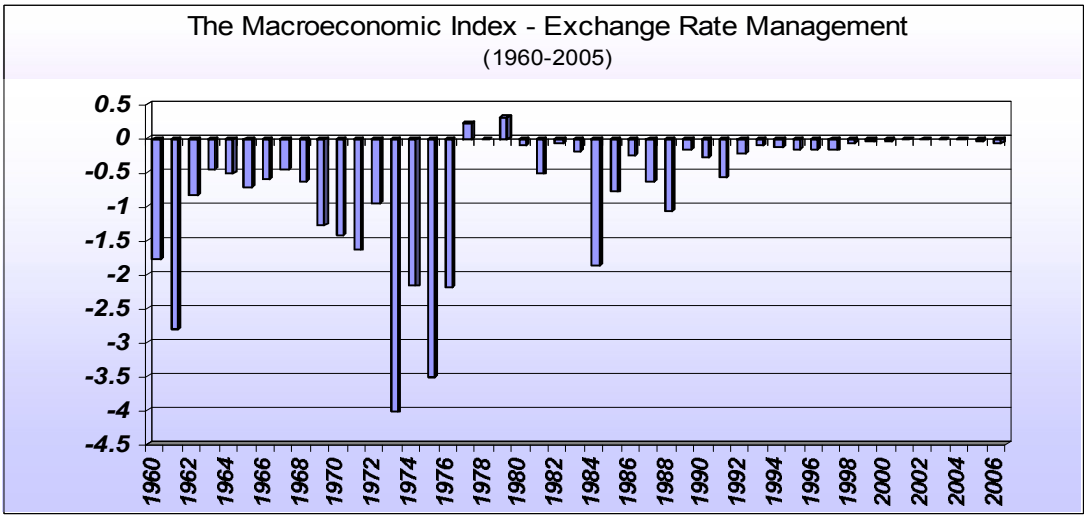
It is interesting to note that the index shows a clear rise in the quality of macroeconomic management since 2003 that was caused mainly by the achievement of price stability and the government recording a low budget deficit, while at the same time the exchange rate regime was a free float; in fact, 1997 was the last year of intervention in the foreign exchange market by the Bank of Israel.

The following graphs show the main components of the macroeconomic index: macroeconomic policy, as represented by the government budget deficit and inflation, and exchange rate management, as represented by the weighted average of the variables BMP, OVERVAL and ERATE.

[7] On February 10th, 1962, there was a 67 percent devaluation of the Lira.







These graphs show that during the 1960s macroeconomic management was generally quite good, although in the first years the exchange rate management index was negative and large in absolute value, indicating an overvaluation of the Israeli Lira and a significant black-market premium.

In the 1970s both exchange rate management and the general government deficit deteriorated, which was reflected in a deterioration in the quality of the macroeconomic management index.

The deterioration of macroeconomic management in the high inflation period (mid-1980s) was evident in all components of macroeconomic management.

The stabilization plan of 1985 resulted in a sharp reduction of inflation and of the government budget deficit, while the index of the quality of exchange rate management continued to be negative. This negative index persisted until the 1990s, when exchange rate liberalization lead to a steady improvement in exchange rate management.

The clear improvement in macroeconomic management in the new millennium was mainly driven by the reduction of inflation that enabled price stability to be achieved, while the government deficit remained roughly stable before declining in 2003-06.

3. An analysis of persistent growth episodes: 1960-2006

In this section we build a linear probability model[8] in order to analyze the factors that influence persistent growth, using quarterly data. We act in two stages: a binary model of three mutually exclusive states of nature (persistent growth, growth and recessions) and a three-choice model that allows us to calculate the probabilities of transition to persistent growth for a given change in the independent variables.

Since we expect all variables to have an impact on growth according to their environment, rather than in a quarterly discretionary basis, we use for all variables four-quarter moving averages.

[8] The LPM has two drawbacks when compared to logit or probit: i) the probability estimates are not constrained to the zero-one range; and ii) heteroskedasticity in the residuals. However, this kind of model produces unbiased coefficients and allows us to assess the relative importance of the different variables for increasing the probability of growth, which is our goal. For a discussion of these points see Pindick and Rubinfeld (1981) and Aldrich and Nelson (1984).

3.1 The variables used in the analysis

WT – An *Index of the World trade*, as published in the World Economic Outlook of the International Monetary Fund. This variable is exogenous from Israel's point of view, and given the increasing openness of the economy and the fact that Israel's industrial exports are based mainly on high-tech products,[9] it is considered one of the most important variables representing demand.

ALIA – The *yearly influx of immigrants*. Immigration was always considered as one of the important variables for explaining growth episodes in Israel. Metzer (1991) mentions that the importance of immigration to growth is reflected through the residential sector. Lavi and Strawczynski (2001) found that the effect on growth is significant when the dimension of the immigration wave is beyond a threshold, leading to increased investment. Since we use other variables related to immigration which represent the impact of immigration on the supply side, we consider the flow of immigrants as a demand variable.[10]

ISR_CAS, TOT_INJ, TER_NUM – *Israel casualties of terror, total injured by terror, and number of terrorist attacks,* respectively. Clearly the security situation, in general, is an important exogenous variable. However, wars like the Six-Day War" (which enhanced growth since it was short and created prospects for improving Israel's geopolitical situation) and the Yom Kippur War (which was relatively short and implied a further increase in defense expenditure) had a more complicated effect on growth, compared to the clear-cut negative effect of terror attacks during the second Intifada, e.g., on tourism. We used the variables related to terror attacks to measure quantitatively the effect of the security situation and we see this variables as

[9] In these products Israel has some market power, and consequently we assume that Israel faces a demand curve with a negative slope (i.e., the world demand is not perfectly elatic).

[10] Hercowitz and Yashiv (2001) found that in the first stage of a high immigration wave there is an impact through the demand side.

representing predominantly the demand side. We expect a negative effect on growth episodes.

MACRO – The *index of quality of macroeconomic management*; see previous section. When using this variable in the growth regressions, we are aware that some of the variables composing this index maybe partly endogenously determined by growth. While the black market premium (BMP) and the volatility (ERATE) are more representative of the exchange rate regime and suffer less from endogeneity, the other variables – government surplus (SURP), inflation (INF) and the overvaluation (OVERVAL) are clear candidates for endogeneity. In order to deal with this issue we will use in the empirical analysis a macroeconomic index calculated using the cyclically adjusted deficit (instead of the actual deficit as used by Sirimaneetham and Temple, 2005). In addition, in Table 6 we will use additional versions of the macroeconomic index: i) an index that excludes OVERVAL which is considered as the most endogenous variable among the ones included in the index – as explained by Sirimaneetham and Temple (2005); and ii) we will use a version of the index (M_MACRO_NET) that additionally excludes inflation (INF), and use instead exogenous variables that represent two polar inflation regimes: FISCAL_DOMINANCE, which is a dummy variable that takes the value of 1 in the period 1973 until 1985,[11] and 0 otherwise, representing the period of acommodative monetary policy; and INFLATION_TARGETTING, that takes the value of 1 in 1994-2007, and 0 otherwise.

STOCK_ALIA – The *stock of immigrants*; This was a crucial variable in empirical growth models in Israel. The variable was built by adding the immigration influxes of 10 successive years, along the lines of Hercowitz, Lavi and Melnick (2000). However, following Flug and Kasir (1998), this variable is insufficient to assess the performance of immigrants in the labor market. Their analysis implies that as immigrants acquire

[11] The selected period is based on Liviatan (1993).

experience in the local market, their impact on productivity increases non-linearly. For this purpose we use a new variable, called STOCK_ALIA_EXPERIENCE that gives a weight to each cohort of immigrants according to their years of experience.

POP – *Average Population.*

CADEF – *Cyclically adjusted general government deficit.*

GI – *Government investment.* Since we consider infrastructure as government capital stock that is part of the production function, we consider this variable as a supply side variable.[12]

TAX_TOT – Total taxes. As stressed by Easterly and Rebelo (1993), the right variable for a regression analysis should be based on statutory tax rates; for example, for income tax the variable that is relevant for individuals for deciding on additional working hours is the marginal tax rate.[13] However, at least at this stage, we do not have data for statutory tax rates before 1980. Consequently, in the cointegration analysis we use total taxes and in the quarterly analysis in Section 3 we will generate a new variable using a weighted statutory tax rate.

T_STATUTORY - This variable is obtained by calculating a weighted average of the statutory tax rates of the main taxation items (income tax, National Insurance contributions, V.A.T, companies tax and savings tax), using as weights their share in total tax revenues. The weighted average covers 80 percent of tax revenues, and only excludes import taxes (except V.A.T.), municipal taxes, fees and housing taxes. Similarly to Easterly and Rebelo (1993), in the regressions we also use the direct statutory tax rate (T_D).

[12] As explained in Barro (1990).

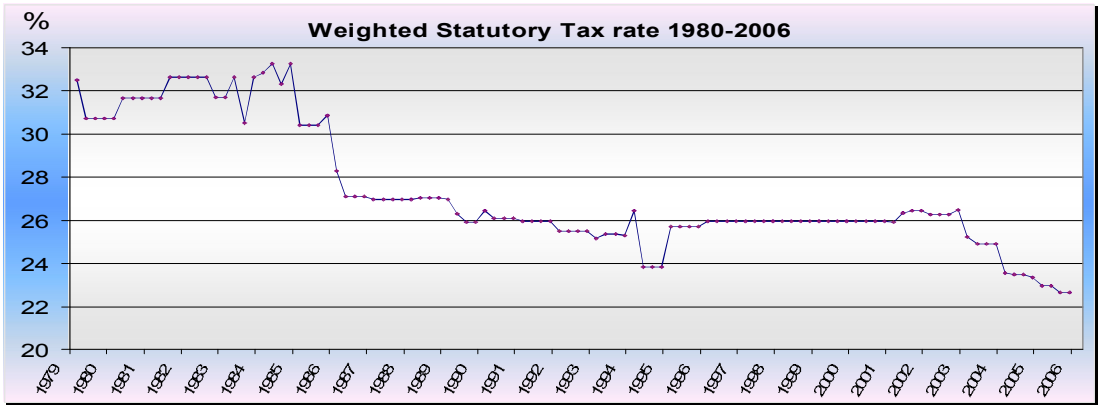
[13] These authors stress that the relevant rate depends on the tax structure: if increasing income implies a decision to work additional hours or to change the composition of family income, then the relevant tax rate is the marginal tax rate; however, if the decision leads to increased tax deductions, then the relevant rate is the effective tax rate. For a paper that follows the second approach, see Mendoza, Razin and Tesar (1994).

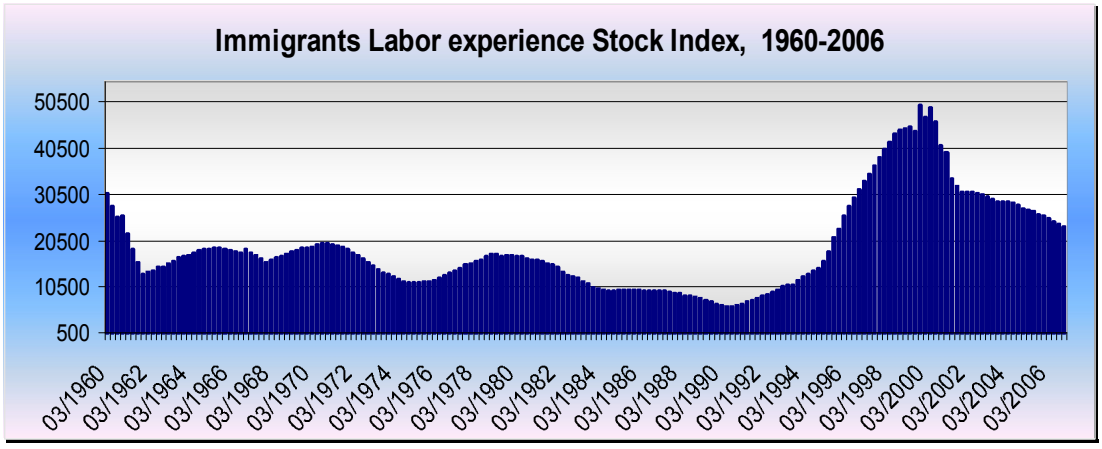
Y_USA – *Real US GDP*. We consider this variable a demand variable, since it represents the income of the U.S., which is a leading target for Israeli exports.

AREBUIOT[14] – *US loan guarantee program*; we used a dummy variable with the value of 1 during the 6 quarters after the approval of the US loan guarantee program and 0 otherwise. US loan guarantee programs were approved in 1992 (following massive immigration) and in 2003 (following the government's stabilization plan).

PXPY – *Export prices relatively to GDP prices;* we use this variable assuming that the main forces that drive its development are exogenous forces. However, it is clear that this may not be the case and that this variable is endogenously determined with the GDP. Thus, we use a two-stage least square procedure in the regression analysis - using the terms of trade as an instrument - in order to cope with the endogeneity of this variable.

The following are diagrams of two of our new variables:





[14] The importance of this variable is analyzed by Hercowitz, Kantor and Meridor (1993).

3.2 A cointegration analysis

In Appendix B we perform a cointegration analysis of business sector per capita GDP and of total factor productivity. The analysis is used to identify the variables that affect per capita GDP and factor productivity in the sample. We regress the business sector GDP per capita (GDP_BS/POP) and the total factor productivity (Solow residual) on the main exogenous variables – world trade, immigration and the security situation – and policy variables, including the macroeconomic index and its components (Table B.1).

As explained by Bruno (1989) in the opening quote of our paper, the permanent effects on growth are expected to be accounted only by supply factors like labor force availabilty.[15] However, given the pronounced business cycles in Israel and the fact that Israel is a young country that has not yet achieved a long-run steady state, it is likely that productivity growth would not materialize unless there is sustainable demand, represented by variables like world trade and income abroad. Consequently, in our cointegration tests we consider variables that are representative of both supply and demand.[16]

3.3 A binary choice model

In order to calculate linear probabilities we use a quarterly frequency model to analyze the different periods as shown in Table 1.

Our binary-choice model has three alternative and mutually exclusive states of nature: periods of persistent growth, growth and recessions. For each period we estimate a linear probability model that helps us to assess the probabilities of the independent variables for increasing persistent growth, growth and recessions, respectively. As explained above, the independent variables are computed using four-quarter moving

[15] Other works of Bruno on sustainable growth in Israel are Bruno (1990) and Bruno and Meridor (1991).

[16] For an analysis that considers only supply variables using a production function framework see Lavi and Strawczynski (2001).

averages.[17] We perform two-stage least square regressions using the terms of trade as an instrument for PX_PY, which as explained above, suffers from endogeneity.

Table 3 shows the results for the definition of persistent growth episodes based on growth rates of per capita business sector GDP.

As mentioned above, the benchmark definition of growth episodes is based on a five-year duration. However, we also performed a sensitivity analysis for six- and four-year durations. Concerning the six-year duration, the results remain the same: all three episodes respond also to this criterion. As for the four-year duration, should be noted that the present period of growth can be considered as a persistent growth episode, assuming that the growth rate in the first half of 2007 evolve according to the Bank of Israel forecast. Another period that almost matched the criteria was the one from October 1983 until mid-1987. In that period per capita growth was higher than 3 percent in annual terms, but the duration was 15 quarters, i.e., one quarter less than required according to this criterion.

The first regression in Table 3 takes some of the most important variables from the cointegration analysis and tests the probability of affecting persistent growth. In this regression the definition of persistent growth does not include the current episode. Although it would be preferable to use the statutory tax rate instead of tax revenues, that would have severely reduced our sample. Thus, we postpone the use of this variable to the next regression. In general the variables are significant and with the expected signs. Beside taxes, all other variables are significant at a 5% level of significance, and the coefficients have the expected signs. Among the supply variables that enhance growth we find the road infrastructure.[18]

[17] We tested also the regressions on a regular quarterly basis, and in general results were similar but with a lower explanation power.

[18] Since we do not have quarterly data we generated a dummy variable that takes the value of one when the growth rate of the roads capital stock is higher than average, and zero otherwise.

Table 3 – A binary choice model

(TSLS*, t statistic in parentheses)

Dependent\ independent variable	Y_persistent	Y_persistent	Y2_persistent	Y2_persistent
Equation number	(1)	(2)	(3)	(4)
Number of observations	153	105	153	104
Period	1968q4-2006q4	1980q4-2006q4	1968q4-2006q4	1980q4-2006q3
C	-1.41 (-2.2)	0.26 (0.3)	-0.47 (-0.7)	1.78 (1.9)
MOVAV_dlog(STOCK_ALIA)	4.39 (7.6)		2.95 (4.8)	
MOVAV(ALIA/POP)		0.11 (7.9)		0.06 (3.8)
MOVAV_M_Macro_ca	0.24 (3.2)	0.09 (1.4)	0.18 (2.2)	0.18 (2.5)
MOVAV_dlog(WT)	7.90 (2.2)	4.62 (1.3)	11.47 (3.1)	7.99 (1.9)
MOVAV_dlog(TAX_TOT)	-0.25 (-0.2)		1.09 (0.8)	
MOVAV_dlog(STOCK_ALIA_ EXPERIENCE)		2.82 (3.3)		2.34 (2.2)
MOVAV_PXPY	1.03 (2.3)	1.37 (4.3)	0.40 (0.8)	2.08 (5.4)
MOVAV_K_ROADS	0.45 (4.4)		0.20 (1.8)	
MOVAV(ISR_CAS/POP)	-7.31 (-1.8)		-2.84 (-0.7)	
MOVAV_T_STATUTORY		-0.07 (-2.5)		-0.16 (-4.4)
AREBUIOT		0.23 (2.6)		0.42 (4.0)
Adj. R squared	0.31	0.56	0.33	0.53

* Instruments: terms of trade (for PX_PY) and M_Macro_net (for M_Macro_ca).

The second regression substitutes total taxes with the statutory tax rate. The coefficient of this variable is negative and significant, and the explanatory power of the regression rises substantially.[19] Moreover, some additional variables that were not significant in the previous regression are significant in this one - immigrants' labor experience and the US loan guarantee program. However, some of the variables (world trade and macroeconomic performance) are not significant.

[19] By looking at the statutory tax rate variable (see diagram), it is evident that immediately after the stabilization plan of 1985 the huge reduction of the statutory tax rate may be explained by a parallel rise in effective tax rates during this period, as a consequence of the reduction of inflation (i.e., disappearance of the Tanzi-Olivera effect); in order to control for this possibility we used an interaction dummy variable with the value of 1 for eight quarters after the stabilization plan and 0 otherwise, and found that this term was statistically not significant.

The third regression considers the last period (2003 until 2006) as a persistent growth period (Y2_persistent), using the same specification as in equation 1. The explanatory power of the regression increases, but some variables become not significant. According to this regression, world trade has a positive and high impact on persistent growth. Statutory taxes have a negative and significant impact on sustainable growth.

The fourth regression also uses the definition of persistent growth which includes the present period, using the specification of equation 2. Also here the explanatory power of the regression rises substantially, and all variables are significant at 10 percent and with the expected signs.

Table 4 shows some additional tests: an analysis of persistent growth episodes using the definition with levels (see appendix), and the analysis of recessions.

The first regression considers both supply and demand variables, including the change in total taxes. Most of the variables have significant coefficients with the expected signs. Macroeconomic policy, immigration and immigrants' labor experience (not significantly) enhance growth episodes, while terror attacks have a negative impact. The world trade coefficient was not significant, and the change in total taxes has a positive coefficient, probably reflecting correlation between growth and tax revenues.

Thus, in the second regression we substitute total taxes with the statutory tax variable, which is the right variable in terms of economic decisions of agents. This substantially improves the explanatory power of the regression from 0.42 to 0.71, and most of the variable coefficients become significant and with the expected signs.

In order to check the policy variables we run an additional regression that substitutes the statutory tax with direct statutory tax, and adds the capital roads stock. The regression improves, and all variable coefficients are significant and with the expected signs.

Table 4 – Additional Tests
(t statistics in parenthesis)

Dependent\ independent variable	Y_levels	Y_levels	Y_levels	Y_RECESSION
Equation number	(1)	(2)	(3)	(4)
Number of observations	181	105	105	153
Period	1961q4-2005q4	1980q4-2006q4	1980q4-2006q4	1968q4-2006q4
C	0.16 (1.0)	-3.30 (-2.9)	-4.29 (-4.1)	0.68 (3.4)
MOVAV(STOCK_ALIA/POP)	0.01 (6.5)	0.03 (12.5)	0.02 (10.0)	
MOVAV_M_Macro_ca	0.18 (4.5)	0.21 (2.5)	0.25 (3.0)	
MOVAV(Y_USA/Y_BS)		39.1 (4.2)	43.7 (4.4)	
MOVAV_dlog(TAXTOT)	2.85 (1.7)			
MOVAV_T_MARGINAL		-0.10 (-2.1)		
MOVAV(STOCK_ALIA_EXPERIENCE/POP)	0.04 (1.4)	0.23 (4.7)	0.19 (3.4)	
MOVAV(TOT_CAS/POP)	-20.4 (-5.1)	-16.7 (-4.8)	-21.6 (-5.3)	7.12 (2.6)
MOVAV_T_D			-0.10 (-2.1)	
MOVAV(K_ROADS)			0.46 (2.3)	
MOVAV_M_Macro_Exc_Rate				-0.28 (-6.3)
MOVAV_PXPY				-0.33 (-2.4)
MOVAV_dlog(STOCK_ALIA)				-1.33 (-2.3)
MOVAV_dlog(WT)	3.96 (0.8)			-5.57 (-1.8)
Adj. R Squared	0.42	0.71	0.73	0.25

The last regression tests a linear probability model for recessions. In general the variables have the expected signs but the explanatory power of the regression is relatively low; note that the variable that represents terror attacks has a positive, significant and high coefficient.

3.4 A three-states model

In this model the states of nature have the following values: persistent growth – 2, growth – 1 and recessions – 0. The results of TSLS estimation are shown in Table 5.

The results of the first and second regressions confirm our findings regarding the importance of combining both exogenous (world trade, immigration, Intifada) and

policy variables (macroeconomic policy and taxes), and demand (world trade, immigration) and supply variables (stock of immigrants).

Similarly to the second regression, the third and fourth regressions are based on a shorter sample. The reason is that we use the weighted statutory tax rate as an explanatory variable, which reduces the sample. It is interesting to see that this variable has a negative and significant coefficient, as expected.

Table 5 – A three-states model

(TSLS*, t statistic in parentheses)

Dependent\ independent variable	Y_1	Y_1	Y_2	Y_2
Equation number	(1)	(2)	(3)	(4)
Number of observations	153	105	105	105
Period	1968q4-2006q4	1980q4-2006q4	1980q4-2006q4	1980q4-2006q4
C	-2.38 (-2.5)	-0.20 (-0.2)	0.55 (0.4)	-0.72 (-0.6)
MOVAV_MACRO_CA	0.47 (5.1)	0.37 (4.2)	0.55 (5.7)	0.57 (5.4)
MOVAV_dlog(TAXTOT)	2.64 (1.4)			
AREBUIOT	0.55 (2.7)	0.55 (3.2)	0.73 (3.8)	0.66 (3.4)
MOVAV_PXPY	1.91 (3.0)	3.20 (4.2)	4.26 (5.1)	5.61 (4.0)
MOVAV_ISR_CAS/POP	-10.5 (-1.7)	-9.23 (-1.6)	-7.85 (-1.2)	-12.8 (-2.0)
MOVAV (ALIA/POP)	0.21 (6.8)	0.18 (6.9)	0.14 (4.9)	0.13 (4.5)
MOVAV_dlog(WT)	5.09 (1.1)	9.84 (1.7)	13.9 (2.1)	12.6 (1.9)
MOVAV_T_STATUTORY		-0.13 (-2.2)	-0.20 (-3.1)	
T__D				-0.27 (-3.2)
MOVAV_K_ROADS				0.40 (1.3)
Adj. R Squared	0.43	0.49	0.51	0.52

* Instruments: terms of trade (for PX_PY) and M_Macro_net (for M_Macro_ca).

Another interesting result is that in the third regression, when using the definition of the present period as a persistent growth episode (i.e., state of nature 2 instead of 1, we call this variable Y_2) the explanatory power of the regression increases, and most variables are significant with coefficient signs in accordance with economic analysis.

The last regression adds the capital roads stock and substitutes the statutory tax rate with direct statutory tax rate (TD), which is considered by economic research to be the main candidate for representing the negative impact of taxation on growth. In fact, its coefficient is higher and significant, and the explanatory power of the regression increases.

In Table 6 we perform additional tests on the macroeconomic index, so as to cope with the endogeneity of some of its components.

The first regression uses the components of the macroeconomic index, using the cyclically adjusted deficit instead of the deficit in order to avoid endogeneity. All three components are significant, and the coefficient of inflation is very small (although positive) and significant, which can be interpreted as a sign of endogeneity.

The second regression mimics the first one, but now we use a macroeconomic index based on the cyclically adjusted government deficit, which is not subject to endogeneity. This is in fact regression 2 in Table 5, which is shown here again so as to compare gradually the contribution of each component of the macroeconomic index to results. Results are significant and the coefficients have the expected signs.

The third regression omits the variable OVERVAL which is subject to endogeneity, as emphasized by Sirimaneetham and Temple (2005). Also in this regression results are significant and the coefficients have the expected signs.

Finally, the last regression deals with the endogeneity of all variables. We use a macroeconomic index that excludes OVERVAL and INF, which are the variables suspect of endogeneity. In order to represent inflation we built dummy variables representing the inflation regimes: FISCAL_DOMINANCE represents the inflationary regime in the 1970s and mid-1980s, while INFLATION_TARGETTING represents the period since the mid-1990s. Results are significant and with expected signs, except for FISCAL_DOMINANCE which was not significant and consequently

not reported. Also the explanatory power rises. We see this regression as representative of our results, since this regression is based on exogenous variables only.

Table 6 – The Macroeconomic Performance

(TSLS*, t statistic in parentheses)

Dependent\independent variable	Y_1	Y_1	Y_1	Y_1
Equation number	(1)	(2)	(3)	(4)
Number of observations	105	105	105	105
Period	1980q4-2006q4	1980q4-2006q4	1980q4-2006q4	1980q4-2006q4
C	3.13 (2.8)	-0.20 (-0.2)	-0.64 (-0.5)	-1.59 (-1.2)
MOVAV_CA_DEF	-0.04 (-2.1)			
MOVAV_INFLATION	0.004 (3.3)			
MOVAV_MACRO_EXC_RATE	1.59 (6.4)			
MOVAV_MACRO_CA		0.37 (4.2)		
MOVAV_MACRO_OVERVAL			0.40 (3.8)	
MOVAV_MACRO_CA_NET				0.92 (4.9)
AREBUIOT	0.59 (3.7)	0.55 (3.2)	0.55 (3.1)	0.78 (3.9)
MOVAV_PXPY	3.75 (5.3)	3.20 (4.2)	3.24 (4.2)	4.25 (3.6)
MOVAV_ISR_CAS/POP	-9.39 (-1.8)	-9.23 (-1.6)	-8.55 (-1.4)	-14.0 (-2.3)
MOVAV(ALIA/POP)	0.17 (7.2)	0.18 (6.9)	0.19 (6.8)	0.20 (6.4)
MOVAV_dlog(WT)	0.13 (2.3)	9.84 (1.7)	10.3 (1.7)	17.4 (2.0)
MOVAV_T_STATUTORY	-0.25 (-4.1)	-0.13 (-2.2)	-0.12 (-1.9)	-0.13 (-1.9)
INFLATION_TARGETTING				0.71 (2.1)
Adj. R Squared	0.57	0.49	0.48	0.52

* Instruments: terms of trade (for PX_PY) and M_Macro_net (for M_Macro_ca).

3.5 Granger causality tests

One of the important questions is whether the variables analyzed above reflect causality, as opposed to correlation with business sector GDP (BS_GDP). In this section we show the results of pair-wise Granger causality tests.

The results are shown in Table 7. A low probability implies that we can reject the hypothesis that the analyzed variable does not cause per capita BS_GDP. The results

show that we reject the hypothesis that world trade, terror attacks and statutory taxes do not cause the development of per capita BS_GDP.

Table 7 – Granger Causality Tests

(probability of rejecting the null hypothesis)

	Per capita BS_GDP does not cause the variable	The variable does not cause per capita BS_GDP	Sustainable growth does not cause the variable	The variable does not cause sustainable growth
Immigrants (% of total population)	0.20	0.22	0.13	0.75
PX/PY	0.10	0.50	0.43	0.16
World trade	0.48	0.002 *	0.054	0.24
Terror injuries (% of total population)	0.002 *	0.03 *	0.67	0.27
Weighted statutory tax rate	0.12	0.049 *	0.35	0.028 *, **
Direct statutory tax rate	0.14	0.03 *	0.26	0.031 *, **
CA Macroeconomic index	0.09	0.27	0.36	0.40
Immigrants labor experience stock	0.20	0.14	0.785	0.16
US loan guarantee program			0.65	0.085

* Significant at 5 percent. ** Including 12 quarters lag.

Concerning sustainable growth episodes, the single variable that causes these periods is the statutory tax rate; however, this finding is dependent on using a twelve-quarter (three-year) lag. All the other variables do not cause sustainable growth episodes. We conclude that the combination of variables is the one that causes these episodes, and single variables per se are not able to cause sustainable growth. In fact, when we test the joint hypothesis that all the variables that appear in Table 7 Granger cause persistent growth, we get that the results are significant at a 1 percent level.

3.6 Contributions to the transition from recession to the present growth episode

In this sub-section we use the coefficients estimated above to asses the contribution of the different variables to the transition from the recession at the beginning of the millennium to the present persistent growth episode. For this purpose we use equation 4 in Table 6.

The analysis compares the values of the different variables in two periods: the present growth period, which started in the third quarter of 2003 and continued until 2006, and the previous recession period, that started in the last quarter of 2000 and lasted till the second quarter of 2003. By multiplying the differences in the values of the explaining variables in these two periods by the coefficients of the regression, we obtain an estimate of the contributions of each variable to the transition from the recession to the present growth period. The results presented in Table 8. Since Per-Capita GDP growth increased from -3.3 percent to 3.2 percent (Table 1), we normalized the results so as to obtain that the sum of the contributions amounts to 6.5 percent.

Table 8 – Contributions of different variables to the present growth episode

Variable	Difference	Contribution (% of GDP)
Change in world trade	1.3	1.3
Share of individuals injured by terror in the population (%)	-3	2.4
Macroeconomic performance (NET_Index)	0.3	1.4
Weighted statutory tax rate (%)	-1.6	1.2
The share of immigrants in the population (%)	-0.9	-1.0
The ratio of export to GDP prices (Index)	3	0.7
US loan guarantee program		0.5
Total (%)		6.5

The results show that the exogenous variables, mainly world trade and the security situation as represented by the number of casualties caused by terror, are responsible for approximately two thirds of the transition from a recession to growth. Policy variables, i.e., the improvement of macroeconomic performance and the reduction of the tax rate, explain approximately the remaining third of this transition.

4. Conclusions

The following are the conclusions obtained from our research:

i) Macroeconomic management in Israel was characterized by periods of bad and good management throughout Israel's short history. In the last years there has been a remarkable improvement in macroeconomic management.

ii) The main variables affecting growth episodes are exogenous variables – the world trade and the security situation – and policy variables – macroeconomic policy (positively), government investment (positively) and taxes (negatively). Exogenous variables had a higher impact on growth episodes than did policy variables.

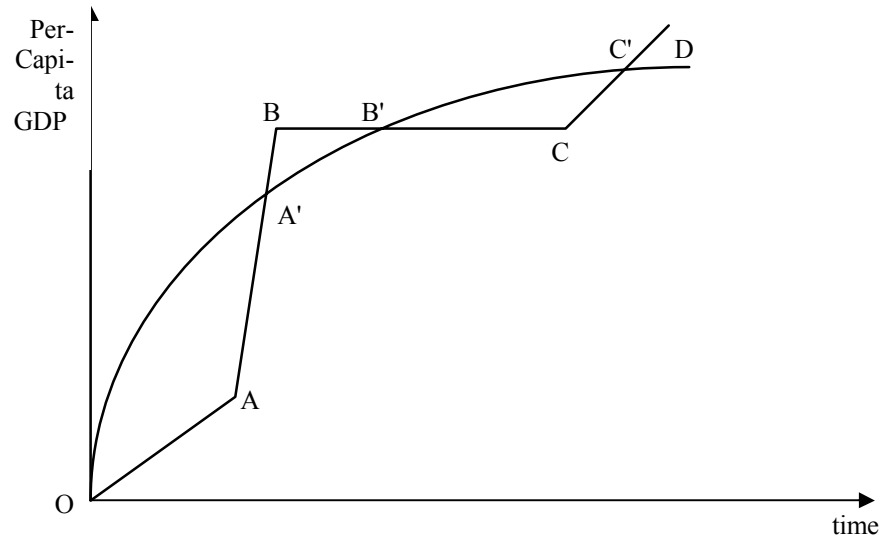
iii) Growth episodes in Israel were affected by both supply and demand factors. Among the demand factors we stress the world trade, the security situation and the first stage of the influx of immigration. Among the supply factors we stress government investment in infrastructure and the experience of immigrants after their integration in the labor market.

iv) Using our analytical framework to quantify the contribution of the different forces to the transition from the 2001-03 recession to the present growth episode, we found that exogenous variables – world trade and the security situation – are responsible for approximately two-thirds of this transition, and

policy variables – macroeconomic management improvement and tax reduction – are responsible for approximately one-third.

We stress that our analysis is focused on growth episodes, and not on long-run growth. Quantifying the forces explaining long-run growth requires using additional variables, like investment in research and development and investment in education at different education levels, which is beyond the scope of the present research.

APPENDIX A – Definitions of Sustainable Growth



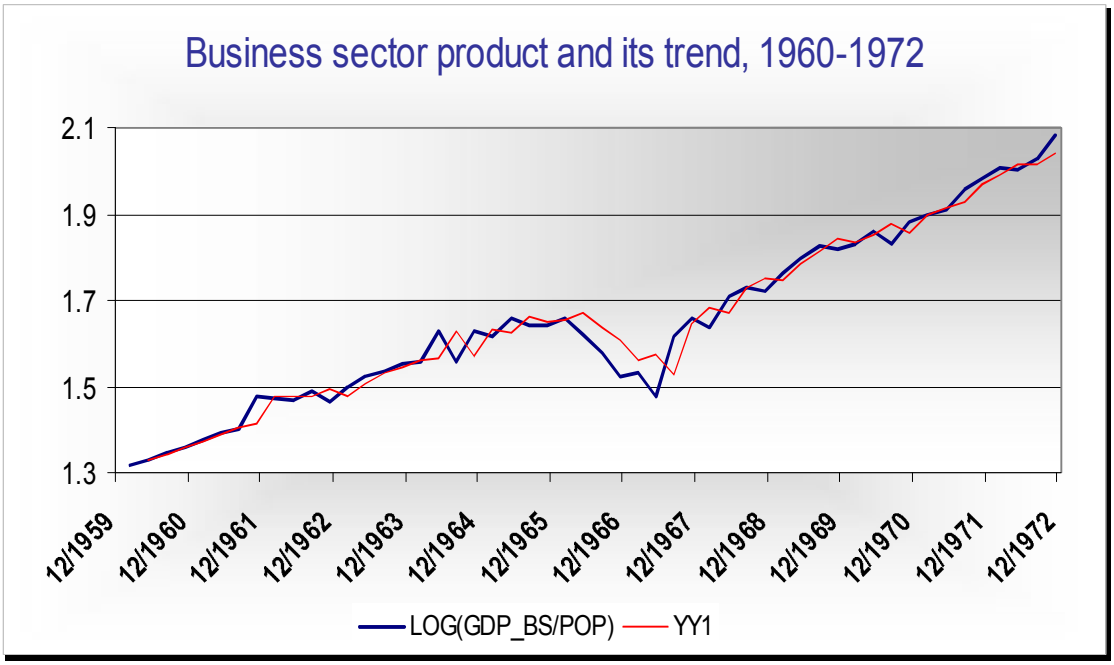
Suppose that the piecewise linear line in the diagram represents actual GDP, and the curve represents its trend (using an HP filter).

Using the benchmark definition of growth, which is based on growth rates, implies that the periods AB and CD are defined as growth periods - note the steep slope, which means a high rate of change - and OA and BC as recession periods.

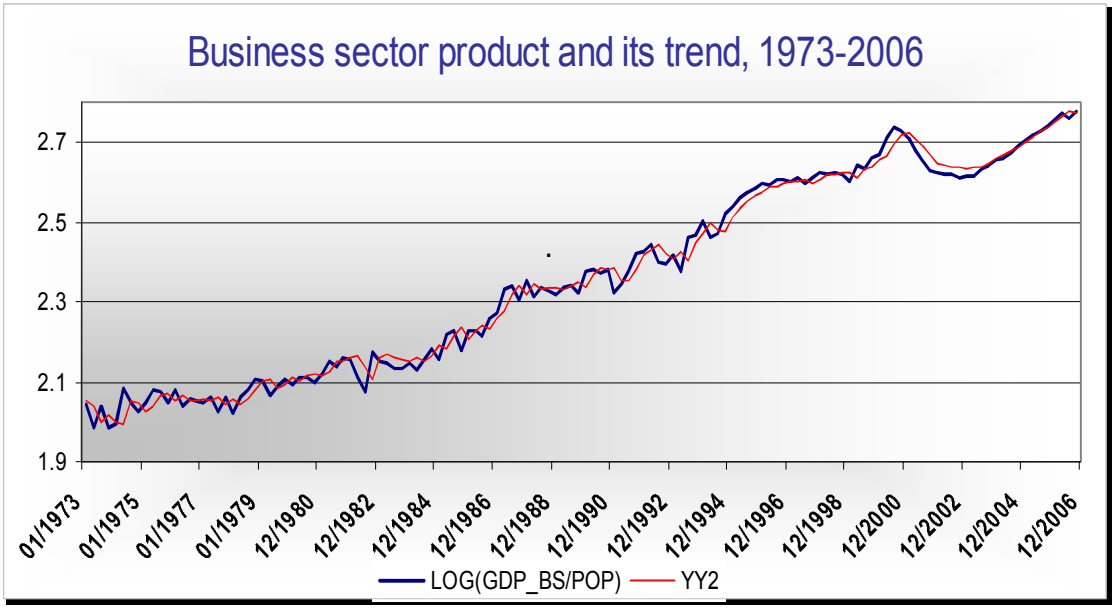
An alternative definition of growth is based on per capita GDP level. According to this definition, the growth period starts when the per capita GDP level is higher than trend; i.e., the first growth period starts at A` (instead of A) and ends at B` (instead of B). The delay on the starting date can be interpreted by thinking that the higher growth rate after point A only compensates for the loss of output in the previous recession, and it is only at A` that the growth period begins.

A good example of the difference between these definitions can be found at the present growth episode, which occurred after two years of a sharp reduction in per capita GDP, in 2001 and 2002. According to the first definition we are in a persistent growth episode since 2003. According to the second one, the growth in 2003-06 is only compensating for the loss of output during the recession years, and only at the present the persistent growth period is starting.

The following figures show a comparison between actual per capita business sector GDP and its trend. The trend was calculated using a linear regression for the logarithm of per capita GDP in two different periods: 1960-1972 in which per capita GDP increased by 1.6 percent, and 1973-2006 in which per capita GDP increased by 0.6 percent. Given that we included autoregressive components, the trend is not linear. We see in the first diagram that the two persistent growth periods as defined in Table 1 remain the same, with one difference: the end of the first period occurs one quarter ahead (the first quarter of 1966) and the second period starts one quarter ahead.



The biggest difference is related to the more recent periods: the immigration period continues until the year 2000 instead of ending in 1996, and the present period cannot be considered as a persistent growth episode since it is only at the present that the per capita GDP level achieves the trend level.



APPENDIX B – A Cointegration Analysis

B.1 An analysis of per capita GDP

The results of the cointegration analysis of Business Sector per capita GDP are summarized in Table B.1. We report the coefficients, the standard deviations, and the ADF statistic obtained when excluding each variable from the cointegration equation. This indicator allows us to assess the contribution of each variable to the long-run relationship with per capita business sector GDP.

The variables used in the analysis are the ones introduced in section 3.1, in addition to the following ones:

FW – The *number of foreign workers*. In many studies (see Hercowitz, Lavi and Melnick, 2000) it was found to be an important variable for explaining productivity and growth (as well as a contributing factor to income inequality).

A_USA – This variable represents *total productivity in the United States*,[20] and as in previous studies it is considered a supply variable.

[20] In the cointegration analysis of productivity we used both A_USA and US GDP. We expect that US productivity accounts for supply factors, while US GDP represents demand factors. Economic research shows that supply factors are more related to growth since they are permanent, while demand factors are related to business cycles since they are transitory (Blanchard and Quah, 1989).

Table B.1– Business Sector GDP (Per capita)

(In parentheses: standard deviation, ADF excluding the variable)

Dependent\ independent variable	Log(GDP_BS/ POP)	GDP_BS/POP	GDP_BS/POP
Equation number	(1)	(2)	(3)
Period	1960-2006	1963-2005	1963-2005
C	1.8 (0.2)	4.8 (1.5)	8.4 (2.3)
Log (WT), WT	0.38 (0.02, -1.2)		
Log(STOCK_ALIA), STOCK_ALIA	0.03 (0.01, -3.7)	4.3e-6 (2.8e-6, -4.5)	-1.4e-5 (9.1e-6,-5.2)
Log(FW), FW	0.03 (0.003, -3.7)	0.02 (0.009,-4.6)	0.03 (0.01,-4.8)
ISR_CAS		-0.004 (0.001, -4.1)	-0.03 (0.001, -5.2)
GI		0.0004 (0.0002, -4.8)	0.0004 (0.0002, -5.4)
Y_USA		0.004 (0.0004, -2.8)	0.004 (0.0004, -4.7)
CADEF		-0.08 (0.03, -3.8)	-0.07 (0.02, -5.3)
MOVAV_EXC_RATE		4.3e-6 (2.8e-6, -4.8)	-0.25 (0.3, -6.0)
STOCK_ALIA^2			1.9e-11 (1.0e-11,-4.8)
ADF	-4.1	-4.8	-6.1*

* Significant at 5 % level

MOVAV_EXC_RATE – The *exchange rate system component of the macroeconomic index*.

A – *Total factor productivity*, calculated as a Solow residual of the Aggregate production function, which includes weights of 0.67 and 0.33 for labor and capital respectively.

CAPACITY_K – *An index of capacity utilization*; to analyze the capacity variable note that the production function includes the stock of machinery, and consequently the capacity utilization of machinery (hours of operation) is not measured directly and is computed in the measure of total productivity as a residual (Solow Residual). In order to capture the capacity utilization component at the cointegration analysis, we

use a measure of capital utilization as recorded in the Companies Survey of the Bank of Israel. This measure is based on a questionnaire on machinery utilization, as reported directly by company managers. Since this measure is available only since 1983, we extended the series backwards to 1970 by using the electricity consumption of the industrial sector as an indicator of capacity utilization in the earlier period.

L – *Labor input*, measured in hours.

Equation 1 takes into account only three exogenous variables. We ran this equation in a log-log specification, so as to obtain elasticities. It was found that although these variables have a significant contribution to the ADF, they are not sufficient to explain the business sector GDP per capita; additional variables, including policy variables, must be added. The largest elasticity and the highest contribution to cointegration were obtained for the world trade.

Equation 2 adds additional exogenous variables,[21] one of them representing a supply variable – government investment (G_I) – and another representing the security situation (the number of Israeli casualties). Each of these variables improves cointegration, but we still do not obtain a cointegrative relationship.

An interesting variable is the stock of immigrants (STOCK_ALIA), which turned to be a crucial contributor to the long-run relationship. Moreover, the squared immigration term is a crucial contributor for this relationship.[22]

B.2 An analysis of productivity growth

In this sub-section we extend the analysis to total factor productivity. Among the components of the production function, this variable was found to be crucial for the explanation of growth (Lavi and Strawczynski, 2001). Like in the previous sub-

[21] In contrast to the first regression, in the next regressions we do not use logarithms.

[22] The fact that the squared variable adds to cointegration means that there is a significant contribution for growth under high values of the stock of immigrants. One possible interpretation is that important immigration influxes enhance both demand and supply, as explained in Lavi and Strawczynski (2001).

section, we search for the long-run relationship that explains productivity, and we test both supply and demand variables.

Table B.2– Total Factor Productivity

(In parentheses: standard deviation, ADF excluding the variable)

Dependent\ independent variable	A	A	Log(A)
Equation number	(1)	(2)	(3)
Period	1960-2005	1970-2005	1970-2005
C	0.29 (0.60)	71.4 (2.6)	75.4 (7.1)
Log (FW) , FW	0.03 (0.005, -2.0)	0.05 (0.02, -5.0)	0.06 (0.03, -5.0)
Log(STOCK_ALIA), STOCK_ALIA	0.04 (0.02, -1.9)	1.5e-5 (3.6e-6, -5.3)	1.6e-5 (4.0e-6, -5.1)
Log(A_USA) , A_USA	0.78 (0.14, -1.9)		
CAPACITY_K		0.005 (0.0008, -3.3)	0.006 (0.001, -3.2)
ISR_CAS		-0.003 (0.001, -5.1)	-0.003 (0.0015, -5.2)
Y_USA		0.009 (0.0007, -1.7)	0.008 (0.001, -1.7)
L		-0.84 (0.11, -2.2)	-0.95 (0.21, -3.8)
K_ROADS			0.10 (0.16, -5.7)
ADF	-1.8	-5.7*	-6.1*

* Significant at a 5 percent level.

Our first approximation considers the variables used in the growth regressions that are directly related to labor and capital productivity. This includes the productivity in the US, which acts as a good proxy for technological advance. However, the result shows a lack of cointegration. This result means that other variables are needed in order to understand the long-run development of productivity.

Next, we consider a new variable, CAPACITY_K, which is a measure of capacity utilization.[23] We expect this variable to have a positive contribution, given that capacity utilization is clearly pro-cyclical. Not surprisingly, this variable has a

[23] In a non-reported regression, we obtained more significant results when using the short series of CAPACITY_K (from 1983 until 2005) - based only on the measurement of capacity utilization from the Companies Survey (i.e., not measuring capacity utilization by electricity consumption).

substantial contribution to cointegration.[24] The other variables explaining productivity are the US real GDP, labor input as a control variable, and Israeli casualties in terror attacks. We consider the finding that demand variables are needed in order to achieve cointegration as an additional sign that Israel has not achieved yet a long-run steady state.

The third regression adds the stock of roads, which is a policy variable and is expected to increase cointegration. In fact, he ADF increases to 6.1, which is significant at 1 percent.

[24] Note that the value of the ADF when excluding this variable is based on a longer sample.

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