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Fiscal Policy and the Current Account

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Fiscal Policy and the Current Account

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Abstract

In this paper, we use the *VAR* model to produce a first-ever estimate of the connection between fiscal policy and the current account in Israel in 1995–2010. We find that a positive shock of 1 percent of GDP in public consumption increases net imports by 0.6 percent of GDP on average, but only in the short term — up to two quarters. The fact that the short-term effect of the shock is far from zero indicates, as estimated in the literature, that individuals do not increase their current personal savings by an amount equal to the full increase in public consumption. The study also shows that the main pass-through from public consumption to net exports is the direct one, based on real demand, not the pass-through powered by indirect effects, such as the exchange rate, inflation expectations, and interest. Another finding is that the positive pass-through of public consumption to civilian import demand is the principal channel that leads to this outcome. These conclusions are of fiscal macroeconomic importance in understanding macroeconomic processes in recent years, in examining the planning of the government consumption framework, and in understanding the implications of both.

המדיניות הפיסקאלית והחשבון השוטף

יובל מזר והרן מאיה

תקציר

במאמר זה אנו אומדים לראשונה באמצעות מודל ה-*VAR* את הקשר בין המדיניות הפיסקאלית לחשבון השוטף בישראל בין השנים 1995-2010. נמצא שזעזוע חיובי של אחוז תוצר בצריכה הציבורית מגדיל בטווח הקצר בלבד – עד שני רבעים – את הייבוא נטו ב-0.6 אחוז תוצר בממוצע. העובדה שההשפעה של הזעזוע רחוקה מלהיות אפס בטווח הקצר מעידה על כך שבהתאם להערכות בספרות, הפרטים אינם מגדילים את החיסכון הפרטי בהווה במלוא הגידול בצריכה הציבורית. עוד עולה מהמחקר כי הערוץ המרכזי של התמסורת בין הצריכה הציבורית לייצוא נטו הוא הערוץ הישיר המתבסס על הביקושים הריאליים, ולא מנגנון התמסורת דרך השפעות עקיפות, כמו שער החליפין, הציפיות לאינפלציה או הריבית. ממצא נוסף הוא שהתמסורת החיובית בין הצריכה הציבורית לביקוש לייבוא האזרחי היא הערוץ העיקרי שמביא לתוצאה זו. למסקנות אלו משמעות פיסקאלית מקרו-כלכלית הן בהבנה של התהליכים המקרו כלכליים בשנים האחרונות, הן בבחינת תכנון מסגרת הצריכה הממשלתית והן בהבנת ההשלכות של אלו.

1. Introduction and Review of the Literature

The pass-through between fiscal policy and the current account arouses intense interest in both theory and practice. The importance of this pass-through and the difficulty in identifying it can explain the great interest in this subject in the literature. The fact that the government deficit and the current account deficit are empirically correlated has been recognized for a long time in the literature (this correlation has given rise to the "twin deficits" concept, which will be discussed later). The **causal** factor, however, especially the effect of fiscal policy on the current account deficit, is still a focus of research into macroeconomic policy.

In open economies, particularly those in which the current account deficit constitutes a significant problem, the question arises of how fiscal consolidation (reducing the government deficit through spending cuts or tax increases) can contribute to narrowing this deficit. Although the Israeli economy is small and open, to the best of our knowledge, this question has never been addressed for Israel. This study assesses how the changes in public consumption in Israel affected net exports in Israel in 1995-2010.

A look at Figure 1, which displays public consumption and net exports as percentages of GDP on a yearly basis, provides an initial motivation for evaluating the connection between public consumption and the current account in the period under discussion. The correlation emerging between the two sequences is -0.96, an almost perfect negative correlation.

Figure 1

The Public Consumption and the Net Export, Annual Frequency 1995-2005

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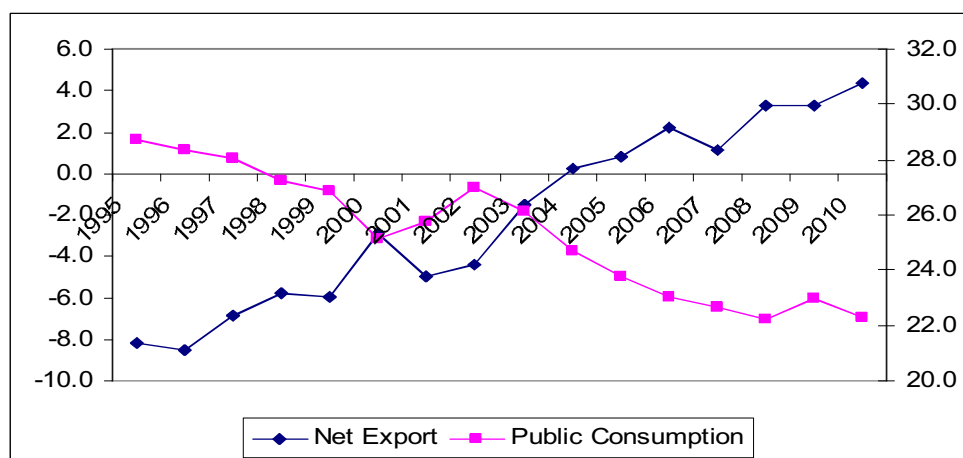
By definition:

(1)
$$CA \equiv Net\_Export + rB \equiv Y - C_{pr} - I_{pr} - C_g - I_g + rB =$$
$$= [(Y - C_{pr} - T) - I_{pr}] + [(T - C_g) - I_g] + rB \equiv (S_{pr} - I_{pr}) + (S_g - I_g) + rB$$

Where Y is GDP, C is private consumption, I is investment, T is taxes, S is savings, rB is interest payments, g stands for government, and pr stands for private.

In this article, we focus on estimating the effect of a change in C_g on CA. Looking at the equation, it can be seen that if the other elements of the equation are constants, an increase in C_g can be expected to cause a decrease in CA; however, when the effect is broken down into parts, the indirect effects of an increase in government consumption through other elements in the equation – private consumption and investment – must also be addressed.

Fiscal policy can affect the current account through the following pass-through.

- **A direct effect through demand**
  - According to Keynesian theory, changes in public consumption influence aggregate demand. A rise in public consumption (with no corresponding tax increase) will cause a rise in total demand in the economy and an increase in the trade deficit, i.e. a higher government deficit causes a current account deficit – a phenomenon recognized in the term "twin deficits."
  - According to classic economic theory, a rise in government consumption has a different effect; if individuals are forward-looking and the rise in public consumption is permanent, the trade deficit will not increase. If individuals are aware that a permanent increase in government consumption will lead to higher taxes in the future, they increase their savings now in order to prepare for this measure, since the assumption is that individuals smooth their consumption (Ricardian equivalence). When Ricardian equivalence is fully effective, any permanent rise in government consumption should be directly offset by a fall in private consumption, and there is therefore no effect on total demand in the economy, or on net exports. Transitory changes in government consumption can cause a change in net exports and the current account, because they are not fully offset by private consumption. Furthermore, Ricardian theory states that given

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supervision of government consumption, taxes should have no effect on private consumption and the current account.

- **An effect through the real exchange rate**

  Fiscal policy can affect the current account by changing the relative price of non-durable goods (a change in the real exchange rate): an increase in public consumption leads to higher demand for non- durable goods (such as education and health), which in turn causes in rise in their price, compared with the price of durable goods, i.e. a real appreciation. As a result, private consumption will be diverted to durable goods, and production will be diverted away from durable goods. These factors will lead to an increase in the current account deficit.[1] The government is the main factor on the demand side, and especially affects domestic demand. A rise in government demand is usually reflected in greater demand for domestic goods, and therefore causes appreciation and an increase in surplus imports, which means that net exports will fall.

- **The effect of fiscal consolidation on an increase in demand for investment**

  In cases in which the government deficit is large, restraint in public consumption is likely to cause a surprising increase in demand in the economy and a higher trade deficit, i.e. a drop in net exports. Fiscal consolidation demonstrates credibility and an ability to bring about a real decrease in the economy's risk premium, and signals a future drop in the tax burden. This encourages foreign and local investors to invest, in which case the current account deficit, which reflects a surplus of investment over savings, can be expected to rise. According to the Mundell-Fleming model, when a foreign currency regime is flexible, a drop in the economy's risk premium will lead to a flow of investment into the economy, and therefore to an appreciation. This appreciation has a negative impact on the current account deficit, and causes net exports to fall.

  Debt in Israel from 1995 was high during the entire period. Under the Maastricht Treaty, debt higher than 60 percent of GDP is considered high and unsustainable.

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[1] A graph describing domestic public consumption as a proportion of total public consumption appears in Figure A.1 in the appendix. The fact is that most public consumption is directed towards domestic uses, and consequently to non-durable goods.

Although the general level of Israel's debt was high all during the period, the government systematically cut its debt starting in 2003. Note that the economy's risk premium was low during the study period, except for the period preceding the cut (2003), when the economy's risk premium rose. The cut may therefore have had a more significant effect.

■ **Size and development of the economy**

The Israeli economy is small and open, and the exchange rate therefore has an important effect. On the other hand, in closed economies, such as the US, an interest rate hike will be translated into a drop in investment, and it is therefore expected to have less effect on the current account, as has indeed been found in various empirical studies showing that the effect of a rise in public consumption is greater when an economy is more open. Some studies in the US found almost no connection between public consumption and the current account deficit, and a few studies even found a positive connection. An explanation of this phenomenon could be based on the indirect effect of the interest rate on investment. Furthermore, relaxing of governmental discipline leads to higher debt, and the government must therefore pay a higher interest rate to finance its spending. A rise in the interest rate lowers public savings, and therefore crowds out investment.

The relative weight of these forces, and their resulting overall effect on the current account, theoretically depend on the parameterization of the model, i.e. depends on the basic factors of the country. For example, in a developing and open economy, fiscal consolidation can have a negative impact on the current account if the flow of capital into the country responds sharply to a decline in the risk premium of that country, which would more than offsets the other direct and indirect effects mentioned above having a negative effect on the current account. On the other hand, in an economy that is less sensitive to movements of capital, it is likely that a drop in the government deficit will also have a negative effect on the current account. Empirical studies have indeed shown that the current account's response to fiscal policy depends on each country's characteristics and the timing of the business cycle.

The connection between the government fiscal variables and the current account balance cannot be discussed without a mention of the twin deficits hypothesis concept. This hypothesis is essentially based on the positive empirical connection between the government deficit and the current account deficit. The hypothesis relates to changes in the tax rate or government spending; therefore when all the various effect channels through which the government deficit can affect the current account deficit are weighted, the conclusion is that this connection is positive, meaning that a government deficit causes a rise in the current account deficit.

In looking at Equation 1, the government fiscal element can be separated into public consumption (C_g) and tax revenues (T), and the effect of each element can be examined separately. On the other hand, the two variables can also be evaluated together: $T - C_g$ as government savings. According to the twin deficits hypothesis, net government savings are what affect the current account balance, not each of its elements.

In this article, we will mainly address the effect of the government deficit in indirect fashion by adding a tax receipts variable to the model. As soon as tax data are included in the model, we will be able to get an indication of the effect of the higher government deficit channel on the current account deficit. At the same time, it should be kept in mind that in the *VAR* model, the tax variable is endogenous, and can respond or not respond to a change in public consumption. For this reason, this test yields only an indication of the effect of the government deficit on the current account. The main test in this article assesses the meaning of the effect of **government consumption** (the spending side) on the current account.

A review of the literature on the subject

Interest in the effect of a rise in public consumption on the current account has been renewed in recent years, after a correlative trend was found between the government deficit and the current account deficit in the US, starting during the George W. Bush administration in 2000. After a decade in which it appeared that the US government deficit had no effect on the current account balance, the US government deficit rose following the war in Iraq and Afghanistan, simultaneously with an increase in the current account deficit.

This made it necessary to reconsider the subject, and a considerable number of articles on the subject were accordingly published. In addition, the 2008 global crisis led to an expansionary and exceptional monetary policy that generated renewed interest in this policy's effect on the current account.

The currently prevailing assumption in the literature is that individuals are not completely Ricardian, and that this mechanism therefore does not fully offset the effect of a rise in government consumption on the current account, even if the change in public consumption is permanent. There is no general agreement, however, about the extent of public consumption's effect on the current account. Various studies have presented different results, showing that the effect depends on special characteristics of each country: the degree of free trade, monetary policy, extent of public debt, and level of development, as well as the estimation methods.

The principal difficulty in considering the subject lies in the endogeneity of the variables. Government consumption and the current account can both be affected by the business cycle. Furthermore, government consumption can fall following a rise in the current account deficit. There are two principal ways in the literature of handling the evaluation of the effect of public consumption on fiscal variables, including its effect on the current account.

Individual identification of exogenous variables

In this approach, the solution of the endogeneity problem is obtained through individual identification of changes in public consumption determined to be exogenous to the business cycle. There are a number of ways of identifying an exogenous change in public consumption. The first is according to government statements and official documents indicating a change in public consumption resulting from ideology, rather than from the business cycle. The second marks changes in public consumption stemming from a change in the security situation as exogenous changes. The first studies on the subject tested the effect of a rise in public consumption in the US caused by security shocks (wars) on other macroeconomic variables. Barro (1981) and Ramey and Shapiro (1997) tested the effect of a change in government consumption stemming from a security shock on the real interest rate, private consumption, wages, and productivity in production. Romer and Romer (2007)

tested the effects of a change in taxation on fiscal variables, although they relied on US presidential speeches, a perusal of documents of senior administration officials, and Congressional reports to identify exogenous changes in taxation.

Feyrer & Shambaugh (2009) used data from the Romer and Romer study (2007) to test the effect of an exogenous change in public savings on the current account. They found that a positive shock in savings caused a rise in the current accounts deficit.

Section 4 of the International Monetary Fund annual report (September 2011) discusses at length the effect of fiscal expansion and contraction on the current account by using individual identification of exogenous variables of similar import to figures from the Romer and Romer study for a large number countries. The authors use fiscal changes over the past 30 years for 17 difference countries (panel data) defined as unrelated to the business cycle or circumstances pertaining to foreign trade ("We identified 291 fiscal policy change that were not motivated by cyclical or external considerations"). The authors indeed found a significant difference between the pass-through for the new variable defined in comparison with the business cycle-adjusted deficit, and estimate the average elasticity as 0.5, i.e. fiscal strengthening of 1 percent of GDP will reduce the current deficit by 0.5 percent of GDP within two years. This effect is simultaneous through a reduction of demand for imports and through an exchange rate devaluation causing an increase in exports. In addition, they indicate that a permanent fiscal change has a greater effect than a change defined as temporary, and that when other dominant countries make fiscal adjustments at the same time, the important variable is the relative size of the adjustment, not its absolute size. Finally, the authors show that when a monetary constraint prevails in a country through monetary policy and/or the exchange rate, fiscal changes are expected to have a stronger effect.

The advantage of using individual identification results from criticism of the common use of the business cycle-adjusted deficit as a variable reflecting a country's fiscal policy: this deficit is still affected by extreme changes in the business cycle (the technical adjustment is underestimated); in some cases, the causality is in the opposite direction – i.e. fiscal contraction is due to problems in the current account and the desire to reduce the deficit by cooling off demand. In our opinion, the individual identification approach does not avoid this criticism. The declared reasons can conceal other motives – and even a direct

connection consisting of a change in public consumption aimed at dealing with a current account deficit. Government statements can be defined as a cause of an exogenous change, but in essence, they result from a stage in the business cycle. Without a particular stage in the business cycle, these changes could not have been made because of reasons of public opinion and expert opinion. For example, a rise in the current account deficit can cause fiscal contraction (according to expert advice), regardless of statements by the Administration that the contraction could be related to ideological motives. Measurement is also a problem in this method. When do you begin measuring the change? Immediately after the speech? When a change in public consumption becomes visible? It can be difficult to connect spending with declarations. From now on, we will therefore focus on the second approach, which in our opinion better addresses the subject.

Use of *SVAR* regression

In recent years, it has become customary to use *VAR* regression to evaluate the effect of fiscal aggregates. The logic behind the use of *VAR* regression in this case is that quarterly public consumption responds to changes in other fiscal variables only **at a lag**, and does not respond to such changes directly and **simultaneously**. It was also found that especially in Israel, public consumption is almost unaffected by the business cycle through the automatic stabilizers, meaning that there are practically no business cycle components in public consumption in Israel. In this sense, changes in public consumption are exogenous. This logic makes it possible to use Cholesky decomposition, as was first done in a study by Blanchard and Perotti (2002). In their study, they used *SVAR* regression for the first time to test the effect of public consumption on fiscal variables (GDP).

The advantage of using this model is that quarterly observations make it possible to analyze the effect of a change in public consumption on the current account after adjusting for the effect of the business cycle and the endogeneity between public consumption and the current account (owing to the order of the variables). Furthermore, the *VAR* model makes it possible to separate the effect of government consumption on the other endogenous variables in the equation from their effect on the current account.

A number of current studies on the subject that examined the effect of government consumption on fiscal variables and on the current account are presented here, particularly

using the *SVAR* model with Cholesky decomposition: Jaime Guajardo, Danile Leigh, and Andrea Pescatori (2011) examined the effect of fiscal consolidation on economic activity in 17 OECD countries in 1978-2009. They found that a 1 percent drop in the public deficit increases net exports in comparison with GDP by 0.5 percent. This result reflects both a 0.9 percent increase in exports and a 1.2 percent drop in imports as a proportion of GDP. This result weakens, but does not offset, the decrease in domestic activity resulting from fiscal restraint, so that the net effect on GDP of a drop in public consumption remains negative.

The paper by Abbas et al., which uses panel data for a number of countries, found that the effect of a 1 percent drop in the public deficit causes an improvement of 0.1-0.4 percent in the current account. This finding is robust for both developing and developed countries. It was also found that the effect becomes stronger when GDP is above its long-term trend (above its potential GDP) and when the countries have more free trade. In this article, the researchers ran a *VAR* model, and found that an increase in government consumption as a percentage of GDP of up to one standard deviation (1.35 percentage points) caused a decrease of the same proportion in the current account. In this running of the model, it was found that the effect was stronger in developing countries.

Ilzetzki, Mendoza, and Ve'gh (2011) mention the importance of the exchange rate regime, the degree of free trade in the economy, and the level of government debt in examining the effects of government spending on macroeconomic variables. The more an economy is closed to international trade, and the lower its debt, the stronger and more sustained the effect of a shock in government consumption on GDP. It was found that in an open economy, the rise in demand created by a shock in government consumption is filled by supply from outside the country.

Today, it is understood that the effects of fiscal policy depend on monetary policy. The article by Ilzetzki et al. (2010) found that the effect of an expansionary fiscal policy depends on the level of the interest rates in the economy. When the interest rate approaches 0, the effect of fiscal policy becomes stronger. In recent years, interest rates in Israel have been far from 0; only in the past two years, during the most recent global financial crisis, did the interest rate plummet to almost 0.

Corsetti and Muller (2006) built a model in which the effect of public consumption on the current account did not exist in a relatively closed economy when the shock in

government consumption was not sustained. They back their model with an empirical test through a *VAR* model that compares the US and Australia (where the economies are relatively closed) to the UK and Canada (where the economies are relatively open).

Obstfeld and Rogoff (2001) examined the effect of government consumption on other macroeconomic variables. The variables relevant to this study are trade costs, price discrimination, and preferences for domestic goods. In this sense, the set of prices facing investors inside and outside the country can vary between countries, and can therefore affect the consumption and investment decisions of individuals. In the context of this article, the article constitutes an indication of the difference between countries in the effect of fiscal variables and the importance of an economy's openness to trade and its level of risk. It is important to check the model in Israel, in contrast to other countries, in order to grasp the unique features of the Israeli economy in considering the effect of public consumption on the current account.

The article by Vamvoukas (1999) examined the phenomenon in Greece. Greece is an interesting case, because the country has had both a government and current account deficit since 1948. Israel also had both a government and current account deficit for most of the years in the sample period. In addition, Greece joined the euro bloc relatively late – in 2001. This article found a significant positive connection between the government deficit and an increase in the current account deficit.

The article by Kim and Roubini (2004), on the other hand, which used US data, found that a rise in public consumption increases the balance of the current account, and causes depreciation in the real exchange rate.

An up-to-date summary of the recent empirical findings estimated around the world is displayed in an enlightening table in the appendix of Abbas et al. (2011).

In Israel, a number of studies about topics indirectly related to this study have been published in recent years. The study by Strawczynski and Lavi (2005) found a limited substitution of 20 percent between public and private consumption. They also found that how government spending was financed had an important affect on private consumption. Mazar (2011) used *VAR* regression to test the effect of public consumption and its elements on GDP. This study found that an increase in public consumption had a positive effect on

GDP, and that the magnitude of the effect was less than unitary, meaning that an increase of 1 shekel in public consumption increased GDP by less than 1 shekel.

In this article, we will examine the effect of public consumption on the current account in Israel. In order to find the final result of the effect itself, we will also deal with the indirect mechanism by including endogenous and exogenous variables liable to have an indirect effect. The size and direction of the pass-through will be tested through a *VAR* system based on four endogenous variables expressed as proportions of GDP: public consumption excluding defense imports, similar to the variable used by Mazar (2011); net exports; private consumption; and investment in the economy. We will add nominal variables to this basic model: the Bank of Israel interest rate, inflation expectations and the real exchange rate.

The article is structured as follows: Part 2 describes the database, Part 3 discusses the *VAR* methodology, Part 4 presents the main results of the analysis, and Part 5 summarizes.

2. Description of the Data and Their Development over the Period

A simple development of Equation 1 leads to Equation 2:

(2) $\quad NX \equiv Net\_Export \equiv Y - C_{pr} - I_{pr} - C_g - I_g = Y - C_{pr} - C_g - I$

Where *I* with no subscript stands for the level of investment in the economy. It is easy to derive Equation 3 from Equation 2 by dividing both sides by GDP:

(3) $\quad \dfrac{NX}{Y} = 1 - \dfrac{C_{pr}}{Y} - \dfrac{C_g}{Y} - \dfrac{I}{Y}$

When a closed economy is being observed, a change in C_g as a percentage of GDP must be balanced by total opposite changes in C_{pr} and *I*. In an open economy, the adjustment can also come from net exports – *NX*.

As can be seen in Table 1, the change in percent of GDP between 1995 and 2010 in public consumption (C_g) amounted to a decrease equal to 6 percent of GDP. Private consumption (C_{pr}) increased by only 2 percent, and total investment in the economy (*I*) even fell by 6 percent. During this period, the adjusted took place through net exports, which rose by 10 percent of GDP.

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Table 1: Total Change in Uses and Net Exports as a Percentage of GDP between 1995 and 2010

C_g	-6%
C_{pr}	+2%
I	-6%
NX	+10%
Total	0%
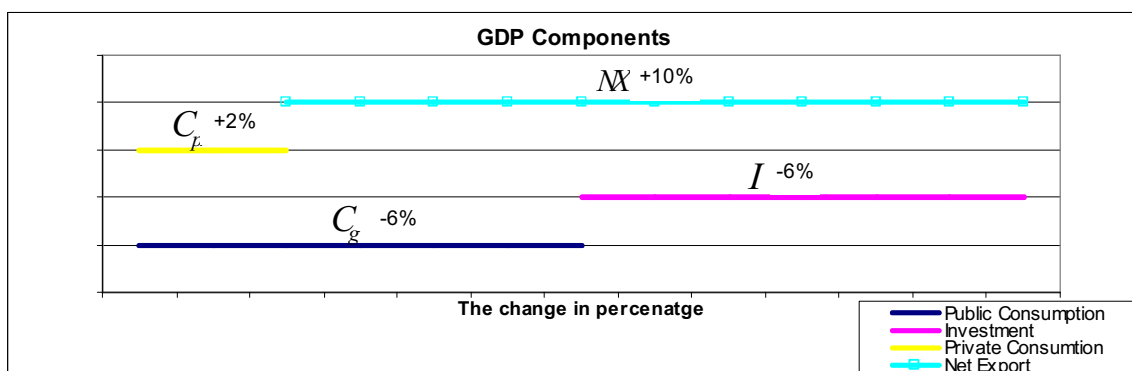
During this period, taxes (the tax burden) also declined by 6 percent of GDP, as did public consumption. This figure provides a rationale for the effect of public consumption on the current account, because there was no change in the government deficit for this period.

Equation 4 is also derived from Equation 1:

(4) $Net\_Export \equiv (S_{pr} - I_{pr}) + (S_g - I_g) - rB \equiv S - I - rB$

Where S with no subscript stands for total savings in the economy. The economy's savings is defined as gross national product minus private and public consumption.

As mentioned above, net exports rose by 10 percent of GDP during 1995-2010, and total investment in the economy declined by 6 percent of GDP. The economy's total savings, on the other hand, behaved like a stationary variable during the entire period. Interest payments were down by 4 percent of GDP.

Table 2: Total Change in Savings, Investment, Interest Payments, and Net Exports as a Percentage of GDP in 1995-2010

S	Stationary
I	-6%
rB	-4%
Total change in the right side of the equation	+10%
NX – total change in the left side of the equation	+10%

The key question to be examined in the current study is whether there is a causal connection between public consumption excluding defense imports and the current account balance (net exports) excluding defense imports.

In the basic model for the *VAR* system, we will use four endogenous variables:

1. Public consumption excluding defense imports.[2] As defined in the national accounts, this variable includes the same factors producing goods or services, i.e. wage payments and purchases.

2. Net exports excluding defense imports are the part of the current balance that does not include interest payments on the national debt, and excludes defense imports. The advantage of using this variable is that its behavior does not depend on assumptions about the capital market structure and government financing.[3] Defense imports were excluded because they add noise to the system, and do not add information necessary for continued assessment of the above-mentioned connections.

3. Private consumption is total private consumption as defined in the national accounts.

4. Investment is the investment in the sectors of the economy.

   Another endogenous variable we added to some of the models is business cycle-adjusted government tax receipts.[4] The tax receipts are in fixed prices adjusted to

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[2] Defense imports are excluded, because these imports are mostly financed by aid money from the US government. The size and timing of this spending is determined in long-term contracts, not by current decisions.

[3] In the past, it was found that the behavior of net exports resembled the behavior of the current account – Baxter (1995). The two series are also very similar in Israel.

[4] We used the short-term elasticity of government tax receipts – 1.2 – a little more than estimated for Israel in the study by Brender, Mazar, Navon, and Shachar, scheduled for publication in the near future (its main points were published in the Bank of Israel's Review of Developments 121, because the elasticity of government taxes does not include property tax, for which elasticity is very low).

the business cycle and season; this is a data series produced by the Bank of Israel on the basis of figures obtained from the Ministry of Finance Accountant General. The figure for tax receipts exists only from 1996, and the models containing this variable were therefore run for the 1996-2010 period. In studies of this type, it is customary to use this variable in order to control for the government's revenues. Alternatively, we used an index for the statutory tax level calculated by the Bank of Israel Research Department – a variable used by Mazar (2011). The index for the level of the marginal statutory tax is composed of all the principal taxes in the Israeli tax system, divided into direct and indirect taxes. The index constitutes the weighted average of these principal taxes, when the weights are the size of state revenues from the tax, divided by the total tax revenues included in the index. The weights are set according to the average for 1980-2009. This index is an indicator of the prevailing level of statutory taxation in the economy. Figure 2 displays these two variables.

Figure 2: Tax Receipts and the Statutory Tax Index
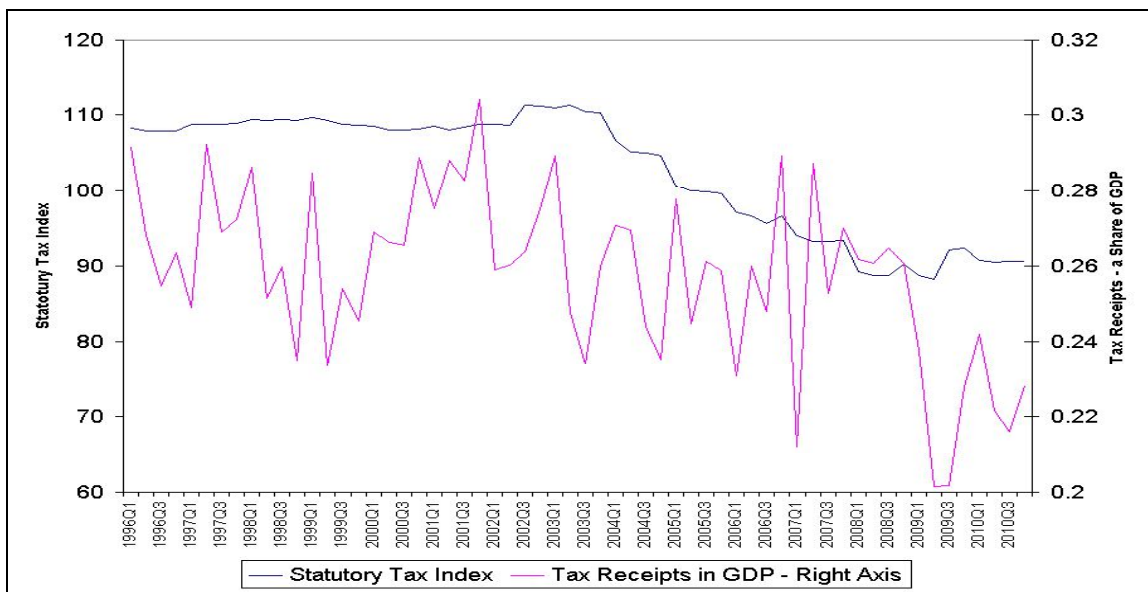
Another variable used in some of the tests is the business cycle-adjusted budget deficit (excluding net credit) of government in the narrow sense, meaning spending minus tax revenues adjusted for the business cycle. This variable is also customarily used around the world for studies of this type.

Additional endogenous variables are Israel's real exchange rate, inflation expectations, and the Bank of Israel interest rate.

All of the variables are quarterly, seasonally adjusted (except for inflation expectations, the Bank of Israel interest rate, and the level of the marginal statutory tax), and originate with the Central Bureau of Statistics and analyses by the Bank of Israel.

Figure 3 describes the development path of the two key variables (public consumption and the surplus of net exports), and Figure 4 describes these in comparison with GDP. As expected, public consumption is not stationary, and increases with time. A less trivial and expected findings is that net exports also are on a rising trend during the study period. In comparison with GDP, it is evident that the weight of public consumption decreases with time, particularly since 2003, while the ratio of net exports to GDP increases.

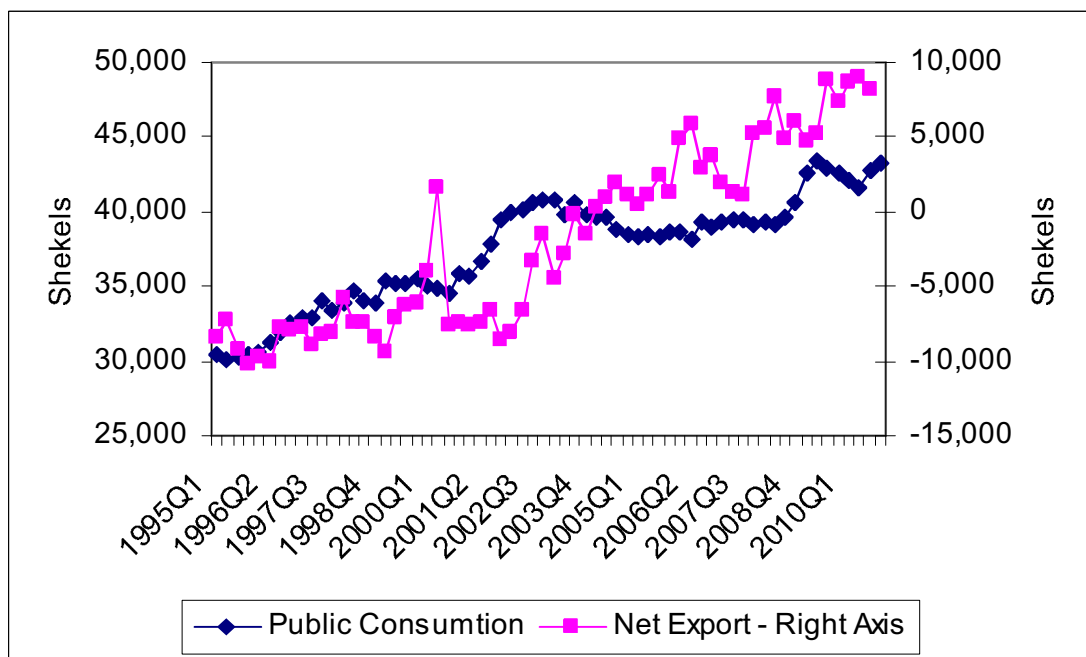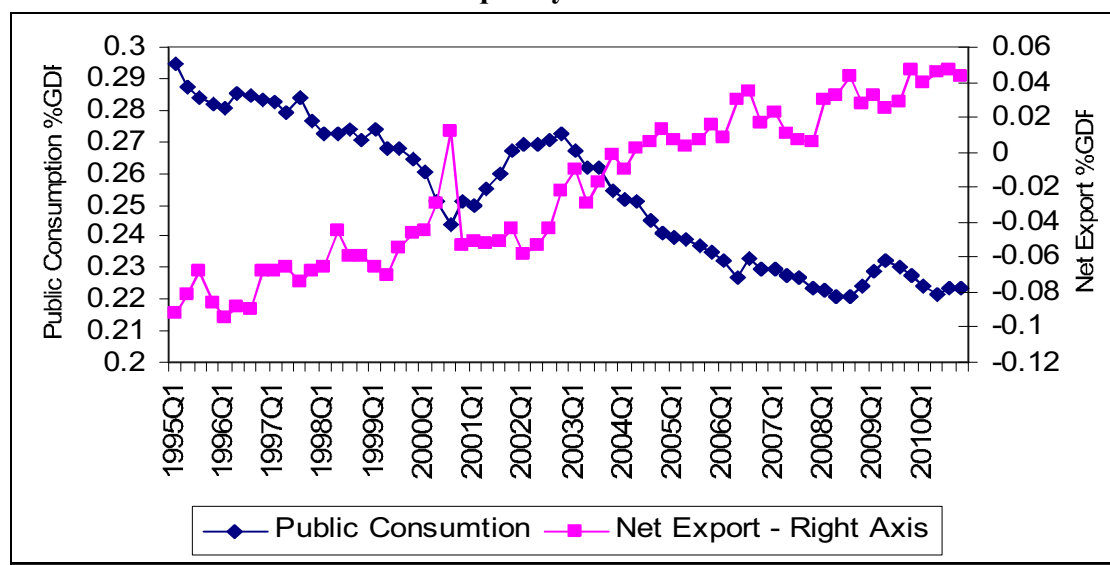**Figure 3: Public Sector and the Export Balance Sheet (without confidence Import)**

Figure 4: The Public Consumption and the Net Export in GDP percent, Quarterly Frequency 1995-2005

In the long term, net exports must equal zero (more exactly, surplus exports finance overseas interest payments), and the effect of fiscal consolidation therefore cannot last. Such consolidation is likely to increase the export surplus, and do it for an extended period, but in the long term, its effect will be neutral. Therefore: 1. It is clear that at some stage, the export surplus and public consumption will stop moving in opposite directions. 2. The important empirical question is how long fiscal consolidation will continue to affect the export surplus.

Beyond this, there are a number of explanations why a simple glance at graphs or the simple correlation coefficient is misleading. Periods of economic growth can increase or decrease public consumption, given the level of cyclicality in government consumption. The study by Zeira and Strawczynski (2007) found that the government spending and deficit were anti-cyclical, starting in 1985. Net exports were also affected by the business cycle. In most cases, economic growth also caused a real appreciation.[5] This appreciation has a negative impact on the current account. A situation is thus created in which a spurious connection between two variables, both dependent on a third factor – state of the business cycle – is possible. Looking at the simple correlation coefficient, it is possible this is the

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[5] The Mundell-Fleming model was presented for the first time in Mundell, Robert A. and Fleming, J. Marcus (1962).

nature of the observed phenomena; it is clear, however, that it indicates the behavior of the variables during the business cycle, not causality.

Furthermore, the sample period, which was selected despite its shortness, is misleading, because it begins at the peak of current account deficit – the period of mass immigration – and ends in years when the economy's export surplus was at its peak. In this study, we therefore also examined a longer period, starting in 1987. The results of the econometric analysis were similar.

3. Methodology

Assessing pass-through between fiscal and macroeconomic variables involves a number of econometric problems of identification and correct specification. Among other things, these problems have also led to different findings in the same countries.

In recent years, the effects of aggregate fiscal variables have often been tested through *VAR* regression. The logic behind using *VAR* regression in this case is that quarterly public consumption responds to changes in other fiscal variables only **at a lag**, and does not respond directly and **simultaneously** to these changes. It was also found that particularly in Israel, public consumption is almost unaffected by the business cycle through the automatic stabilizers, meaning that there are almost no cyclical components in public consumption in Israel. In this sense, changes in public consumption are exogenous. This logic makes it possible to use Cholesky decomposition, as in the studies of Blanchard and Perotti (2002), Kim and Roubini (2004), and Mazar (2011). In Israel, as in most developed countries, the budget framework is annual, and since 2009, even semiannual, and it goes into operation only after a long approval process. It can therefore be assumed that changes in government policy are not immediate, and are put into effect at a lag. Another important advantage of the *VAR* model is that other than the importance of the order of the variables in the system, it is not necessary to assume in advance which variables are exogenous and which are endogenous; in this system, all the variables can respond to each other simultaneously, or at a lag.

The main disadvantage of this method is the use of quarterly variables whose macroeconomic significance in unclear, compared with annual or even less frequent data. For this reason, in order to obtain support for a causal connection between public

consumption and net exports, we also examined annual models by testing the integrative curve connection between the two variables, despite the problems involved – simple *OLS* regression and the *VAR* method on annual data. It is important to note that in each of these methods, we found a strong negative (to all appearances causal) connection between the two variables.

A large number of different *VAR* regression specifications were carried in this study, based on four basic endogenous variables. The principal model we adhered to in this study was regression on ***differences in percentages of GDP*** – as a result, all the variables in the system were stationary at a high level of significance according to Dickey-Fuller tests. We examined the basic model with the help of four different specification: use of nominal variables (current shekels) or real variables (adjusted to the Consumer Price Index), and use of either GDP itself or the economy's potential GDP in the denominator.[6] Using potential GDP instead of GDP normalizes the denominator of the variables, so that the fraction is now less affected by the state of the business cycle. The basic model is when the data are at current prices and GDP is GDP itself, not potential GDP.

We established further empirical support for the connections by testing two additional models: 1. Deviation of the variables from a linear trend; 2. When the variables were taken from the difference from trend by using an HP filter.[7] In order to shorten and focus the article, the results of these models do not appear in it, but the result support the article's principal finding.

Even after subtracting the trend, the two endogenous variables, public consumption and net exports, are affected by the business cycle, and this effect can cause bias in the results and their interpretation. The logic guiding us in this study, however, relies on the hypothesis mentioned the article by Perotti and Blanchard (2002) – that the fiscal variables are exogenous with respect to simultaneous GDP when the observation is at a quarterly

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[6] For the purpose of the calculations in this document, the economy's potential GDP is defined as the GDP that can be produced under full utilization of the production factors. According to this definition of potential GDP, the Israeli economy produces less than its potential in most years, by an average of 1.2 percent. The GDP gap is estimated in this document using the production function, as in OECD calculations. This estimation is based on breaking down the production factors' store into a trend and a cyclical component, and breaking down the residual into productivity and utilization of capital. According to this definition, the GDP gap reflects the deviation of GDP over the business cycle from the production capacity calculated according to the long-term trends.

[7] The HP filter was used with the usual parameter of 1600.

resolution. On the other hand, in contrast to a number of articles on the subject that use GDP as an endogenous variable,[8] in this study we also control for the global business cycle by using exogenous variables. It also appears that public consumption does not affect the current account through changes in GDP, i.e. it cannot create significant changes in the business cycle by itself. The article by Mazar (2011) found that the effect of a rise in public consumption has only a weak effect on GDP – a rise of 1 percent in consumption increases GDP (which includes public consumption) by about 0.2 percent (a less than unitary coefficient).

The exogenous data inserted into the model in order to control for the business cycle, the security situation, and relative prices are: debt at a lag of four quarters,[9] US GDP, the number of casualties in terrorist attacks as a control variable for the security situation,[10] the number of immigrants and the number of immigrants at a lag, population and population at a lag, the number of tourists, a seasonally adjusted international trade index from the IFS, a seasonally adjusted commodities price index from Merrill Lynch, and an index of trade terms.

In its basic form, the *VAR* model is as follows:

$$Y_t = A + \lambda(L)Y_{t-1} + \gamma(L)X_t + U_t$$

Where Y_t is a vector of endogenous variables at time t, $\lambda(L)$ is a matrix of auto-lags, $\gamma(L)$ is a matrix of lags for the vector of exogenous variables (X_t), A is a constant, and U_t is a vector of residuals for time t.

The Cholesky breakdown uses an order of the effect of the variables on each other in order to solve the sub-identification problem created in *VAR* systems. This is a triangular matrix used to identify the effect of simultaneous shocks for each of the endogenous variables in the model. **A shock in the first variable in the order of estimation simultaneously affects the other endogenous variables, but a shock in the other variables does not affect the first variable**. In this way, a triangular matrix $\lambda(L)$ is created describing the coefficients of the endogenous variables. We stress that a shock in the

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[8] Corsetti & Muller (2006), Kaufmann et al. (1999), Ilzetzki et al. (2011).
[9] Debt figures are measured in Israel only at the annual level, and this variable is therefore inserted as an exogenous variable at a one-year lag (four quarters).
[10] B'Tselem figures.

second variable in the order is affected by the first variable, and does not affect the first variable, but affects all the variables below it in the order, which do not affect it, and so forth. In this model, a shock in public consumption can affect at the same time the Bank of Israel interest rate, the real exchange rate, inflation, and the current account, but these variables affect public consumption only at a lag. This means that fiscal decision makers respond to economic shocks at a lag.

4. Results

In this section, we will present the empirical results for the VAR model, including the impulse response of the public consumption variable on net exports. Figures 6 and 7 display the effects of a shock in public consumption on net exports, and the confidence intervals at a 95 percent level of confidence, meaning that if the space between the confidence intervals does not include 0, we will conclude that the effect is significant. The *X* axis stands for the time axis, starting at the moment of the shock and moving at a quarterly frequency. The graph can be read as the magnitude of the marginal or cumulative effect of the change at time 1 in public consumption on net exports from time 1 onwards.

The basic model includes the difference between the ratios of the variables to GDP according to the following order: public consumption divided by GDP, investment, private consumption, and net exports. The basic model was run on three lags. Later, other results from many robustness tests are presented: adding more endogenous variables, change the order of the variables, and changing the number of lags.

The results appearing in the tables are after conversion to elasticities (the effect in percentages of the standard deviation, divided by the standard deviation of the variables in order to obtain the elasticities).

Figure 6: The Basic Model – the *Marginal Effect* of One Standard Deviation Shock on the Net Export
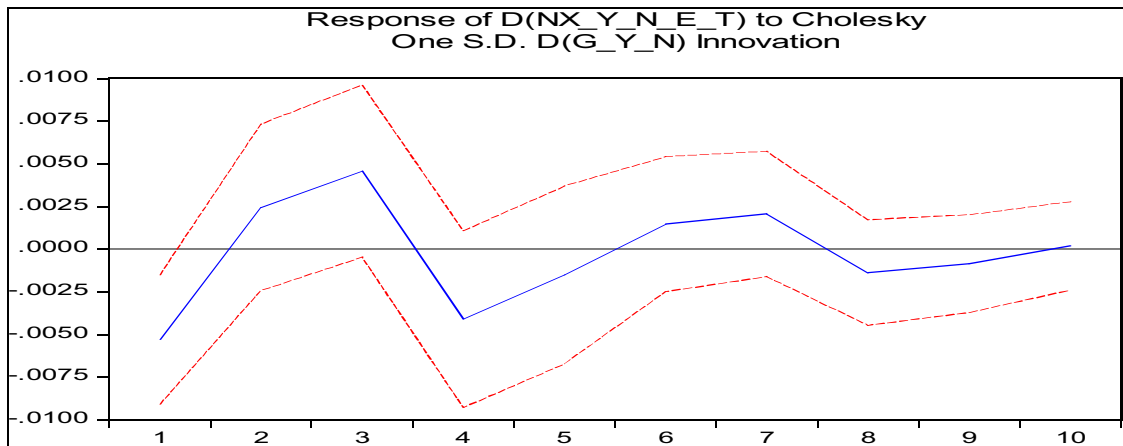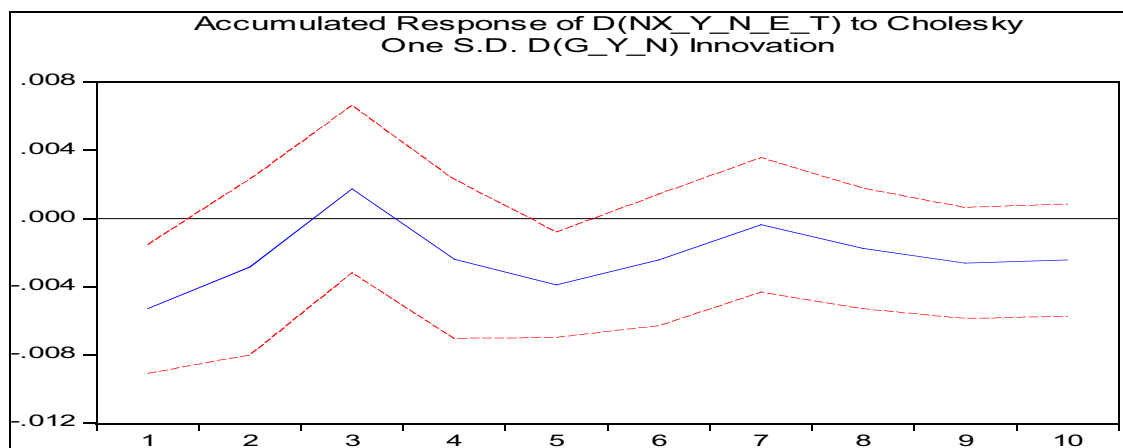

Response of D(NX_Y_N_E_T) to Cholesky
One S.D. D(G_Y_N) Innovation

Figure 7: The Basic Model – the *Cumulative Effect* of One Standard Deviation Shock on the Net Export

Accumulated Response of D(NX_Y_N_E_T) to Cholesky
One S.D. D(G_Y_N) Innovation

The marginal effect in this case resembles the cumulative effect, since the latter is valid for only one quarter. The estimated elasticity is -0.61, **meaning a drop of 0.61 percent in the balance of net exports for an increase of 1 percent in public consumption**.

The estimation results of specifications added to the basic model are presented in Tables 3-5 and in Figure 7. A perusal of the results indicates that the estimated elasticity is relatively stable, and the average estimate of all the specifications is 0.62. The standard deviation between the specifications of the estimate is 0.16. This means that even after the additional endogenous variables are included (taxes, inflation, the interest rate, and the real exchange rate), the effect of a rise in public consumption on net exports is significantly

negative. Since the significance of the effect in most cases is for only one quarter, the results for the cumulative effect are similar to the result of the marginal estimation. This, the key result in the article, indicates that **the government cannot improve the current account by cutting public consumption – except for a simultaneous improvement that dissipates already in the following quarter**.

This finding of simultaneous elasticity of more than 0.5 is relatively high in an international comparison. If, however, we keep in mind that Israel was a small and open economy with a flexible exchange rate for most of the study period, we will conclude that this finding is not exceptional, compared with most of the existing findings in the literature. On the other hand, the finding that the effect vanishes after a short time, and the elasticity already becomes zero after two quarters, is exceptional in an international comparison. It is possible that the relatively short period that we examined in this study, compared with other studies around the world, constitutes an additional source of the differences in the findings.

Controlling for the tax receipts variable, whether through the statutory tax index or through tax receipts adjusted for the business cycle, increases the estimated elasticity of public consumption for most of the specifications. It is interesting to note that in contrast to a change in public consumption, a change in revenues had no effect on total net exports in most of the cases tested, and if any such effect appeared, its effect was unexpectedly negative – in the same direction as a change in public consumption. In other words, it appears that a change in the level of revenues is less reliable than a change in the level of public consumption, among other things because of the fact that changes in the tax base are more frequent. Furthermore, it appears that if tax policy nevertheless has an effect, the change in tax policy is perceived as a variable presaging a change in the direction of government spending or consumption, and the sign of the two parameters is therefore in the same direction – a decrease (increase) in taxes is now expected to decrease (increase) the ratio of future public spending to GDP (Table 6). Tests we conducted using similar models showed that public consumption indeed responds positively to a positive shock in taxes.

From Figure 7, we learn that not only the initial response is stable in a comparison between different specifications in the basic model (Figure 7 displays only four of them); the response over the following 10 quarters is very similar, and is not sensitive to the selected specification.

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Table 6 and Figures 8 and 9 display the estimates for the elasticity of net exports with respect to public consumption, in comparison with three other models we tested using the *VAR* model: use of potential GDP instead of the current nominal GDP, and use of real variables adjusted for private consumption prices instead of variables at current prices. This comparison shows that the elasticity of net exports with respect to public consumption is not sensitive to the models selected; in all of them, elasticity is in the neighborhood of -0.6, and its validity is usually for only one quarter, or two at most (Table 6). The findings also indicate that the significance of the results declines slightly when the real variables are examined instead of the nominal variables and/or the change with respect to potential GDP is examined instead of in respect to actual GDP.

Table 3: Elasticity of Net Exports with respect to Public Consumption, the Basic Model and Robustness Tests

Government Consumption, Investment, Private Consumption, Net Exports	3 Lags	Change in Order[1]	2 Lags	4 Lags	Without Exogenous Variables	With Statutory Taxes
	-0.61	-0.38	-0.31	-0.85	-0.56	-0.75
	1 Significant Period					

[1] Government consumption, net exports, investment, private consumption (in current prices)

Table 4: Elasticity of Net Exports with respect to Public Consumption with Tax Receipts and Robustness Tests

Tax Receipts, Government Consumption, Investment, Private Consumption, Net Exports	3 Lags	4 Lags	Change in Cumulative Order[1]	Without Exogenous Variables	Sample until 2008
	-0.60	-0.89	-0.68	-0.74	-0.66
	1 Significant Period				

[1] Government consumption, tax receipts, investment, private consumption, net exports (in current prices)

Table 5: Elasticity of Net Exports with respect to Public Consumption with Price Variables the Basic Model, and Robustness Tests

Government Consumption, Investment, Private Consumption, Net Exports	Inflation Expectations[1]	Interest Rate[2]	Real Exchange Rate[3]	Tax Receipts[4]	Deficit[5]
	-0.56	-0.48	-0.40 (not significant)	-0.33 (not significant)	-0.66
	1 Significant Period				

[1] Government consumption, investment, private consumption, net exports (in current prices), inflation expectations.
[2] Government consumption, investment, private consumption, net exports (in current prices), inflation expectations, interest rate.
[3] Government consumption, investment, private consumption, net exports (in current prices), inflation expectations, real exchange rate.
[4] Tax receipts, government consumption, investment, private consumption, net exports (in current prices), inflation expectations, interest rate, real exchange rate.
[5] Government consumption, deficit, investment, private consumption, net exports (in current prices).
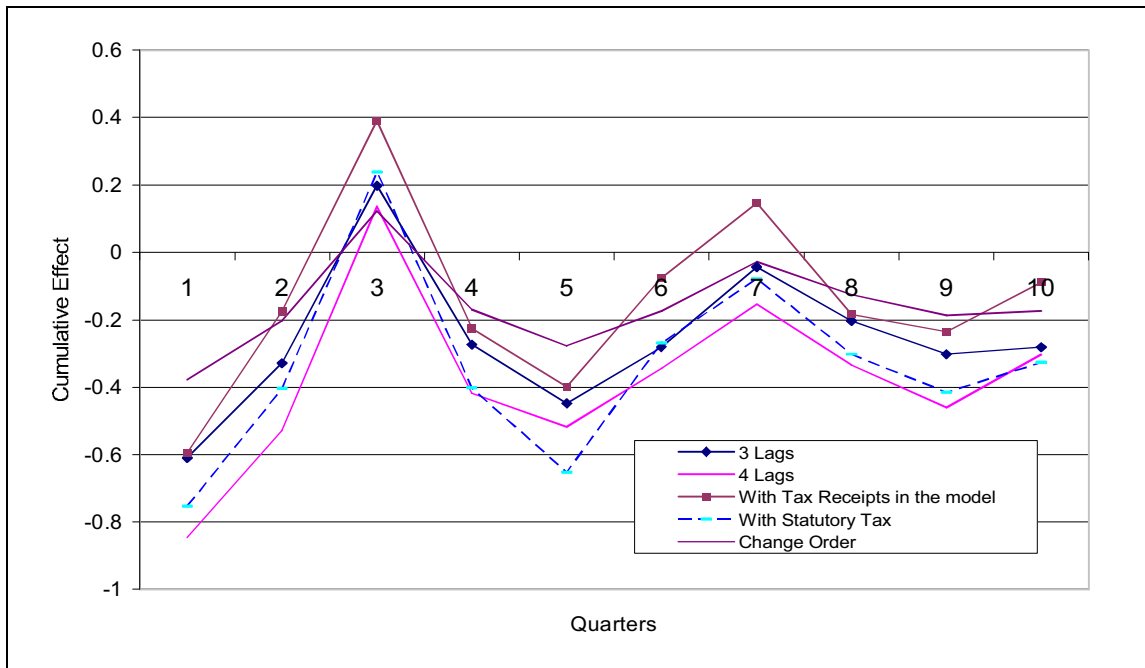
Figure 7: the Basic Model – Cumulative Effect

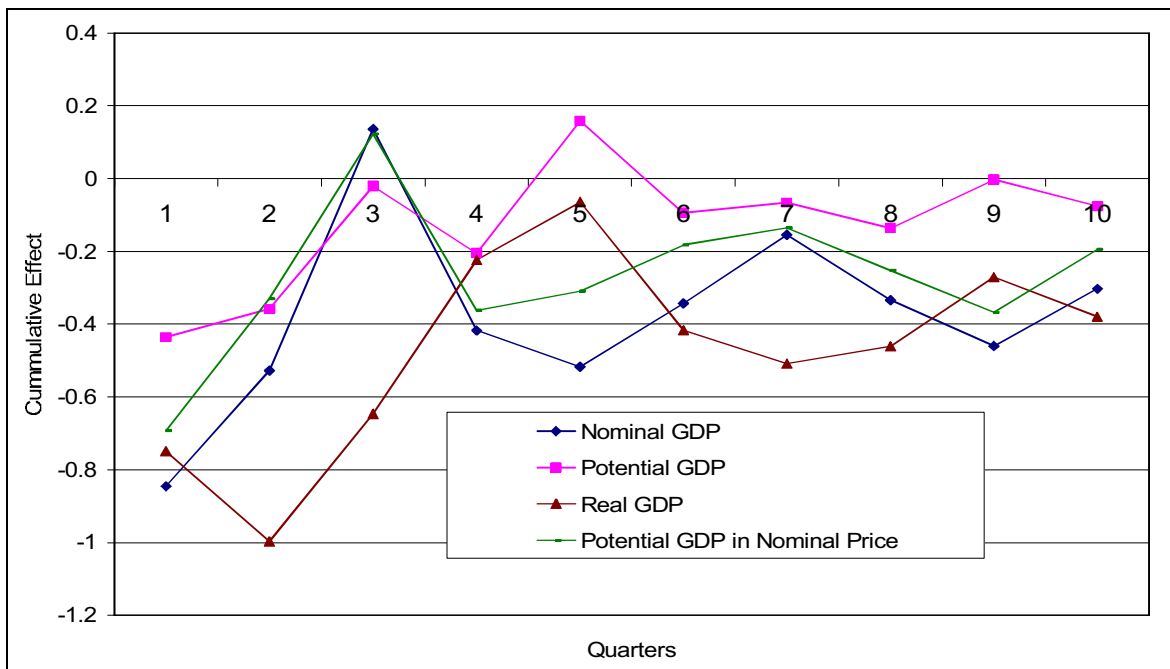**Figure 8: 4 Models Comparison (4 Lags), Cumulative Response**

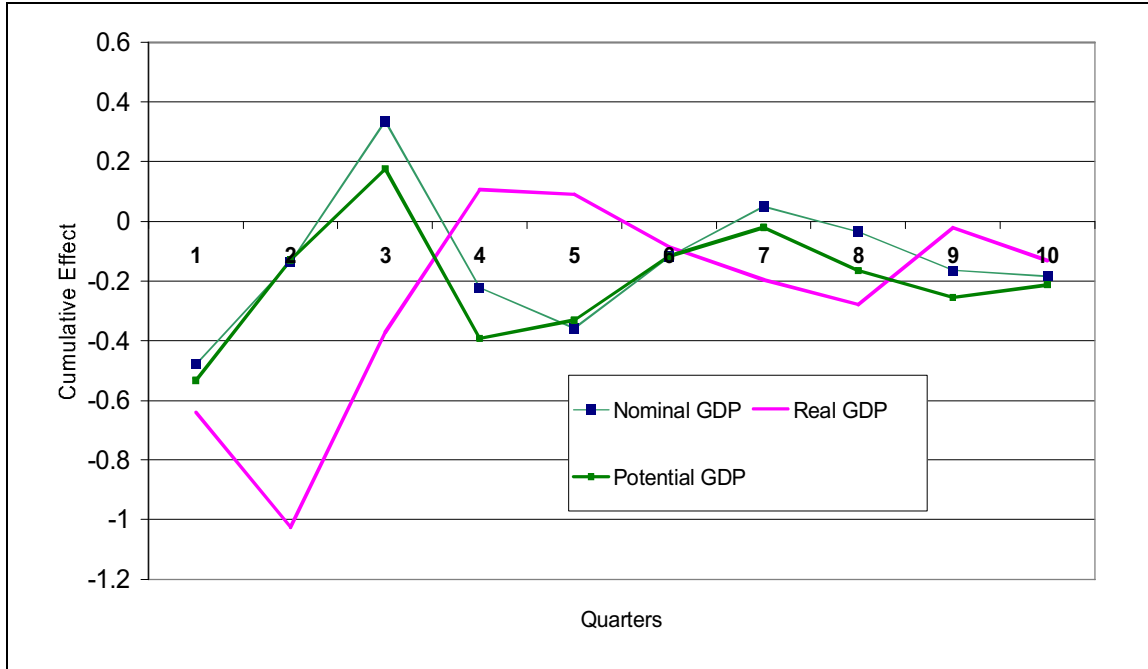**Figure 9: 3 Models Comparison with Inflation Expectation and Nominal Interest Rate**

Table 6: Elasticity of Net Exports with respect to Public Consumption, the Cumulative Effect, Robustness Tests, and Various Models

	Difference from GDP Percentages, Nominal – Basic Model	Difference from Potential GDP Percentages, Nominal	Difference from GDP Percentages, Real	Difference from Potential GDP Percentages, Real
3 lags – base	-0.61 [1]	-0.64 [1]	-0.78 [2]	Not significant
2 lags	-0.31 [1]	-0.44 [1]	-0.61 [1]	-0.53 [1]
4 lags	-0.85 [1]	-0.33 [2]	-1.00 [2]	-0.44 [1]
Change in order cumulative 1	-0.38 [1]	-0.50 [1]	-0.41 [2]	Not significant
Without exogenous variables	-0.56 [1]	-0.43 [2]	-1.20 [2]	-0.37 [1]
With statutory taxes	-0.75 [1]	-0.69 [1]	-0.77 [2]	Not significant
Effect of the taxes themselves	Not significant	Not significant	-0.52 [1]	-0.39 [1]
Taxes in GDP Percentages				
With taxes in GDP Percentages	-0.60 [1]	-0.56 [2]	Not significant	Not significant
Effect of the taxes themselves	Not significant	Not significant	-0.67 [1]	Not significant
With taxes in GDP percentages – 4 lags	-0.89 [1]	-0.72 [1]	-1.00 [2]	Not significant
With taxes in GDP percentages, change in order - cumulative	-0.68 [1]	-0.62 [1]	-0.84 [2]	Not significant
Without exogenous variables	-0.74 [1]	-0.49 [2]	Not significant	Not significant
Sample up until 2008	-0.66 [1]	-0.53 [1]	Not significant	Not significant
Price Variables				
Inflation Expectations	-0.56 [1]	-0.51 [1]	-0.89 [2]	Not significant
Interest rate	-0.48 [1]	-0.53 [1]	-1.02 [2]	Not significant
With exchange rate	Not significant	-0.52 [1]	-0.99 [2]	Not significant
Three price variables with taxes in GDP percentages	Not significant	Not significant	Not significant	Not significant
Three price variables with taxes in GDP percentages – 4 lags	Not significant	Not significant	Not significant	-0.56 [1]
Three price variables with taxes in GDP percentages – 2 lags	Not significant	-0.44 [1]	-0.65 [1]	-0.43 [1]
Three price variables with taxes in GDP percentages – change in order	Not significant	-0.45 [1]	Not significant	Not significant
With budget deficit	-0.66 [1]	-0.53 [1]	-1.14 [2]	-0.40 [1]

Another important and interesting finding arises from an analysis of the results displayed in Tables 5 and 6: the estimated elasticity of public consumption with respect to net exports weakens only minimally and does not change monotonically when nominal variables and/or the real exchange rate are included. This finding again indicates the robustness of the parameter, but especially its pass-through with net exports: it appears that the main channel through which a change in public consumption affects net exports is the direct-real channel – the demand channel. The fact that including the nominal variables, through which the direct effect could be weakened by the indirect effects described in the first section, does not weaken the key parameter shows that the indirect channel does not constitute a significant factor in pass-through between public consumption and net exports. Furthermore, even though the effect of public consumption on the nominal variables is evident in some cases – a rise in public consumption increases inflation expectations a year later, and causes a real depreciation[11] (albeit not always a significant one) – (Figures A.3 and A.4), in most of the tests we conducted, <u>no direct connection between the nominal variables and net exports was found</u>.

We conducted additional robustness tests, both for the *VAR* method and for the sample period. When we extended the sample period to 1987, we also switched to using annual variables. We examined models using two lags and one lag, and using potential GDP instead of ordinary GDP. The estimated elasticity of net exports with respect to public consumption was discovered to be less stable and slightly higher than the estimate we obtained in the main model which uses quarterly data. In all the cases we examined using the *VAR* model, the long-term effect becomes zero. In another approach, despite the difficulties in using the integrative curve model, a test for the long-term connection between the variables produced similar results for the estimated elasticity – between -0.8 and unitary.

Where the other uses were concerned, a positive shock in public consumption increases private consumption only in the following quarter, while on the other hand crowding out investment in the economy – an effect that drops to zero only after a year. Since a positive

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[11] For some of the specifications, it was found that the real exchange rate weakened (a depreciation) in response to a rise in public consumption. This finding, although not sufficiently robust, indicates that an increase in public consumption may detract from the credibility of fiscal policy, as perceived by foreigners, increase the economy's risk premium, and later bring about an interest rate hike.

shock in investment or private consumption has a negative impact on net exports (Figure A.5), these two indirect channels offset each other in considering the elasticity of net exports to a shock in public consumption. This means that a shock in public consumption increases private consumption in the short term on the one hand, which in turn reduces net exports, probably due to the import element in private consumption, while on the other hand crowding out private investment, which boosts net exports. Quantifying the indirect channels shows that the magnitude of the two opposite effects is similar, so that they practically cancel each other out.

It is interesting to see that taxes, both as a percentage of GDP and as statutory taxes, do not respond to a shock in public consumption, while the *VAR* model shows us that public consumption responds positively to a shock in taxes (since this is not the subject of this study, I will not delve more deeply into this question in this paper). This reinforces the assumption that a change in the tax level hints at a future change in the same direction in the ratio of public consumption to GDP.

As in other empirical articles that discuss a similar research topic, we tried to assess whether the source of the negative impact of public consumption on net exports was through a drop in exports, a rise in imports, or a combination of both. We also examined this question with the help of the *VAR* model by using the basic model with the differences of four variables (the ratio of public consumption to GDP, the ratio of private consumption to GDP, the ratio of investment to GDP, and the ratio of imports (excluding defense imports) to GDP and the ratio of exports to GDP. It was found that the ratio of imports to GDP was the variable that responded to changes in public consumption, with a positive and stable elasticity; the elasticity we found varied between 0.4 and 0.6 percent (Figure 10). In contrast to imports, in most of the tests we conducted, a shock in public consumption had no observable effect on exports (Figure 11). In the cases in which we found that a shock in public consumption had an effect, it was in the same direction as imports, i.e. positive, but with an estimated elasticity of about half the elasticity of imports. To summarize, the finding emerging from the tests we conducted is that the source of the negative correlation between net exports and public consumption was mainly through the channel of the strong positive correlation between public consumption and imports. No evidence that public consumption crowded out exports was found.

Figure 10: the Impulse Response of the Import Share in GDP to one standard deviation in the Public Consumption share in GDP
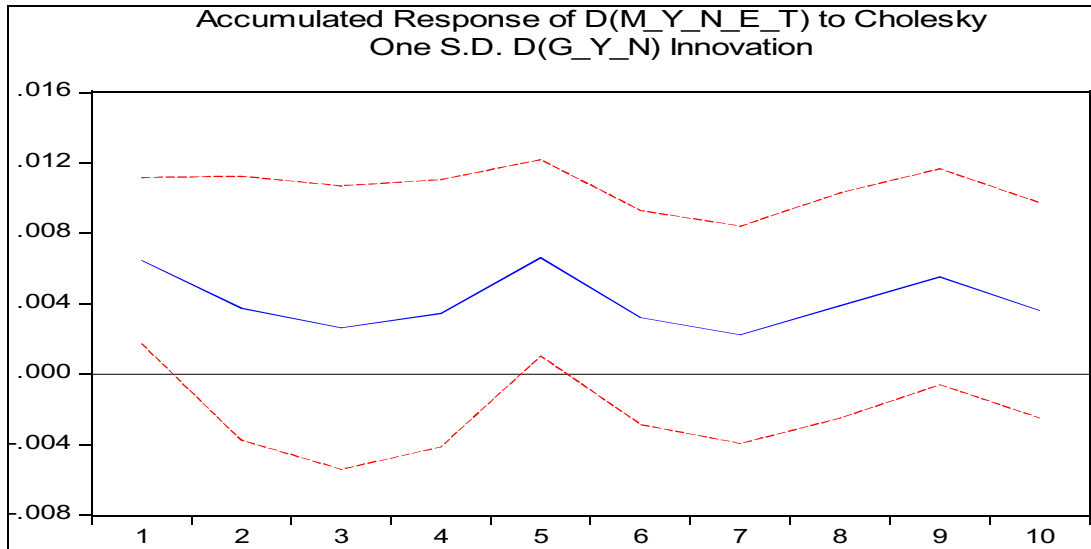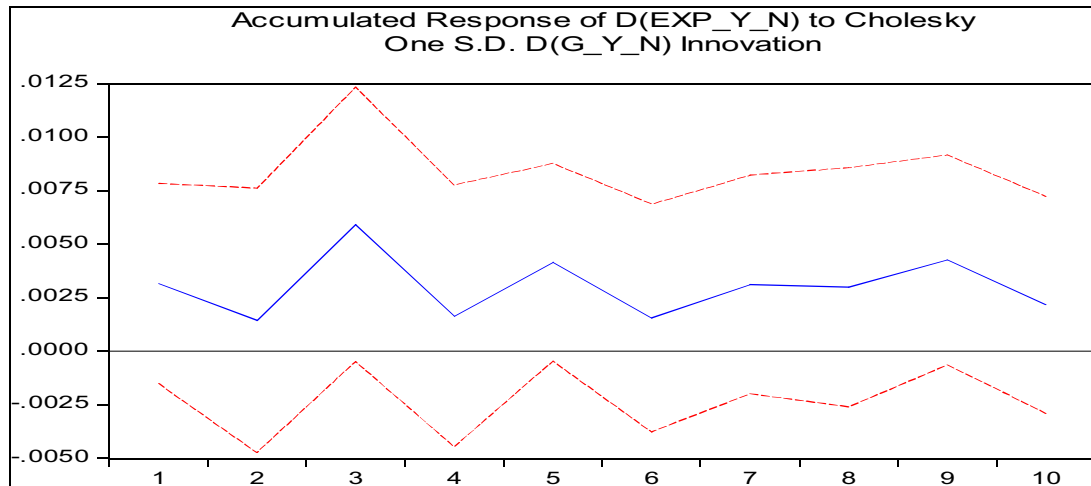

Accumulated Response of D(M_Y_N_E_T) to Cholesky
One S.D. D(G_Y_N) Innovation

Figure 11: the Impulse Response of the Export Share in GDP to one standard deviation in the Public Consumption share in GDP

Accumulated Response of D(EXP_Y_N) to Cholesky
One S.D. D(G_Y_N) Innovation

5. Summary

In this article, we use the quarterly *VAR* model for the first time to estimate the connection between fiscal policy and the current account in Israel in 1995-2010. The principal finding of the study is that a transitory positive shock in public consumption equal to 1 percent of

GDP has a average negative impact of 0.6 percent of GDP on net exports for up to two quarters. This effect dissipates within 1-2 quarters, and a government budget cut therefore does not cause a sustainable improvement in the current account.

Another important finding is that the main pass-through between public consumption and net exports is through the direct channel, meaning that a rise in public consumption accelerates real demand in the short term, which has a positive effect on net civilian imports. The channel through which public consumption affects the nominal variables and/or the exchange rate, and through them net exports, was found to be not significant throughout the entire period of the current study.

As far as a change in revenues is concerned, in contrast to a change in public consumption, there was no effect on total net exports in most of the cases tested, and if such an effect was registered, it was unexpectedly negative – in the same direction as the change in public consumption, In other words, it appears that a change in level of revenues is less credible than a change in the level of public consumption, among other things due to the fact that changes in the tax base are more frequent. Furthermore, it appears that if tax policy nevertheless has an effect, this is because a change in tax policy is perceived as a variable presaging a change in the trend of government spending or consumption, and the sign of the two parameters is therefore in the same direction – meaning that lower taxes now are expected to decrease the proportion of public consumption to GDP in the future.

In this article, we also found that the positive pass-through between public consumption and imports is the principal channel causing the result in which net exports are negatively correlated with public consumption. In addition, no evidence was found indicating that a rise in public consumption crowds out exports; the effect of public consumption on exports was even found to be positive in some cases, although this effect was smaller and less robust than the elasticity imports.

Figure A.1: Public Consumption without Import Confidence and Local Public Consumption in GDP, 1995-2010
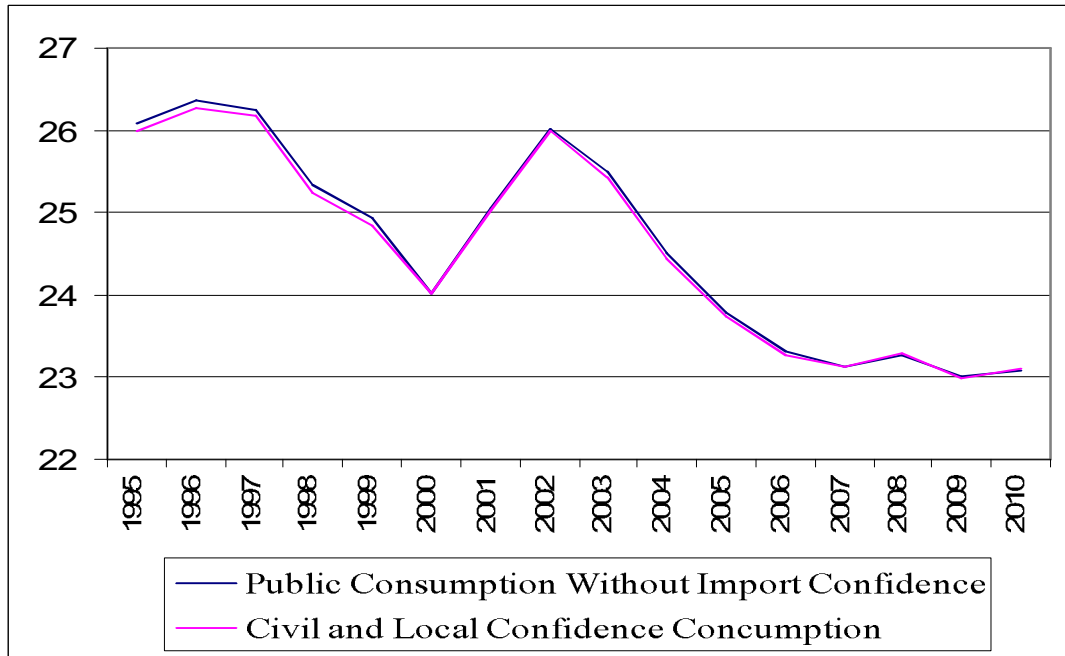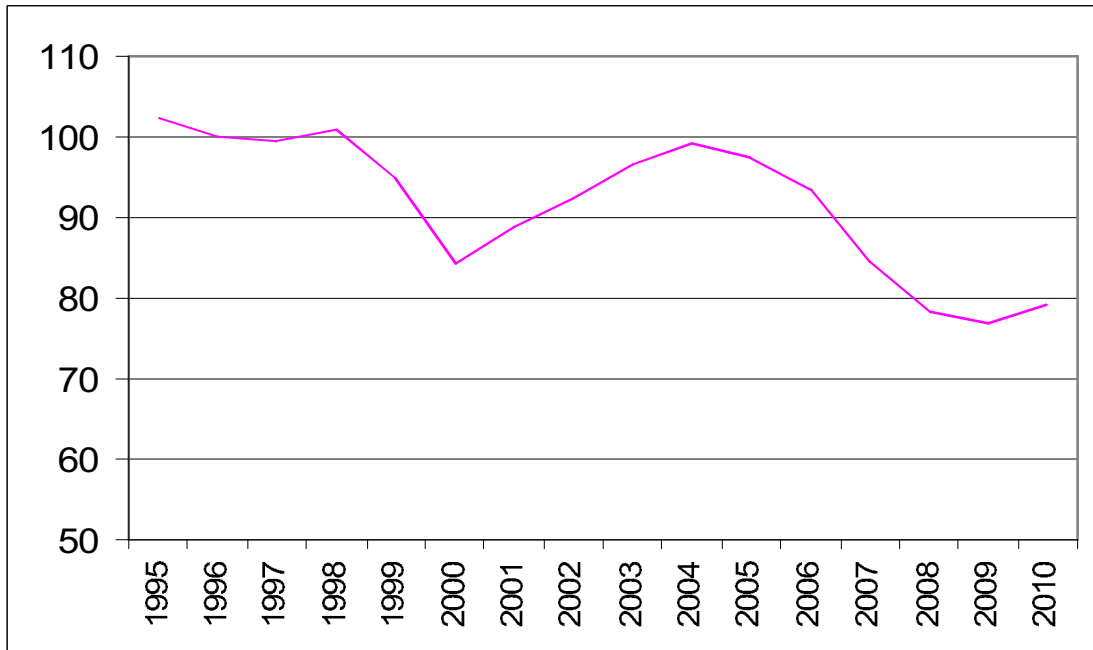

Figure A.2: the Gross Dept in GDP, 1995-2010

Figure A.3: the Cumulative Effect of a shock in the Public Consumption on the other Endogenous Variables, the Basic Model

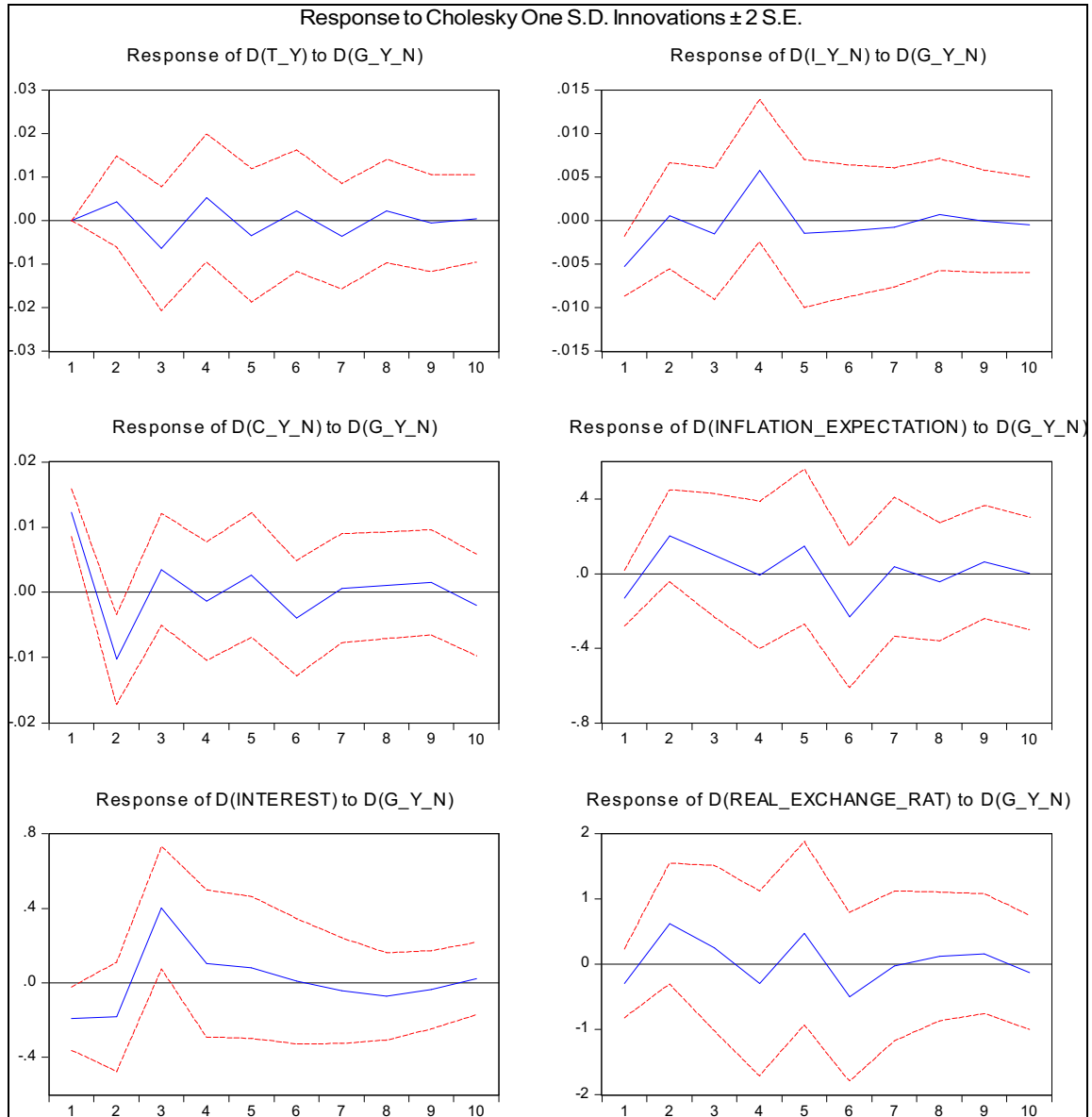Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure A.4: the *Cumulative Effect* of a shock in the Public Consumption on the other Endogenous Variables, the Basic Model

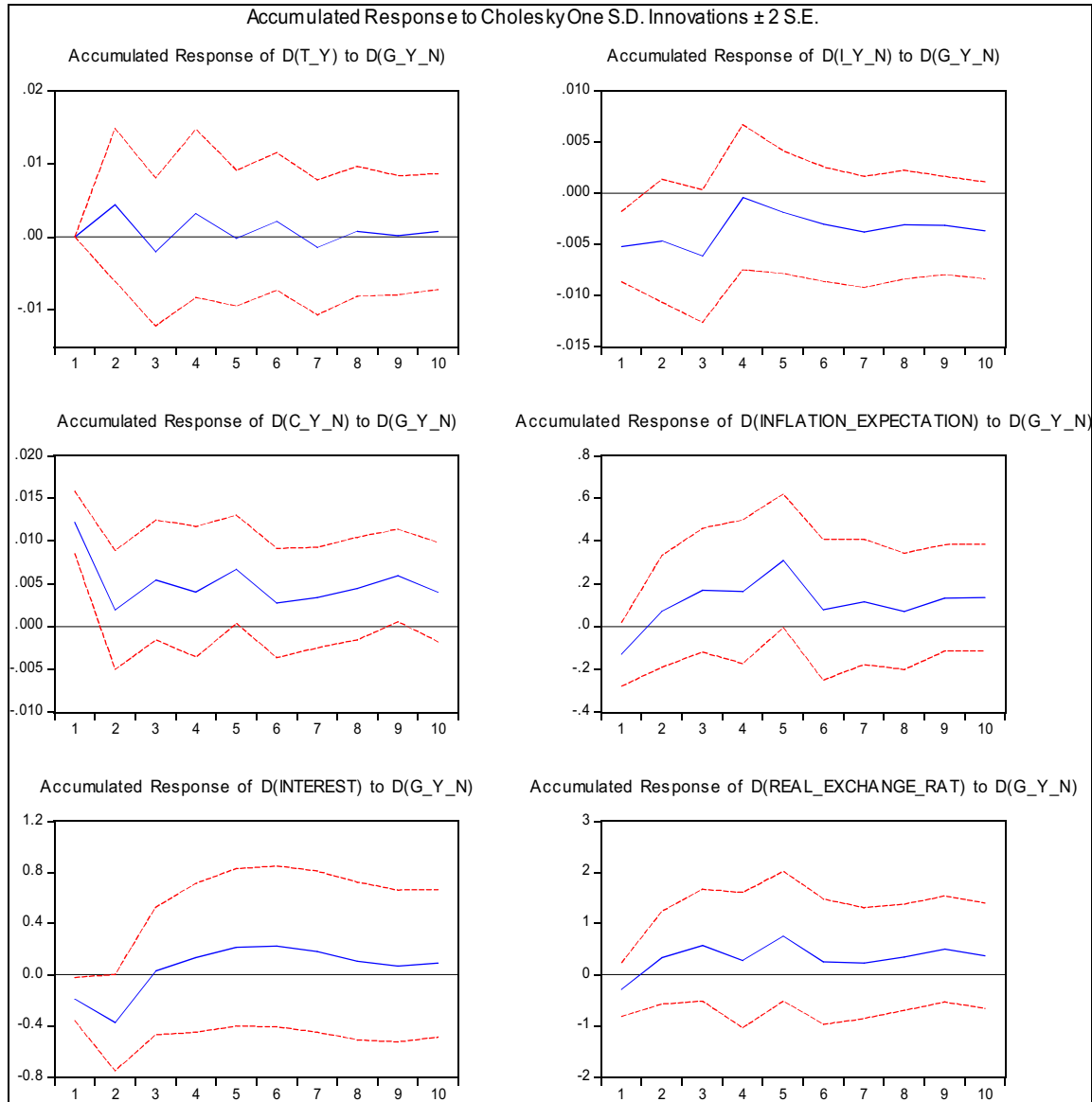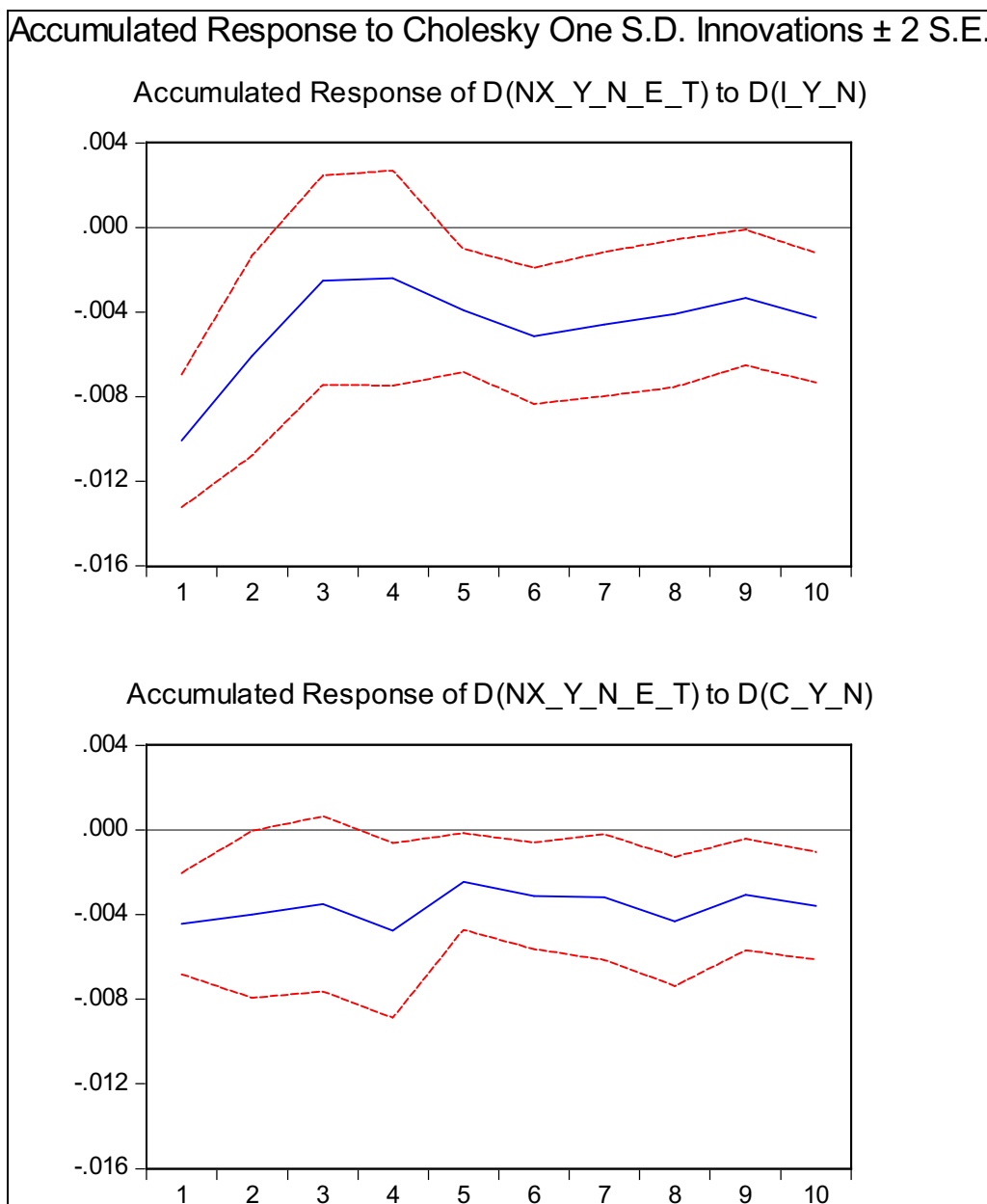**Figure A.5: the Net Export Impulse Response to a Shock in Investment and Private Consumption**

Accumulated Response to Cholesky One S.D. Innovations ± 2 S.E.

Accumulated Response of D(NX_Y_N_E_T) to D(I_Y_N)

Accumulated Response of D(NX_Y_N_E_T) to D(C_Y_N)

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