DYNAMIC EFFECTS OF FISCAL SHOCKS UPON DIVERSE MACROECONOMIC VARIABLES: A STRUCTURAL VAR ANALYSIS FOR ARGENTINA

Ernesto Rezk, Maria Cecilia Avramovich and Martín Basso[*]

The paper studies the dynamic effects of fiscal policy shocks upon Argentine macroeconomic variables such as the gross domestic product, the inflation rate and the level of unemployment; a structural Vector Autoregression model is resorted to in order to estimate the impulse response functions; the econometric analysis is carried out for the period 1984-2005 (second quarter) and quarterly logarithmic real variables are used for the VAR´s specification. Point estimation of impulse response functions indicate both a relatively low statistical significance of fiscal shocks upon macroeconomic variables and a short-lived impact of innovations while at the same time cast doubts upon some traditionally accepted Keynesian macroeconomic policy prescriptions.

1. Introduction

Argentine economic researchers traditionally analyzed the performance and impact of monetary and fiscal policies, for different scenarios and situations, by resorting to more or less complex Keynesian macroeconomic models whose econometric handling would assumedly enable them to recommend determined economic policy actions.

From a critical stance, Blanchard and Perotti (2002) pointed out some shortbacks of the above mentioned methodology, one out of the most notorious being that – in reason of their Keynesian structure – the models assumed rather than proved a positive effect of fiscal expansions upon output. In these authors' words episodes in which private consumption and output significantly grew while severe cuts in public spending took place cast – to say the least – doubts on the soundness of traditionally accepted theoretical approaches; Perotti (2004) stressed later a similar concern by recalling that neoclassical models predicted a private consumption fall following a positive shock to government spending and called for seeking more empirical evidence as a form of shedding light on the matter.

In this connection the present paper aims at studying the dynamic effects of fiscal shocks upon a set of Argentine macroeconomic variables (gross domestic product, inflation rate, unemployment) resorting to a structural Vector Autoregression approach that uses quarterly data from 1980 through 2005 (second quarter); correspondingly, Impulse-response Functions are estimated. As Kamps

[*] Institute of Economics and Finance – Faculty of Economic Sciences – National University of Córdoba (Argentina). E-mail: ernerezk@eco.unc.edu.ar

(2005) stressed it, within the context of a production function approach but nonetheless conceptually applicable to the case analyzed in this research, VAR formulations have several advantages in relation to alternative methodologies as no aprioristic sequence links are imposed among the variables and feedback effects among variables are not ruled out either; Enders (1995, chapter 5) also outlined these features by asserting that the VAR's goal is to find important inter relations among the variables and not make short-term forecasts.

Concerning the paper's organization, Section 2 includes a brief survey of recent articles that have dealt with the analysis of dynamic impact of fiscal variables, using VAR models; Section 3 deals with the model's specification and also discusses methodological aspects; Section 4 discusses Impulse-response Functions; Section 5 presents the dynamic impact of innovations and discusses robustness and Granger causality and Section 6 concludes.

2. A brief survey of the literature

Studies on impulse response functions' estimation in Argentina (*i.e.*, Utrera, 2004) were mainly oriented to monetary issues, for what not many papers are available in which VAR models are used to analyzing the dynamic impact of fiscal variables. Contrariwise, the international literature on the matter is ample and valuable and some of the leading papers whose objectives link to ours' are reviewed below.

Blanchard and Perotti (2002) resorted to a structural VAR specification to characterize the dynamic effects of shocks in government expenditure and taxes on economic activity in USA, during the post second world war period. The use of VAR was defended on grounds that it was better suited for fiscal policy studies as fiscal variables moved for many reasons (apart from output stabilization) and there were exogenous fiscal shocks; furthermore, decision and implementation fiscal policy lags ensured that the discretionary response of fiscal policy (within a quarter) to unexpected contemporaneous movements in output would be very rare. Their results consistently showed that positive innovations in public spending and in taxes respectively had a positive and an negative impact upon output; they also found that both positive shocks in spending and taxes had a strong negative effect upon private investment spending.

Perotti (2004) used a structural VAR model in order to analyze the effects of fiscal policy (per capita real public spending and net taxes) on gross domestic product, inflation and interest rates in five OECD countries since 1960 to 2001. The paper concluded that the effects of fiscal variables upon gross domestic product tended to be small whereas results did not either supply evidence that tax cuts worked faster or more effectively than expenditure increases. Another finding was that both the effects of spending shocks and tax cuts upon product and its components had become substantially weaker or negative over time, particularly on private investment. As regards the other variables, only in the post-1980 period

Perotti found evidence of positive effects of government spending on long term interest rates whereas, under plausible price elasticity values, expenditure had a small impact on inflation.

Giordano, Momigliano, Neri and Perotti (2005) used a structural Vector Autoregression model to analyzing also the impact of fiscal variables on product, inflation and interest rates, resorting in this case to Italian quarterly cash data corresponding to the period 1982:1 - 2003:4; for the estimation of impulse response functions fiscal variables were separated into real government spending on goods and services, real government wages and real net taxes. Conclusions pointed out that while a shock to government purchases had a sizeable and robust positive impact on both private consumption and investment (despite it low persistence) innovations in public wages did not have any significant short run effect upon output and employment but a negative effect after two years. With regard to inflation and interest rates, the response to public purchases and public wages was positive but short lived in the first case and positive and larger in the second one. Finally, negligible effects were reported on all variables' response to net revenue shocks.

Creel, Monperrus-Veroni and Saraceno (2005) estimated a structural VAR model of the French economy, based on the fiscal theory of the price level; they found econometric evidences to reject the predictions of FTPL that fiscal shocks and interest rates should cause an important impact upon prices while at the same time their results agreed with most of conventional Keynesian effects of fiscal policy. Thus, Creel et al emphasized the immediate negative impact of a positive surplus shock on output although they acknowledged that the favorable impact of an expansionary and discretionary fiscal policy on product would deploy its effects after a time; they also found that negative wealth effects (due to sharp public debt reductions) played a key role in the long lasting decrease in gross domestic product.

Kamps (2005) resorted in turn to the VAR methodology in order to assess dynamic effects of public capital in 22 OECD countries for the period 1960-2001 and used the following variables: public capital net stock, private capital net stock, real output and employment. In short, Kamps' results yielded proofs that shocks to public capital spending tended to have significant positive effects upon output although no evidence was found of the former's supernormal returns as was normally the case in production function approaches; in another striking result, Kamps found that public and private capital were – for most of countries analyzed – complementary in the long run while for the short run they were substitute in some countries and complementary in others. Finally, the study showed neither that the long run response of employment to innovations in public capital were statistically significant nor evidences that employment could be boosted by additional public capital.

3. Specification of the model

The specification of the VAR model used in the analysis includes quarterly[1] values of the following 5 Argentine macroeconomic variables: current public expenditure (PE) and tax revenues (TR) corresponding to the central government and the provinces,[2] gross domestic product (GDP) and unemployment (UNE) and inflation (INFL) rates. The sample period extends from 1984:1 through 2005:2 and series of fiscal variables and gross domestic product were seasonally adjusted using the Multiplicative Census X12 procedure. Fiscal and product variables are expressed in real terms, the Consumer Price Index available from the National Institute of Statistics and Censuses (INDEC) being used as the deflator.

Public Expenditures include public wages, government purchases of goods and services and transfers to the private sector; as for public capital spending, the series showed a marked irregularity throughout the period; although this feature has been recently stressed by the privatization in the nineties of most of public utilities (electricity and water provision, transport and oil producing firms) and the concession of road maintenance to the private sector, perhaps a more adequate explanation for the series' irregularity has to be sought at the fact that capital spending has in general behaved as a tool of discretionary fiscal policy. In reason of this, public capital outlays were excluded from the model's first estimation but were later considered together within public spending in a second estimation (variable PEK), with the object of ascertaining whether impulse response functions behaved differently.

Tax Revenues in turn comprises, on the one hand, taxes whose responsibility for collection resides in the central government as the yields of individual and corporate income taxes, transactions, consumption, property and wealth taxes, import and export duties and social security contributions.[3] On the other hand, the fiscal yield of provincial turnover, property and car taxes, as well as stamp duties, were also added to the series.

In order to avert the risk of spurious regressions, typical of non-stationary time series, the Augmented Dickey-Fuller Test was resorted upon in order to prove the existence of unit roots; the results are shown in the ensuing table:

---

1 Although Blanchard and Perotti (2002) pointed it out that the use of quarterly values for variables is extremely important as it enables seasonal patterns in variables' response to diverse shocks to be captured, in this case, in which stationality has been removed, the advantages of resorting to quarterly data reside in that more degrees of freedom are available and in that quarterly data give the possibility of analyzing short time periods elapsing since a shock takes place.

2 The decision to include national as well as subnational figures in the series rests on the fact that provinces' public expenditures and tax revenues account respectively for more than 50 per cent and 15 per cent of total when all government levels are considered.

3 Owing to the new pension systems (private capitalization scheme) existing in the country as of 1994, most of payroll taxes are directed straightaway to Pensions Funds; therefore, computed social security contributions are those directed to the residual public system.

Null Hypothesis: ORIG_GDP_X12_TC has a unit root		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	–0.655914	0.8517
Null Hypothesis: ORIG_PE_X12_TC has a unit root		
Augmented Dickey-Fuller test statistic	–2.545447	0.1083
Null Hypothesis: ORIG_PEK_X12_TC has a unit root		
Augmented Dickey-Fuller test statistic	–4.046548	0.0018
Null Hypothesis: ORIG_TR_X12_TC has a unit root		
Augmented Dickey-Fuller test statistic	–3.314716	0.0173
Null Hypothesis: ORIG_UNE_X12_TC has a unit root		
Augmented Dickey-Fuller test statistic	–1.101106	0.7127
Null Hypothesis: ORIG_INFL_X12_TC has a unit root		
Augmented Dickey-Fuller test statistic	–2.717007	0.0749

* MacKinnon (1996) one-sided *p*-values.

τ 's critical values used to test the null hypothesis were the following ones:

Test critical values:	1% level	–3.501445
	5% level	–2.892536
	10% level	–2.583371

As indicated above, the null hypothesis could not be rejected for gross domestic product, current public expenditures and unemployment, at any significance level, whereas only public spending (inclusive of capital outlays) proved to be stationary at all significance levels. As for tax revenues and inflation, the existence of unit roots is rejected at 1 per cent level, in the former and at 1 and 5 per cent levels in the latter series; as shown by Table 7 in the Statistical Appendix, the ADF test proves that $I(1)$ series turn out to be stationary in all cases. In the light of quoted results, first differences of logarithms of gross domestic product (GDP), public expenditure (*PE* and *PEK*) and tax revenues (*TR*) were used together with first differences of unemployment (*UNE*) and inflation (*INFL*) rates.[4]

The ensuing expression (1) stands for the reduced form of the used VAR model:

$$X_t = A(L)\,X_{t-1} + U_t \tag{1}$$

where $X_t = [PE_t,\ TR_t,\ GDP_t,\ UNE_t,\ INFL_t]'$ denotes the vector of endogenous variables whose order is (5 x 1), A is the matrix of autoregressive coefficients of order (5 x 5), whereas the vector $U_t = [u_t^{pe}\ u_t^{tr}\ u_t^{gdp}\ u_t^{une}\ u_t^{infl}]'$, of order (5 x 1), includes the reduced form stochastic residuals. Ordinary Least Squares were resorted to in order to estimate the reduced VAR model's equations; estimated coefficient, *r*-squares and *F*-Statistics values are shown in Tables 1 and 4 in the Statistical Appendix, for public spending exclusive and inclusive of capital outlays respectively.

All equations include lags to each of endogenous variable, their appropriate length being determined by usual information criteria[5] and an intercept omitted in (1) for simplification.[6] Let it in this regard be said that the choice of the lag number took into account the trade-off between long lag lengths' costs, in terms of consumed degrees of freedom, and the small lag-lengths' risk of model misespecification. The matter was dealt with in a iterative way by starting with a lag number sufficiently large that met the "degrees of freedom" restriction. From Tables 2 and 5 (in the Statistical Appendix) which include the results for the various Lag Order Selection Criteria, and for public spending inclusive and exclusive of public capital formation respectively, Akaike's value for 12 lag order turned out to be the more significant for what this lag length was imposed to variables in the estimation of the VAR.[7]

4. Impulse-response Functions

As stressed by Perotti (2004), reduced form residuals (vector U_t above) may be also interpreted as a linear combination of the following three items: the *automatic* (or unanticipated) *response* of fiscal variables to shocks in other variables,

---

4 As, in general, the estimation of A yields consistent autoregressive coefficients, many authors directly resort to VAR in levels choosing to ignore the non-stationarity problem. Nevertheless, Kamps (2005) points out, quoting Phillips (1998), that impulse-response functions "...based in the estimation of unrestricted VAR models are inconsistent at long horizons in the presence of non-stationary variables".

5 That is, Akaike, Schwarz or Hannan-Quinn.

6 Econometric tests including dummy variables in those periods in which the Argentine economy faced situations of strain or underwent abrupt changes (*i.e.* hyperinflation in 1989 or the start of convertibility in 1991) did not render significantly different impulse-response, for which reason they were not considered in the model specification.

7 Many an econometrician would defend the point that 12 quarters (three years) suffice to capture the system's dynamics.

the sys*tematic discretionary response*[8] of policymakers to innovations in variables and the *random discretionary (or structural) shocks* to fiscal policy, the latter being the ones upon which the analysis is focused when impulse-response to fiscal shocks are estimated.

When analyzing dynamic effects of a VAR model, identification is a necessary step in order to ensure that impulse response functions yield proper structural interpretations and this is done by imposing appropriate contemporaneous restrictions on the vector U_t. In this case, the Choleski Decomposition of the residuals' matrix of covariances was resorted to and restrictions imposed to the model rendered expression (2) below that links random errors of the reduced form with structural errors:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 \end{bmatrix} \begin{bmatrix} u_t^{pe} \\ u_t^{tr} \\ u_t^{gdp} \\ u_t^{une} \\ u_t^{\inf l} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_t^{pe} \\ \varepsilon_t^{tr} \\ \varepsilon_t^{gdp} \\ \varepsilon_t^{une} \\ \varepsilon_t^{\inf l} \end{bmatrix} \qquad (2)$$

Let it be pointed out that the variable ordering expressed by (2) assumes that: public expenditure does not contemporaneously react to innovations in the rest of variables, tax revenues are not contemporaneously affected by shocks to other variables except for public spending innovations, gross domestic product only reacts to contemporaneous shocks to public spending and taxes, unemployment is contemporaneously affected by innovations in all the variables but inflation and inflation contemporaneously reacts to shocks to the rest of variables in the model. Needless to emphasize, the above placed restrictions only apply to the initial period since all variables in the model are permitted to interact freely in all periods following the one in which the innovation takes place.

In relation to the possibility of cointegration among variables, its almost certain minor impact upon the estimation of impulse response functions, in the light of VAR methodology's results, avails the decision not to take the hypothesis into consideration;[9] in fact, diverse ordering and contemporaneous restrictions placed to variables (not shown in the paper) showed robust results.[10]

---

8 Following Blanchard and Perotti's viewpoint (2002), the assumption was upheld that discretionary responses take more than a quarter to respond and therefore they are not captured by the used quarterly data.

9 The possibility and effects of cointegration are more important when long run relations are being analyzed; it would be advisable, in that case, to use VECM as it explicitly considers such relations and ensures in turn a better treatment of series used for analysis and forecasting purposes.

10 See next section.

5. Dynamic impact of shocks, robustness and granger causality

Plots in Figure 1 display the dynamic impact of current public expenditure (wages, government purchases and transfers to the private sector) and taxes upon the gross domestic product, unemployment and inflation rates for a horizon of 18 quarters, the shocks amounting to a positive innovation (increase) of both the fiscal variables; furthermore, the impact of product, unemployment and inflation shocks upon fiscal variables is also depicted. Particularly, the purpose of estimating impulse response functions of fiscal variables, unemployment and inflation when supply shocks (positive innovations in product) occur was to empirically verify a possible inverse ordering between product and fiscal variables[11] as well as the impact of product's positive innovations, if any, upon employment and economic stability in Argentina.

Each graph includes a point estimation of impulse response functions[12] as well as lower and upper bounds for a 95 per cent confidence interval. As usual, the solid lines depict the variable percent change in response to a standard deviation of one in the respective fiscal variable whereas the dotted lines represent the 95 per cent error bands. Graphs in Figure 2 depict in turn impulse response estimations for gross domestic product only, assuming negative shocks to fiscal variables (spending and tax cuts) while the same quarter number and error bands are maintained.

Plots in the left hand side of Figure 1 (first two columns), with the response of variables to positive innovations in current public spending and taxes, show behavioral patterns that cast doubts on the real effect of shocks. In the first place, the magnitude of impact upon product, unemployment and inflation were surprisingly minimal as following a 1 percent increase in fiscal variables the former reacted with changes in general well below the mentioned percentage; furthermore, by including the error bands the 0-value in almost all the time path estimated impulse response functions fall short from being significant enough in most of cases.

Nevertheless, several cases deserve a comment: in current public spending as well as in taxes the reactions to their own shocks were statistically significant but short-lived (five and three quarters respectively). The explanation to this resides in that innovations to a variable impact all the variables in the system (included the variable itself) for what the impact of an initial shock may continue through time, given the lag structure, its being transmitted also to the same variable via the effects upon the rest. In the case of gross domestic product, the impulse response pattern permits to infer that – at the outset – the fiscal shock gives way to a typical but limited Keynesian demand push, lasting for two or three quarters; it is worth stressing here that apart from the fact that the lack of persistence is accompanied by a rather negligible response size (less than 0.5 per cent), the response soon becomes negative raising suspicions of crowding out effects.

---

11 Diverse authors (Lütkepohl, 2001) accept that the impulse response analysis can also be regarded as a type of reverse causation test.

12 Impulse response functions show the response of variables to an innovation of 1 percent.

Product's negative response to shocks to taxes depicted by the graph, and statistically significant for at least three quarters, seems to be somehow agreeing with supply-side supporters' view that a displacement of private economic activity is to be expected soon after a tax increase. Nevertheless, the markedly low impact and the lack of statistical significance along the time horizon calls for caution at the moment of uttering definite conclusions.

A much clearer pattern is shown in relation to unemployment, as the variable's response to spending shocks hardly differs from zero in the whole time horizon. This feature helps explaining the almost null influence of transfers to the private sector in employment creation, as is also evident from discretionary plans to assist household heads without income[13] rather than aiming at reinserting the jobless within formal labor markets.

The null effect of spending shocks on inflation is a rather intriguing result of the VAR estimation which still remains without explanation. However, a more predictable feature is rendered by the response of inflation to tax increases: while inflation slightly declines on impact (according to what macroeconomic theory would predict) it immediately climbs to reach a maximum in the fourth quarter from where the impact starts to cyclically fade away for the rest o the time horizon. This result is closely related to the overwhelming preeminence of indirect taxation causing that the first round effect of any positive tax change be a consumption reduction, followed later on by a price increase.

An interesting case of analysis arises out of the impact of spending shocks upon taxes: as the latter are clearly dragged by shocks to the former (as the plot's hump-shaped response shows), impulse response of spending to taxes are practically null and no evidence of inverse causation exists: in any case, spending's positive effect lasts until the fourth or fifth quarter with a maximum value around the fourth quarter. The results of the impulse response function thus prove what is intuitively perceived: there is a close correlation between the expansion of public spending and fiscal revenues whose sequence is what the traditional government budget constraint would indicate.

Plots in the third column of Figure 1 mainly aim at assessing whether results for impulse response functions enable to assume reverse causation among gross domestic product and fiscal variables, unemployment and inflation. In starting with the first graph, a positive impact of a supply shock upon public spending is shown as of the first through the fifth quarter, although the evidence is far from being conclusive given that estimations do not significantly differ from 0.[14] Nevertheless, a slight public spending increase cannot be ruled out following a product shock. In turn, tax revenues' lack of response (as shown by the second plot in the column) can be explained by the rather limited reaction of taxes to product shocks owing to the

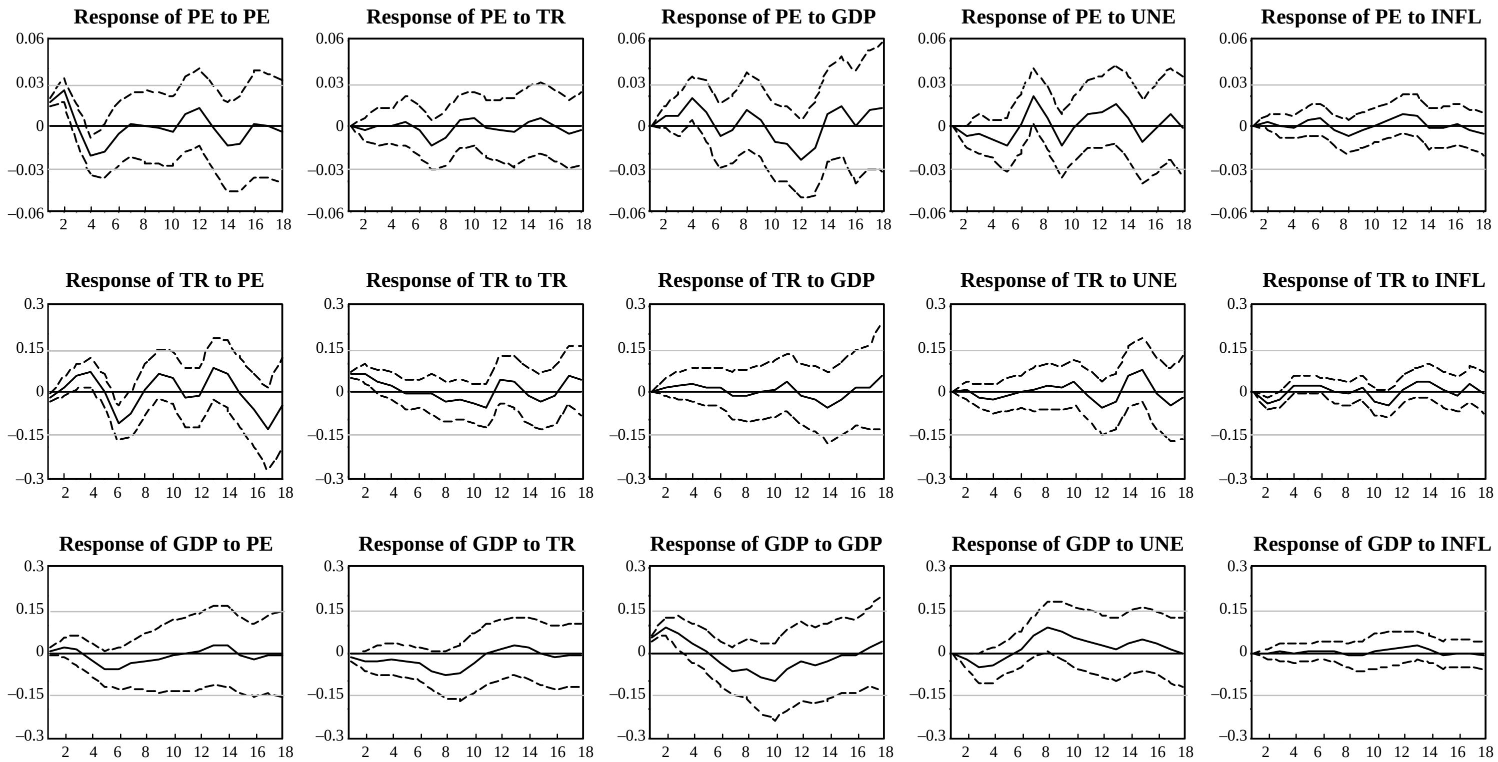
[13] Known as Plan Jefes y Jefas de Hogar.

[14] As is noticed, in many cases error bands include also the 0-value.

Figure 1

Impulse-response Functions: Response to Positive Fiscal Shocks*

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

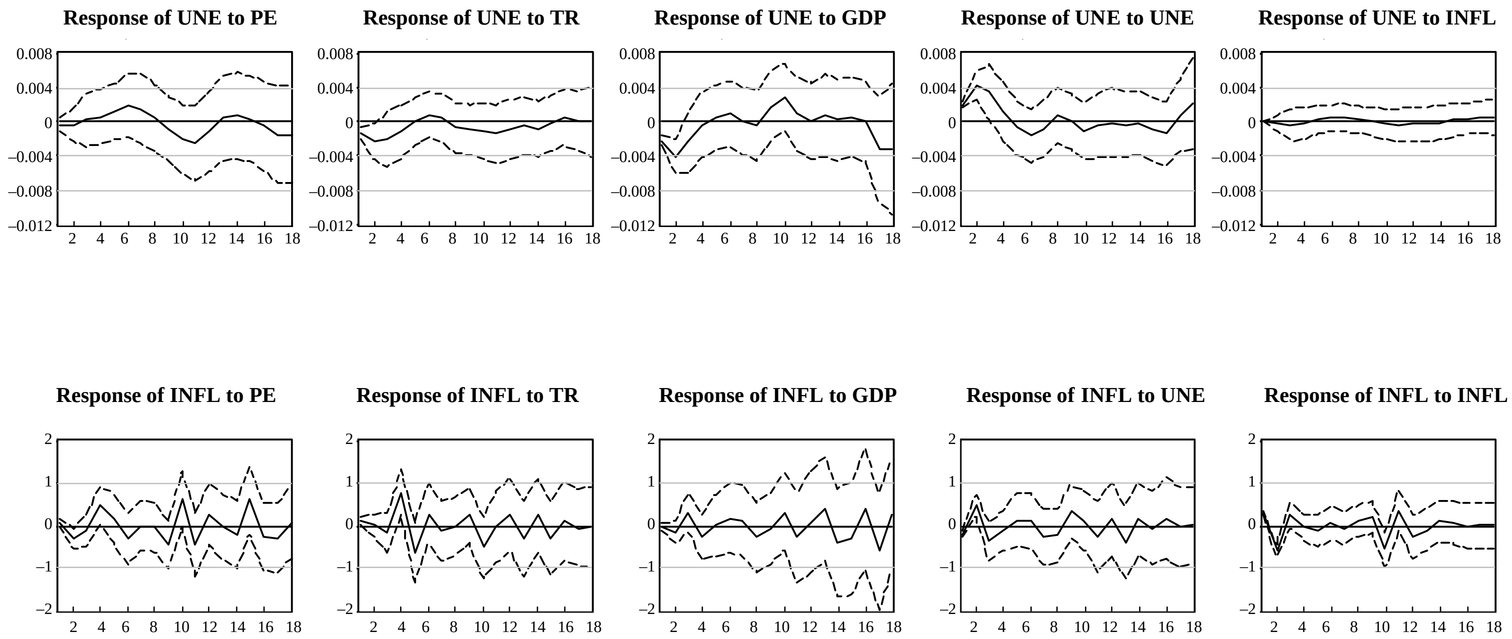


* Capital outlays not included in public expenditure.

Figure 1 (continued)

Impulse-response Functions: Response to Positive Fiscal Shocks*

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

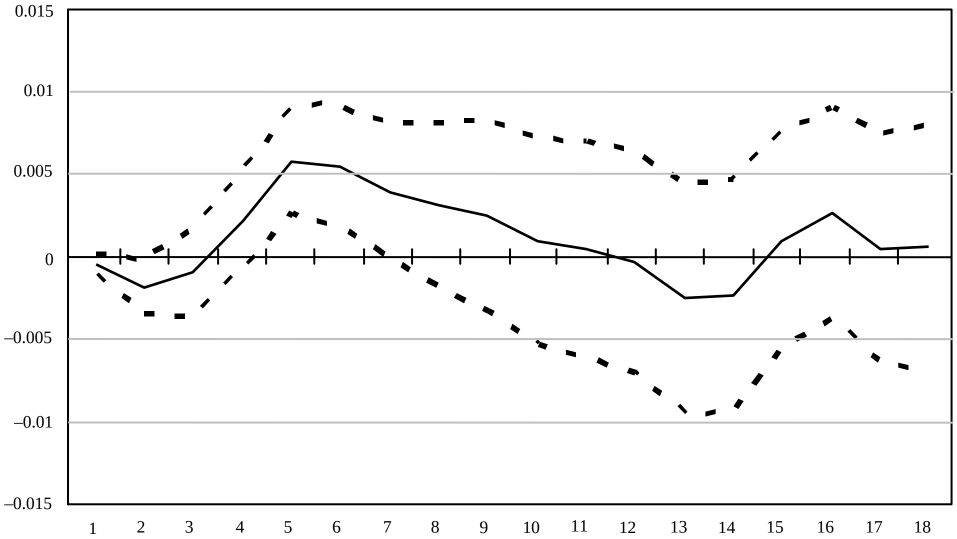


* Capital outlays not included in public expenditure.

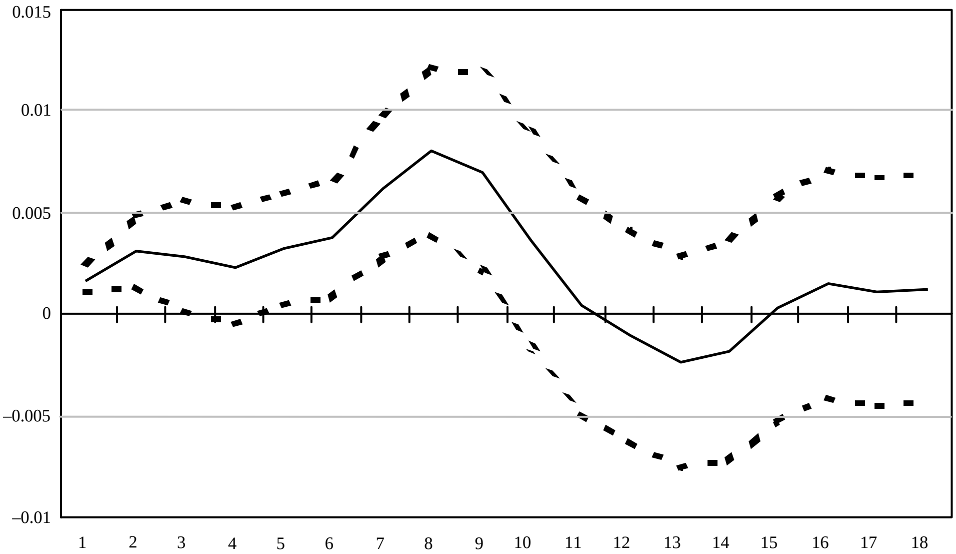
Figure 2

Impulse-response Functions: Response to Negative Fiscal Shocks*

Response of GDP to PE



Response of GDP to TR



* Capital outlays not included in public expenditure.

low income elasticity of the Argentine Tax System.[15]

Although unemployment behaves as expected (and predicted by economic theory) decreasing on impact, the negligible statistical relevance of results could be indicating a capital intensive feature of product innovations which would hardly in turn help to boosting employment to higher levels.

The response of inflation to product innovations is intriguing, to say the least: it is negative on impact as standard textbook presentations would indicate but thereafter not only that the effect is long-lived but also the plot shows a cyclical pattern with cycles of opposite sign successively offsetting each other as the effect tend to increase by the end of the time horizon (eighteenth quarter) although, again, different from 0 estimations for the impulse response are not guaranteed.

In interpreting results for shocks to inflation (fifth column in Figure 1) only two graphs seem to be worth mentioning: the negative impact on taxes, statistically significant in the first four quarters and the same variable's cyclical response to the innovation during the three first quarters. While a not straightaway explanation is at hand for the latter case, evidences of the Olivera-Tanzi effect may be underlying the impulse-response in the former case.

Finally, the short-lived persistence of shocks (between 2 and 5 quarters in the cases in which the impact is significant) falls in line with what many specialists have already pointed out. Suffice it in this connection to quote Fair (1979) saying that the forecasting performance of unrestricted VAR's is poor after about one year; the point has been also stressed by Blinder (in Kopcke, Tootell and Triest, 2006) who asserted that most of evidence from VARs and large-scale econometric models suggested that outside lags[16] for fiscal policy were substantially shorter than the corresponding to monetary policy.

In relation to the dynamic impact of negative fiscal innovations (spending and tax cuts) upon product, a first glance to plots in Figure 3 will lead one to assert that the results do not have statistical significance, in view that the maximum and minimum values for gross domestic product response to negative fiscal innovations hardly reach 0.5 and –0.2 per cent respectively. This conclusion cannot however be considered surprising in any way as it falls in line with results already shown by positive fiscal shocks; in fact, the impulse response function shows, in relation to negative spending shocks, that the product – after an initial fall lasting for 3 quarters – takes positive values until the twelfth quarter even when it results dubious to assert that estimates differ from 0 beyond the seventh quarter. As explained for positive spending shocks, results show at the outset a non persistent Keynesian demand push upon product but – as was already pointed out in the case of positive spending innovations – traces of crowding out effects upon private activity can not be discarded as the graph's hump-shaped response shows it.

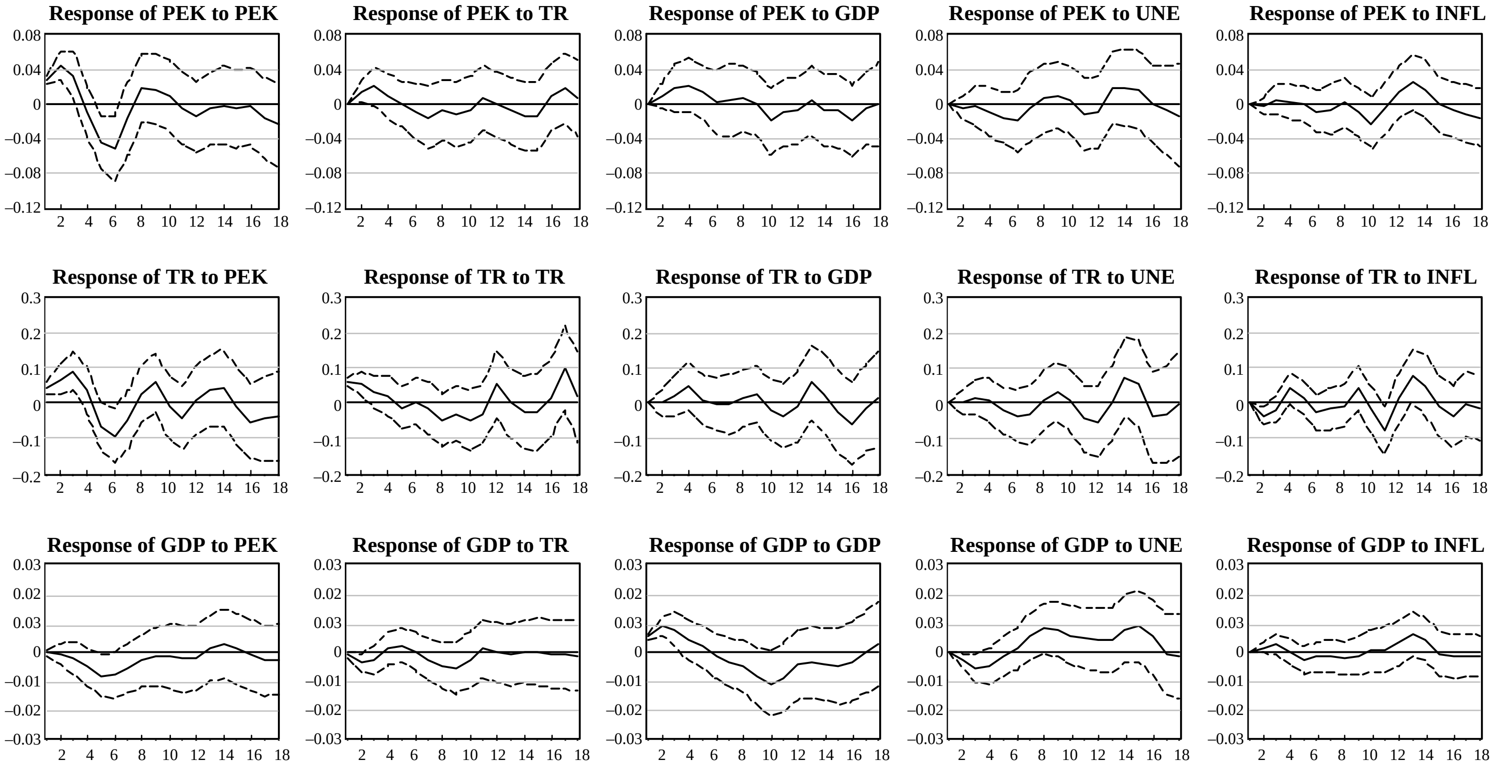
[15] This feature, and the need to correct it, have always been in policymakers' agendas as a prioritary subject still awaiting resolution.

[16] Outside lags stand for the time that runs between a policy shock and its effect upon the economy.

Figure 3

Impulse-response Functions: Response to Positive Fiscal Shocks*

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

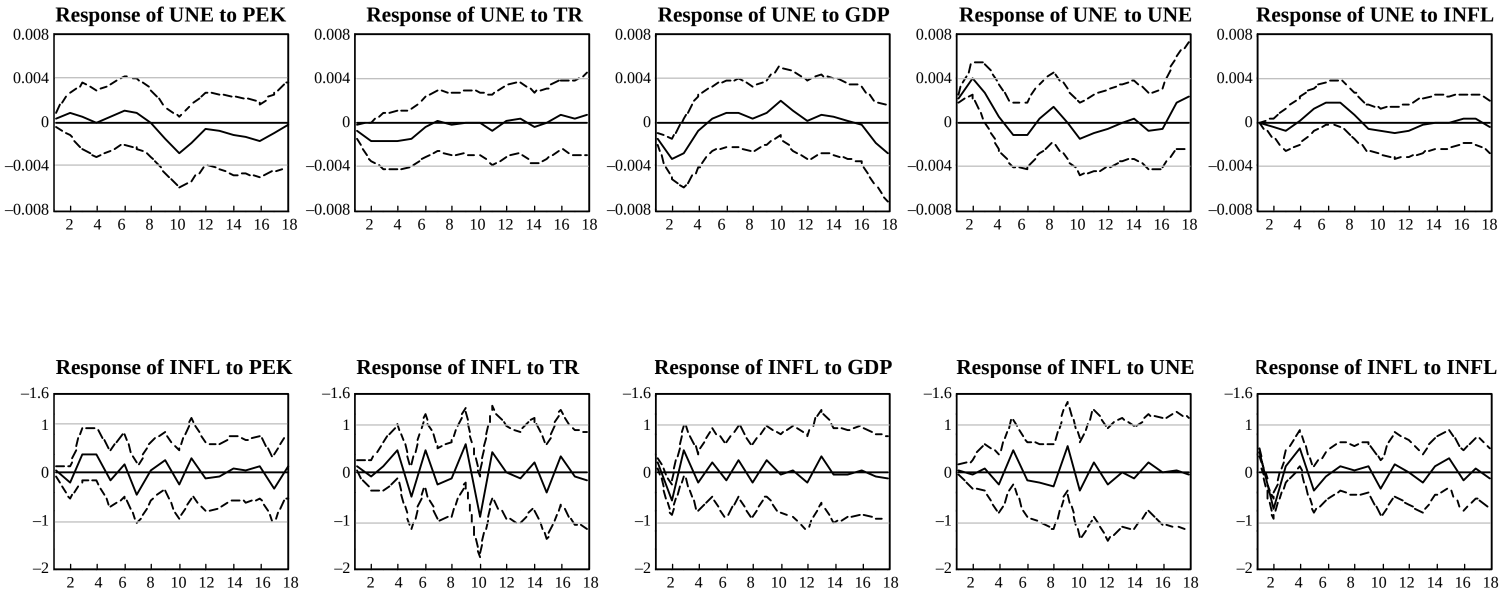


* Capital Outlays included in Public Expenditure.

Figure 3 (continued)

Impulse-response Functions: Response to Positive Fiscal Shocks*

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



* Capital Outlays included in Public Expenditure.

More conclusive and long lived – despite its low statistical significance – is the pattern of product response to a negative tax shock, which extends for eleven quarters and gives somehow support to supply-side economists' claims on the damaging effects of the fiscal hedge upon product[17] caused by distorting taxation.

In spite of the above mentioned difficulties for counting with sound capital formation series, let alone the matter of identifying who is actually building public investment in Argentina, impulse response functions plotted in Figure 3 overleaf were estimated in order to ascertain whether the dynamic impact of fiscal variables upon macroeconomic variables – when capital outlays are accounted for – differed markedly from the case in which only current public expenditure was considered. Thus, graphs in Figure 3 stand for product, unemployment and inflation's response to positive spending and tax innovations and also include the impact of supply shocks, unemployment and inflation upon all the other variables. Finally, the graph in Figure 4 shows the impulse response function of product to negative shocks (public spending cuts) to fiscal variables.

As may be seen, not only that impulse response functions' quality is not impaired by the inclusion of public capital outlays but this improves at least on the following two accounts: in some cases, impulse responses are now statistically different from 0 and in others shocks have a longer-lived impact upon variables. However, in most of the cases results do no exhibit noticeable changes except for minor differences in the plots' shape or maximum and minimum values reached.

Major differences were found particularly in public spending response to tax shocks and in the more significant and greater reaction of taxes to spending innovations bringing to surface a reverse causation situation not shown in the previous case. Also, inflation response to product innovations seems now to be higher, longer lived and clearly different from 0. Finally, impulse response for product and unemployment to product innovations show now short-lived and tenuous but expected reactions to inflation shocks, particularly in the latter case.

One of surprising results, despite its relative statistical significance, is the fall in product that follows a public spending (inclusive of capital outlays) innovation as it puts at a stake the idea of externalities associated to public capital provision. Strange as it may seem, the point has already been pointed out by Kamps (2005) who – in finding a similar pattern for some OECD countries – suggested that unless public capital were conceived to have a negative marginal productivity another possible explanation could be that public and private capital were substitutes in the short run for what the positive innovation to the former would crowd out the latter.[18]

---

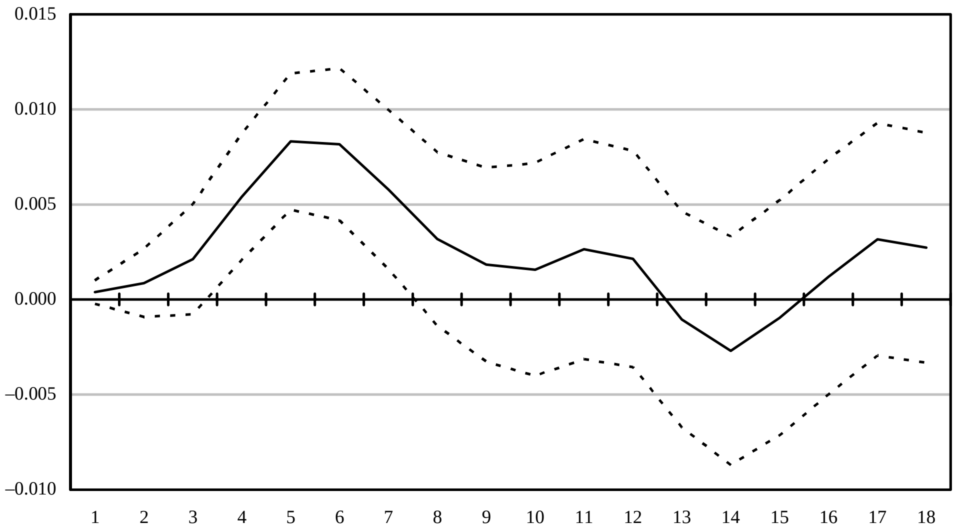
[17] Although this conclusion seems to be at odds with allegedly available evidence about the very limited incidence upon the product of tax cuts implemented in Argentina in various opportunities, either in Social Security Contributions, or in provincial Transactions and Property Taxes, founded conclusions in this matter still wait for a thorough empirical analysis.

[18] Kamps (2005) also suggested that crowding out effects could also reach employment and this is somehow depicted by point estimates of impulse response which increases at the beginning but it decreases after the eighth quarter.

Figure 4

Impulse-response Functions: Response to Negative Fiscal Shocks

Response of GDP to PEK



* Capital Outlays included in Public Expenditure.

Product reaction to a negative spending shock (Figure 4) in turn shows that the response magnitude is larger when public outlays are taken into account even when the impact of the shock is less persistent (7 quarters instead of almost 10) considering the section in which the impulse response is more significant. The feature is however stressed of a likely crowding out effect implicitly built-in the plot's positive hump-shaped pattern as product increases when public spending dwindles.

Robustness of estimations was empirically dealt with in the paper by testing whether the impulse response functions achieved through the recursive approach of autoregressive vector methodology were sensitive to the variable ordering; for that, alternative variable orderings to the one in the benchmark model in (2) were econometrically tested, as for instance: allowing contemporaneous effects of product upon fiscal variables, changing the order between fiscal variables and also allowing product to receive contemporaneous effects of all other variables in the VAR model.

Although results (not shown here) can not be taken as definitive, as series improvement is always a possibility when applying VARs models, estimations found with alternative variable orderings did not substantially differ from those rendered by the benchmark specification (Figures 1 to 4). In sum, differences were hardly noticeable and lacked in general statistical significance even in cases where orderings showed an extreme departure from the benchmark model.

Public Spending exclusive of Capital Outlays	**Public Spending inclusive of Capital Outlays**
TR does not Granger cause PE	TR Granger causes PEK
GDP Granger causes PE	GDP Granger causes PE
UNE does not Granger cause PE	UNE does not Granger cause PE
INFL Granger causes PE	INFL Granger causes PE
PE Granger causes TR	PEK Granger causes TR
GDP Granger causes TR	GDP Granger causes TR
UNE Granger causes TR	UNE does not Granger cause TR
INFL Granger causes TR	INFL Granger causes TR
PE Granger causes GDP	PEK Granger causes GDP
TR Granger causes GDP	TR Granger causes GDP
UNE does not Granger cause GDP	UNE Granger causes GDP
INFL does not Granger cause GDP	INFL Granger causes GDP
PE does not Granger cause UNE	PEK does not Granger cause UNE
TR does not Granger cause UNE	TR does not Granger cause UNE
GDP does not Granger cause UNE	GDP does not Granger cause UNE
INFL does not Granger cause UNE	INFL does not Granger cause UNE
PE Granger causes INFL	PEK Granger causes INFL
TR Granger causes INFL	TR Granger causes INFL
GDP Granger causes INFL	GDP Granger causes INFL
UNE does not Granger cause INFL	UNE does not Granger cause INFL

Source: Tables 3 and 6 in the Statistical Appendix.

As known, Granger causality tests verify whether the lags of one variable enter into equations for other variables the implication being that, when the null hypothesis holds, the sequence of a variable does not cause other variables' sequence. As Enders (1995) states it, the latter amounts to saying that the past values of a variable's disturbance (ε) do not affect the other variables and therefore they cannot either improve the forecasting performance of the variables' sequence.[19]

Results for Granger causality shown in Tables 3 and 6 in the Statistical Appendix, for total public expenditure (exclusive and inclusive of capital public spending) indicate that the null hypothesis stating that a given variable does not Granger cause another variable is accepted eleven times and rejected seven in the first case whereas in the second one acceptances amount to seven and rejections to thirteen.

According to the test's results in Table 3, current public expenditure Granger causes tax revenues, gross domestic product and inflation, tax revenues in turn

[19] A point worth clarifying here is the difference between Granger causality and exogeneity, as the conditions for the latter require not only that past values, but also current values of a variable not to affect the other variables.

Granger causes gross domestic product and inflation, gross domestic product Granger causes public spending, tax revenues and inflation, unemployment Granger causes tax revenues and finally inflation Granger causes public spending and net revenues.

When total public spending is used (Table 6), only unemployment is not Granger caused by the other variables whereas it does not Granger cause public expenditure, tax revenues and inflation either.

As can be noticed, results of Granger tests naturally fall in line with the variables' degree of response to the various shocks, as depicted by Figures 1 and 3 above.

6. Conclusions

The VAR model used permitted to estimate impulse response functions to showing the impact of positive and negative shocks to fiscal variables upon various macroeconomic variables in Argentina. The exercise was carried out for the period 1984-2005 (second quarter) and quarterly data for public expenditure, tax revenues, gross domestic product, unemployment and inflation rates were used.

While the short impact duration and low statistical significance of many an estimated impulse response is the first feature to be emphasized, results showed that variables did not behave sometimes in the way standard textbook presentations would predict it.

In the first place, positive shocks to public spending caused product to increase on impact but soon after the plot's decreasing pattern supplied crowding out evidences. The latter helps also to explain – via the reduction in product – why tax revenues first increased but soon later reacted negatively to positive spending innovations.

The relevant finding of a short lived fall in unemployment, following a public spending increase, arose as a proof that transfer spending in Argentina fed "asistencialista" programs (relief to the poor) rather than promoting employment or reinsertion in formal labor markets.

The negative (although minimal) response of gross domestic product to tax increases and later the tax revenue reaction to positive product innovation, when reverse causation was ascertained, were respectively taken as an evidence of what supply side economics normally asserts and as the natural response to a tax system based mainly on indirect taxes and characterized by a low income elasticity of taxes.

The increase in public spending following a positive shock to taxes and the positive response of taxes to expenditure innovations is a result that, apart from indicating that both the instruments drag each other, deserves further microeconomic considerations (beyond the scope of this paper) related to the efficiency and efficacy of additional public outlays and revenues.

Impulse responses of product to public spending shocks, contrariwise to what the received economic theory predicts, show that both are substitutes in the short run and that crowding out effects cannot be ruled out

As regards the possibility of reverse causation between the product and the other variables, the point must be stressed that all behaved as Keynesian approaches would have predicted it (at least on impact or for a reduced number of quarters) following a supply innovation. Nevertheless, the negligible statistical significance in some of the considered cases endangered the chances of achieving sufficiently strong evidences.

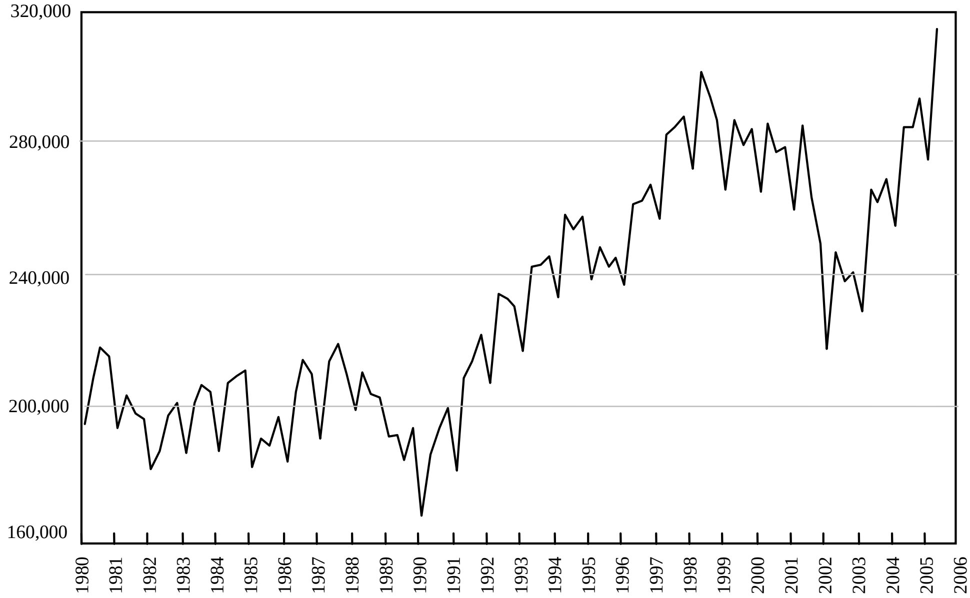
The product response to negative fiscal shocks (spending and tax cuts) not only confirmed but also strengthened evidences found in the preceding findings. Possibilities of crowding out and the damaging effect of distorting taxes upon product were backed by longer-lived shocks' impact and point estimates significantly different from 0.

Finally, Granger causality tests were performed to test the null hypothesis of one variable's lagged values not affecting other variables. The hypothesis resulted accepted in twelve cases and rejected in eight, confirming in general the impulse response analysis.

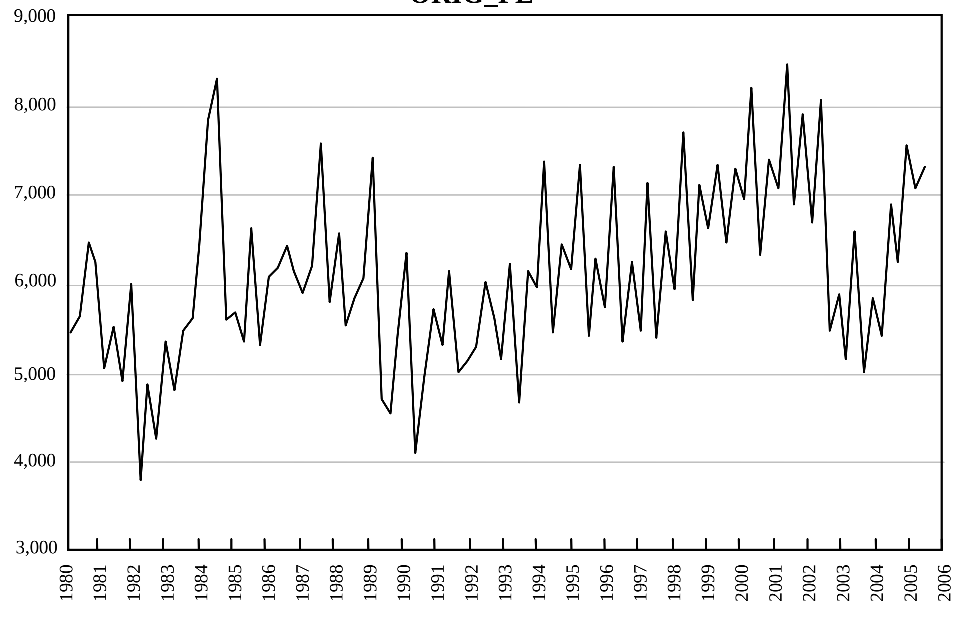
In summing up the main results, structural VARs estimates in the paper reassessed the widespread perception of certain fiscal policy shocks' weakness given their limited impact upon macroeconomic variables and that answering whether Keynesian or alternative macroeconomic policies should be resorted to is still an unsolved subject deserving more investigation.

GRAPHICAL APPENDIX[20]

ORIG_GDP

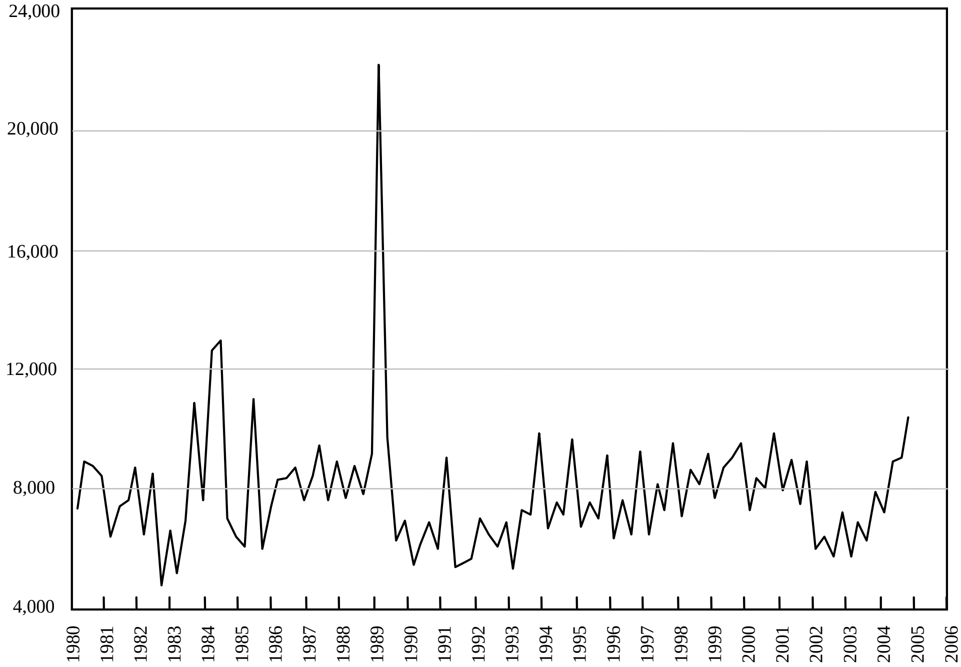


ORIG_PE

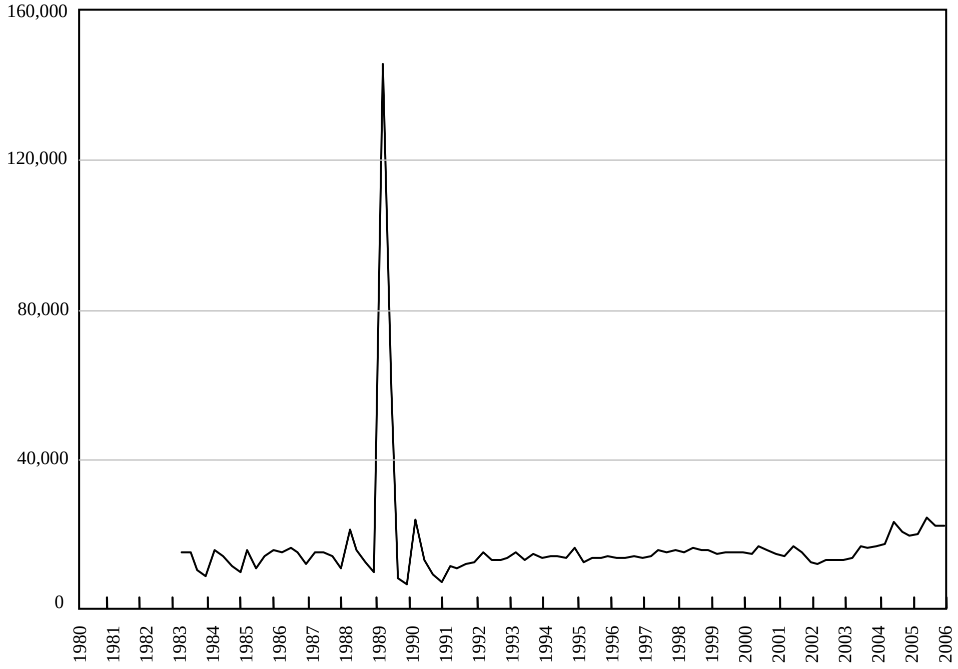


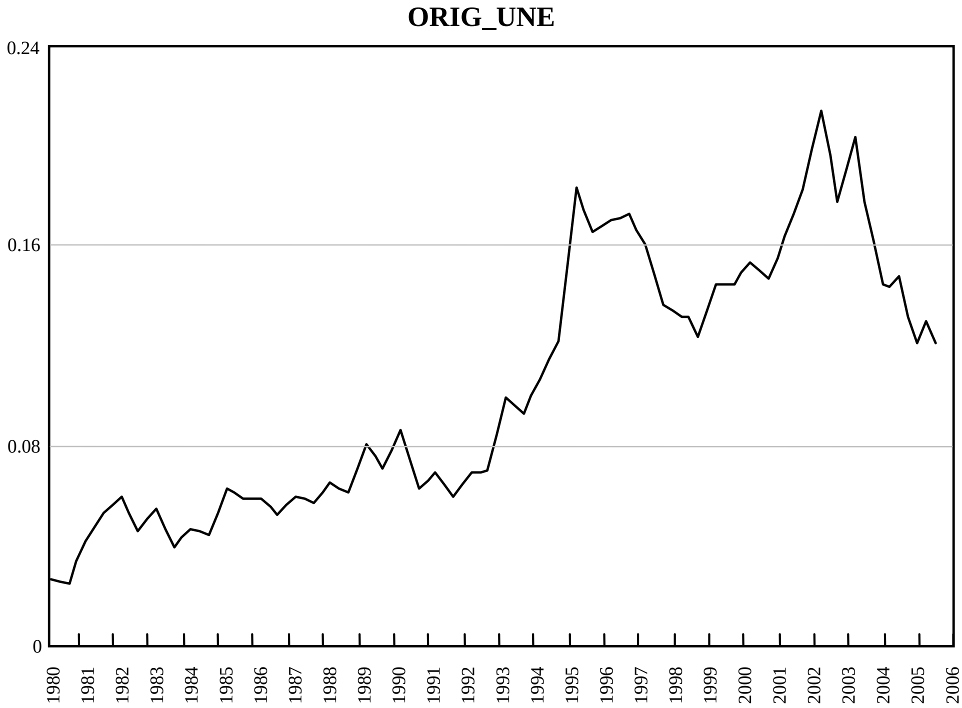
[20] Database including also series used is available from the author on request.

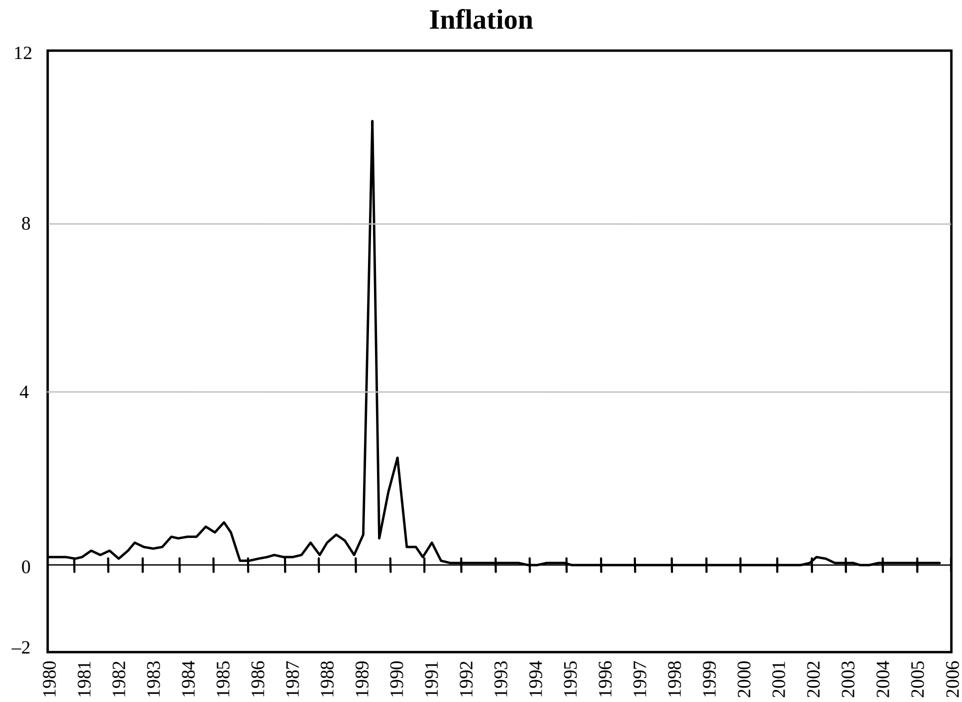
ORIG_PEK



Total Revenues




ORIG_UNE
0.24
0.16
0.08
0
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006


Inflation
12
8
4
0
–2
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006

STATISTICAL APPENDIX

Table 1

Application of VAR Methodology to the Model's Reduced Form: OLS Estimation when Public Expenditures Do not Include Capital Outlays[21]

Vector Autoregression Estimates

Sample (adjusted): 1986:2 – 2004:4

Included Observations: 75 after adjusting endpoints

Standard Errors in ( ) & *t*-statistics in [ ]

	PE	TR	GDP	UNE	INFL
PE(–1)	1.223343	2.826074	0.006534	0.032197	2.442398
	(0.24025)	(0.91080)	(0.07945)	(0.04773)	(5.78826)
	[5.09185]	[3.10285]	[0.08224]	[0.67456]	[0.42196]
PE(–2)	–1.094585	–2.063699	0.034755	–0.069201	–38.30984
	(0.55534)	(2.10528)	(0.18365)	(0.11033)	(13.3794)
	[–1.97101]	[–0.98025]	[0.18924]	[–0.62724]	[–2.86335]
PE(–3)	–0.026695	–1.482412	–0.028539	0.064482	37.79637
	(0.58730)	(2.22646)	(0.19422)	(0.11668)	(14.1494)
	[–0.04545]	[–0.66582]	[–0.14694]	[0.55266]	[2.67123]
PE(–4)	0.186995	2.479978	–0.180272	0.030350	–16.24888
	(0.28851)	(1.09374)	(0.09541)	(0.05732)	(6.95087)
	[0.64814]	[2.26743]	[–1.88943]	[0.52953]	[–2.33768]
PE(–5)	–0.302422	–0.517758	0.088361	–0.009189	–3.996361
	(0.27278)	(1.03411)	(0.09021)	(0.05419)	(6.57191)
	[–1.10866]	[–0.50068]	[0.97952]	[–0.16957]	[–0.60810]
PE(–6)	0.141171	1.311424	–0.034048	0.019695	6.787192
	(0.26566)	(1.00710)	(0.08785)	(0.05278)	(6.40024)
	[0.53141]	[1.30218]	[–0.38756]	[0.37318]	[1.06046]

[21] Complete Vector Autoregression Estimates are available from the author on request.

PE(–7)	–0.252343	–0.861805	–0.000187	–0.021879	–11.34191
	(0.27218)	(1.03184)	(0.09001)	(0.05407)	(6.55751)
	[–0.92710]	[–0.83521]	[–0.00208]	[–0.40462]	[–1.72961]
PE(–8)	–0.114914	–0.629174	–0.120953	0.027261	9.898751
	(0.29218)	(1.10767)	(0.09663)	(0.05805)	(7.03936)
	[–0.39329]	[–0.56802]	[–1.25178]	[0.46964]	[1.40620]
PE(–9)	0.392849	2.163988	–0.020850	0.023957	7.108713
	(0.27002)	(1.02365)	(0.08930)	(0.05364)	(6.50545)
	[1.45487]	[2.11399]	[–0.23350]	[0.44660]	[1.09273]
PE(–10)	–0.294416	–0.865236	–0.065824	–0.055651	–14.55478
	(0.36026)	(1.36573)	(0.11914)	(0.07157)	(8.67940)
	[–0.81724]	[–0.63353]	[–0.55250]	[–0.77758]	[–1.67693]
PE(–11)	0.066998	–0.669178	–0.025035	0.054155	16.19582
	(0.36983)	(1.40201)	(0.12230)	(0.07347)	(8.90995)
	[0.18116]	[–0.47730]	[–0.20470]	[0.73710]	[1.81772]
PE(–12)	0.250213	1.067416	–0.121018	–0.012514	–7.761067
	(0.16993)	(0.64421)	(0.05620)	(0.03376)	(4.09407)
	[1.47242]	[1.65693]	[–2.15347]	[–0.37069]	[–1.89568]
TR(–1)	–0.135098	1.067778	–0.045461	0.008403	5.925813
	(0.09503)	(0.36027)	(0.03143)	(0.01888)	(2.28957)
	[–1.42158]	[2.96383]	[–1.44655]	[0.44506]	[2.58818]
TR(–2)	0.207174	0.281335	0.022010	–0.003765	–1.629933
	(0.11548)	(0.43777)	(0.03819)	(0.02294)	(2.78206)
	[1.79409]	[0.64266]	[0.57636]	[–0.16412]	[–0.58587]
TR(–3)	–0.191414	–0.310863	0.002287	–0.003140	5.808556
	(0.09990)	(0.37870)	(0.03304)	(0.01985)	(2.40669)
	[–1.91614]	[–0.82087]	[0.06924]	[–0.15821]	[2.41350]
TR(–4)	0.050093	0.559696	0.021136	0.007767	3.163495
	(0.12116)	(0.45932)	(0.04007)	(0.02407)	(2.91902)
	[0.41345]	[1.21854]	[0.52751]	[0.32267]	[1.08375]

TR(–5)	0.102306	0.213069	–0.018545	–0.004074	0.826889
	(0.14104)	(0.53467)	(0.04664)	(0.02802)	(3.39790)
	[0.72538]	[0.39851]	[–0.39762]	[–0.14539]	[0.24335]
TR(–6)	–0.088744	–1.027070	0.062372	–0.003693	0.447133
	(0.10413)	(0.39475)	(0.03444)	(0.02069)	(2.50870)
	[–0.85225]	[–2.60181]	[1.81127]	[–0.17852]	[0.17823]
TR(–7)	–0.005050	0.444750	–0.045086	0.001508	3.630977
	(0.07409)	(0.28086)	(0.02450)	(0.01472)	(1.78487)
	[–0.06817]	[1.58356]	[–1.84025]	[0.10244]	[2.03431]
TR(–8)	0.045485	–0.146116	–0.006359	–0.002669	2.607119
	(0.04768)	(0.18077)	(0.01577)	(0.00947)	(1.14881)
	[0.95388]	[–0.80830]	[–0.40327]	[–0.28172]	[2.26940]
TR(–9)	–0.050508	0.229854	–0.003342	0.001795	0.691794
	(0.05370)	(0.20356)	(0.01776)	(0.01067)	(1.29366)
	[–0.94063]	[1.12917]	[–0.18820]	[0.16823]	[0.53476]
TR(–10)	0.036776	0.454391	0.006651	–0.000544	1.841223
	(0.05147)	(0.19511)	(0.01702)	(0.01022)	(1.23994)
	[0.71455]	[2.32891]	[0.39079]	[–0.05321]	[1.48493]
TR(–11)	0.023352	0.196270	0.006430	–0.003685	–2.310592
	(0.07108)	(0.26946)	(0.02351)	(0.01412)	(1.71243)
	[0.32853]	[0.72839]	[0.27355]	[–0.26099]	[–1.34931]
TR(–12)	0.014846	–0.130138	0.017149	0.001137	–1.039025
	(0.04576)	(0.17346)	(0.01513)	(0.00909)	(1.10234)
	[0.32446]	[–0.75026]	[1.13333]	[0.12505]	[–0.94256]
GDP(–1)	–0.227153	–1.800562	1.182416	0.108817	6.755200
	(1.09914)	(4.16681)	(0.36348)	(0.21836)	(26.4807)
	[–0.20666]	[–0.43212]	[3.25301]	[0.49835]	[0.25510]
GDP(–2)	0.670073	2.899751	–1.104212	–0.066598	23.81466
	(1.62809)	(6.17205)	(0.53841)	(0.32344)	(39.2242)
	[0.41157]	[0.46982]	[–2.05088]	[–0.20590]	[0.60714]

GDP(–3)	0.318329	5.471023	0.920331	–0.040388	–68.51897
	(1.76540)	(6.69257)	(0.58381)	(0.35072)	(42.5322)
	[0.18032]	[0.81748]	[1.57641]	[–0.11516]	[–1.61099]
GDP(–4)	–1.025541	–18.62245	–0.393185	–0.054783	12.18401
	(2.30620)	(8.74274)	(0.76266)	(0.45815)	(55.5613)
	[–0.44469]	[–2.13005]	[–0.51555]	[–0.11957]	[0.21929]
GDP(–5)	1.387611	14.84410	–0.369957	0.209890	106.9265
	(3.44311)	(13.0527)	(1.13863)	(0.68402)	(82.9520)
	[0.40301]	[1.13724]	[–0.32491]	[0.30685]	[1.28902]
GDP(–6)	1.206243	–2.538099	0.643640	–0.216711	–135.2719
	(3.29756)	(12.5010)	(1.09050)	(0.65510)	(79.4454)
	[0.36580]	[–0.20303]	[0.59023]	[–0.33081]	[–1.70270]
GDP(–7)	–3.011195	–0.853938	–0.383072	0.161557	90.40920
	(2.17558)	(8.24757)	(0.71946)	(0.43221)	(52.4145)
	[–1.38409]	[–0.10354]	[–0.53244]	[0.37380]	[1.72489]
GDP(–8)	4.386099	–2.237034	0.203893	–0.151725	–53.15904
	(1.89271)	(7.17522)	(0.62592)	(0.37601)	(45.5995)
	[2.31736]	[–0.31177]	[0.32575]	[–0.40351]	[–1.16578]
GDP(–9)	–4.343686	–0.668087	–0.000528	0.131012	10.66574
	(2.11804)	(8.02944)	(0.70043)	(0.42077)	(51.0282)
	[–2.05080]	[–0.08320]	[–0.00075]	[0.31136]	[0.20902]
GDP(–10)	3.819838	1.381154	–0.020500	–0.080274	48.33269
	(2.14533)	(8.13289)	(0.70946)	(0.42620)	(51.6857)
	[1.78054]	[0.16982]	[–0.02890]	[–0.18835]	[0.93513]
GDP(–11)	–2.830412	3.516398	0.182817	0.006338	–75.10920
	(1.80839)	(6.85554)	(0.59803)	(0.35926)	(43.5679)
	[–1.56516]	[0.51293]	[0.30570]	[0.01764]	[–1.72396]
GDP(–12)	1.279406	–5.631765	0.097368	–0.008341	38.45437
	(0.87424)	(3.31420)	(0.28911)	(0.17368)	(21.0622)
	[1.46346]	[–1.69928]	[0.33679]	[–0.04803]	[1.82575]

UNE(–1)	–3.199470	–10.28805	–1.399851	2.063352	87.76050
	(1.94716)	(7.38164)	(0.64392)	(0.38683)	(46.9113)
	[–1.64315]	[–1.39373]	[–2.17394]	[5.33405]	[1.87077]
UNE(–2)	5.138224	32.82339	1.568243	–2.210147	–57.24728
	(3.01284)	(11.4216)	(0.99634)	(0.59854)	(72.5857)
	[1.70544]	[2.87380]	[1.57400]	[–3.69259]	[–0.78869]
UNE(–3)	–8.096930	–31.31128	–1.503020	1.804176	–123.1604
	(4.59906)	(17.4349)	(1.52090)	(0.91366)	(110.801)
	[–1.76056]	[–1.79589]	[–0.98824]	[1.97467]	[–1.11154]
UNE(–4)	9.291831	13.69399	2.200813	–1.521431	204.4272
	(6.14542)	(23.2971)	(2.03228)	(1.22086)	(148.057)
	[1.51199]	[0.58780]	[1.08293]	[–1.24619]	[1.38074]
UNE(–5)	–9.232287	–8.211915	–2.992681	1.211730	–210.0794
	(6.84943)	(25.9660)	(2.26510)	(1.36072)	(165.018)
	[–1.34789]	[–0.31626]	[–1.32121]	[0.89051]	[–1.27307]
UNE(–6)	8.178796	11.01770	3.109020	–0.325330	251.7698
	(7.71377)	(29.2427)	(2.55093)	(1.53243)	(185.842)
	[1.06028]	[0.37677]	[1.21878]	[–0.21230]	[1.35476]
UNE(–7)	–7.071396	–6.026399	–1.659264	–0.419115	–293.1388
	(9.18603)	(34.8240)	(3.03781)	(1.82491)	(221.311)
	[–0.76980]	[–0.17305]	[–0.54620]	[–0.22966]	[–1.32455]
UNE(–8)	5.726185	3.612634	1.968167	0.239752	272.7175
	(9.72452)	(36.8654)	(3.21588)	(1.93189)	(234.285)
	[0.58884]	[0.09800]	[0.61201]	[0.12410]	[1.16404]
UNE(–9)	–2.261995	–8.200830	–2.580861	0.276449	–285.3432
	(10.0058)	(37.9315)	(3.30889)	(1.98776)	(241.060)
	[–0.22607]	[–0.21620]	[–0.77998]	[0.13908]	[–1.18370]
UNE(–10)	–2.919757	2.054375	2.022701	–0.398562	333.3278
	(9.29627)	(35.2419)	(3.07426)	(1.84681)	(223.967)
	[–0.31408]	[0.05829]	[0.65795]	[–0.21581]	[1.48829]

UNE(–11)	4.496086	10.06172	–1.274402	0.225188	–231.7708
	(6.23081)	(23.6208)	(2.06052)	(1.23782)	(150.114)
	[0.72159]	[0.42597]	[–0.61849]	[0.18192]	[–1.54397]
UNE(–12)	–3.469115	–5.008386	0.707655	–0.181639	56.30471
	(2.36996)	(8.98445)	(0.78374)	(0.47082)	(57.0974)
	[–1.46379]	[–0.55745]	[0.90292]	[–0.38579]	[0.98612]
INFL(–1)	0.007416	–0.133096	–0.001112	–0.000585	–1.767720
	(0.00775)	(0.02938)	(0.00256)	(0.00154)	(0.18672)
	[0.95690]	[–4.53006]	[–0.43383]	[–0.38012]	[–9.46733]
INFL(–2)	–0.016869	–0.211387	–0.006773	7.98E–05	–1.506284
	(0.02028)	(0.07690)	(0.00671)	(0.00403)	(0.48871)
	[–0.83159]	[–2.74886]	[–1.00966]	[0.01981]	[–3.08217]
INFL(–3)	–0.014123	–0.036617	–0.015443	0.001564	–0.665998
	(0.03147)	(0.11930)	(0.01041)	(0.00625)	(0.75818)
	[–0.44878]	[–0.30692]	[–1.48392]	[0.25013]	[–0.87841]
INFL(–4)	0.003471	0.103421	–0.013711	0.001490	–0.732094
	(0.02519)	(0.09548)	(0.00833)	(0.00500)	(0.60680)
	[0.13780]	[1.08314]	[–1.64613]	[0.29771]	[–1.20648]
INFL(–5)	0.000693	0.090200	–0.004791	0.000718	–0.648126
	(0.01719)	(0.06516)	(0.00568)	(0.00341)	(0.41408)
	[0.04030]	[1.38436]	[–0.84293]	[0.21017]	[–1.56522]
INFL(–6)	0.003448	0.044370	–0.001656	0.000893	–0.637471
	(0.01369)	(0.05191)	(0.00453)	(0.00272)	(0.32988)
	[0.25179]	[0.85480]	[–0.36575]	[0.32839]	[–1.93243]
INFL(–7)	0.004721	–0.102392	–0.002127	0.001195	–0.806573
	(0.01171)	(0.04439)	(0.00387)	(0.00233)	(0.28212)
	[0.40321]	[–2.30656]	[–0.54937]	[0.51367]	[–2.85902]
INFL(–8)	–0.003322	–0.080480	–0.004385	0.001622	–0.067607
	(0.01561)	(0.05918)	(0.00516)	(0.00310)	(0.37610)
	[–0.21278]	[–1.35993]	[–0.84942]	[0.52296]	[–0.17976]

INFL(–9)	0.000171	–0.029559	–0.002916	7.71E–05	0.272718
	(0.01514)	(0.05739)	(0.00501)	(0.00301)	(0.36473)
	[0.01132]	[–0.51504]	[–0.58236]	[0.02563]	[0.74773]
INFL(–10)	–0.007805	–0.083898	–0.003718	–0.000736	0.734647
	(0.01208)	(0.04579)	(0.00399)	(0.00240)	(0.29098)
	[–0.64626]	[–1.83235]	[–0.93091]	[–0.30695]	[2.52471]
INFL(–11)	–0.006553	–0.059254	–0.004849	0.000614	0.729534
	(0.01405)	(0.05325)	(0.00464)	(0.00279)	(0.33838)
	[–0.46657]	[–1.11285]	[–1.04401]	[0.22011]	[2.15594]
INFL(–12)	0.006946	0.017928	–0.005436	0.000691	0.607210
	(0.00962)	(0.03646)	(0.00318)	(0.00191)	(0.23170)
	[0.72226]	[0.49174]	[–1.70938]	[0.36179]	[2.62071]
C	–0.000847	0.004284	–0.000293	0.000357	–0.060352
	(0.00278)	(0.01054)	(0.00092)	(0.00055)	(0.06696)
	[–0.30490]	[0.40661]	[–0.31846]	[0.64663]	[–0.90131]
R-squared	0.981957	0.987638	0.986913	0.958232	0.988704
Adj. *R*-squared	0.904632	0.934657	0.930825	0.779228	0.940294
Sum sq. resids	0.003805	0.054683	0.000416	0.000150	2.208538
S.E. equation	0.016486	0.062498	0.005452	0.003275	0.397181
F-statistic	12.69900	18.64154	17.59576	5.353135	20.42350
Log likelihood	264.4145	164.4678	347.4056	385.6258	25.77301
Akaike AIC	–5.424387	–2.759141	–7.637483	–8.656689	0.939386
Schwarz SC	–3.539497	–0.874250	–5.752592	–6.771798	2.824277
Mean dependent	0.001152	0.006624	0.005104	0.000937	–0.001216
S.D. dependent	0.053384	0.244492	0.020729	0.006970	1.625474

Determinant resid covariance (dof adj.)	1.03E–17
Determinant resid covariance	2.34E–21
Log likelihood	1249.286
Akaike information criterion	–25.18095
Schwarz criterion	–15.75650

Table 2

VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: *PE TR GDP UNE INFL*
Exogenous variables: *C*
Sample: 1984Q1 2005Q2
Included observations: 75

Lag	**Log*L***	***LR***	***FPE***	***AIC***	***SC***	***HQ***
0	443.5028	NA	5.74e–12	–11.69341	–11.53891	–11.63172
1	563.5262	220.8432	4.57e–13	–14.22737	–13.30037	–13.85723
2	652.3231	151.5466	8.41e–14	–15.92862	–14.22912	–15.25003
3	717.8430	103.0846	2.92e–14	–17.00915	–14.53716	–16.02211
4	766.4200	69.95089	1.63e–14	–17.63787	–14.39338	–16.34238
5	813.1308	61.03548	9.80e–15	–18.21682	–14.19984	–16.61289
6	863.5188	59.12195	5.58e–15	–18.89384	–14.10436	–16.98145
7	912.1400	50.56599	3.51e–15	–19.52373	–13.96176	–17.30290
8	942.0100	27.08213	3.92e–15	–19.65360	–13.31913	–17.12432
9	980.5737	29.82260	3.83e–15	–20.01530	–12.90833	–17.17757
10	1055.436	47.91160	1.64e–15	–21.34495	–13.46549	–18.19877
11	1164.033	55.02280*	3.54e–16	–23.57422	–14.92226	–20.11959
12	1249.286	31.82764	2.03e–16*	–25.18095*	–15.75650*	–21.41787*

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5 per cent level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 3

Pairwise Granger Causality Tests

VAR Granger Causality/Block Exogeneity Wald Tests
Sample: 1984Q1 2005Q2
Included observations: 75

Dependent variable: *PE*			
Excluded	**Chi-sq**	**Df**	**Prob.**
TR	14.37680	12	0.2773
GDP	28.90250	12	0.0041
UNE	16.68188	12	0.1620
INFL	30.57146	12	0.0023
All	260.6443	48	0.0000
Dependent variable: *TR*			
Excluded	**Chi-sq**	**Df**	**Prob.**
PE	47.40404	12	0.0000
GDP	76.13063	12	0.0000
UNE	28.24756	12	0.0051
INFL	144.8809	12	0.0000
All	449.6134	48	0.0000
Dependent variable: *GDP*			
Excluded	**Chi-sq**	**Df**	**Prob.**
PE	36.18907	12	0.0003
TR	21.61037	12	0.0421
UNE	16.71260	12	0.1607
INFL	12.61232	12	0.3978
All	115.7835	48	0.0000
Dependent variable: *UNE*			
Excluded	**Chi-sq**	**Df**	**Prob.**
PE	2.972939	12	0.9957
TR	2.041250	12	0.9993
GDP	2.713306	12	0.9973
INFL	2.164165	12	0.9991
All	10.61212	48	1.0000
Dependent variable: *INFL*			
Excluded	**Chi-sq**	**Df**	**Prob.**
PE	38.12807	12	0.0001
TR	154.5497	12	0.0000
GDP	19.96111	12	0.0678
UNE	17.02475	12	0.1487
All	673.6998	48	0.0000

Table 4

Application of VAR Methodology to the Model's Reduced Form: OLS Estimation when Public Expenditures Include Capital Outlays[22]

Vector Autoregression Estimates
Sample (adjusted): 1986Q2 2004Q4
Included observations: 75 after adjustments
Standard errors in ( ) & *t*-statistics in [ ]

	PEK	***TR***	***GDP***	***UNE***	***INFL***
PEK(–1)	1.195940	0.648436	0.095264	0.017225	–10.81482
	(0.28494)	(0.74281)	(0.05215)	(0.02812)	(4.81591)
	[4.19711]	[0.87295]	[1.82691]	[0.61252]	[–2.24564]
PEK(–2)	–1.104830	–1.176832	–0.041459	–0.034713	2.649430
	(0.40171)	(1.04720)	(0.07351)	(0.03965)	(6.78942)
	[–2.75031]	[–1.12379]	[–0.56397]	[–0.87560]	[0.39023]
PEK(–3)	0.110903	–0.676347	–0.110047	0.062879	–12.59024
	(0.45347)	(1.18214)	(0.08299)	(0.04475)	(7.66430)
	[0.24456]	[–0.57214]	[–1.32609]	[1.40499]	[–1.64271]
PEK(–4)	0.438272	1.545215	–0.042142	–0.016136	3.925443
	(0.42908)	(1.11855)	(0.07852)	(0.04235)	(7.25199)
	[1.02142]	[1.38145]	[–0.53669]	[–0.38105]	[0.54129]
PEK(–5)	–0.128133	–0.279720	0.025228	–0.010463	–5.789221
	(0.36619)	(0.95460)	(0.06701)	(0.03614)	(6.18909)
	[–0.34991]	[–0.29302]	[0.37646]	[–0.28953]	[–0.93539]
PEK(–6)	–0.025726	–0.128971	–0.050748	0.031208	–0.222835
	(0.26074)	(0.67970)	(0.04771)	(0.02573)	(4.40677)
	[–0.09867]	[–0.18975]	[–1.06357]	[1.21279]	[–0.05057]
PEK(–7)	–0.192804	–0.312212	–0.047126	–0.010156	–1.364968
	(0.25739)	(0.67099)	(0.04710)	(0.02540)	(4.35029)
	[–0.74906]	[–0.46530]	[–1.00049]	[–0.39981]	[–0.31376]

[22] Complete Vector Autoregression Estimates are available from the author on request.

PEK(–8)	0.455492	0.780262	–0.024439	–0.018484	–2.481661
	(0.26553)	(0.69219)	(0.04859)	(0.02621)	(4.48776)
	[1.71542]	[1.12723]	[–0.50294]	[–0.70534]	[–0.55298]
PEK(–9)	0.226103	1.111819	–0.031817	0.007823	3.494694
	(0.22808)	(0.59457)	(0.04174)	(0.02251)	(3.85483)
	[0.99133]	[1.86996]	[–0.76230]	[0.34754]	[0.90658]
PEK(–10)	–0.688412	–1.055015	–0.043302	–0.015171	1.367953
	(0.17627)	(0.45950)	(0.03226)	(0.01740)	(2.97911)
	[–3.90555]	[–2.29602]	[–1.34242]	[–0.87212]	[0.45918]
PEK(–11)	0.647202	0.483576	–0.006780	0.002934	–4.531160
	(0.24863)	(0.64814)	(0.04550)	(0.02454)	(4.20219)
	[2.60306]	[0.74609]	[–0.14901]	[0.11956]	[–1.07829]
PEK(–12)	0.057592	0.834051	–0.074266	–0.011071	3.141178
	(0.24974)	(0.65103)	(0.04570)	(0.02465)	(4.22092)
	[0.23061]	[1.28112]	[–1.62497]	[–0.44916]	[0.74419]
TR(–1)	0.264817	1.210042	–0.064974	–0.004078	2.642139
	(0.10652)	(0.27768)	(0.01949)	(0.01051)	(1.80031)
	[2.48609]	[4.35768]	[–3.33317]	[–0.38795]	[1.46760]
TR(–2)	–0.184335	–0.201092	0.031610	–0.003491	6.305015
	(0.16681)	(0.43484)	(0.03053)	(0.01646)	(2.81925)
	[–1.10508]	[–0.46245]	[1.03551]	[–0.21205]	[2.23641]
TR(–3)	–0.057151	0.179604	0.017692	–0.000468	9.829566
	(0.15718)	(0.40974)	(0.02876)	(0.01551)	(2.65652)
	[–0.36361]	[0.43834]	[0.61508]	[–0.03019]	[3.70017]
TR(–4)	0.049106	0.245122	0.004259	0.008693	–0.999946
	(0.19197)	(0.50044)	(0.03513)	(0.01895)	(3.24456)
	[0.25580]	[0.48981]	[0.12122]	[0.45884]	[–0.30819]
TR(–5)	–0.305618	–0.078527	0.028223	–0.014574	11.94811
	(0.16554)	(0.43155)	(0.03029)	(0.01634)	(2.79790)
	[–1.84614]	[–0.18196]	[0.93163]	[–0.89205]	[4.27038]

TR(–6)	0.148344	–0.414422	0.020021	0.014490	–4.891875
	(0.17597)	(0.45873)	(0.03220)	(0.01737)	(2.97414)
	[0.84300]	[–0.90341]	[0.62171]	[0.83436]	[–1.64480]
TR(–7)	0.000907	0.407473	–0.018570	–0.016161	5.118648
	(0.11384)	(0.29677)	(0.02083)	(0.01124)	(1.92409)
	[0.00797]	[1.37302]	[–0.89137]	[–1.43842]	[2.66029]
TR(–8)	–0.073819	–0.323148	0.005871	–0.006715	3.680403
	(0.09673)	(0.25216)	(0.01770)	(0.00955)	(1.63486)
	[–0.76314]	[–1.28152]	[0.33168]	[–0.70343]	[2.25121]
TR(–9)	0.098916	0.412317	–0.017898	0.002252	1.189148
	(0.10695)	(0.27879)	(0.01957)	(0.01055)	(1.80752)
	[0.92491]	[1.47894]	[–0.91450]	[0.21334]	[0.65789]
TR(–10)	–0.012725	0.432538	0.013715	–0.005929	6.007145
	(0.11222)	(0.29254)	(0.02054)	(0.01107)	(1.89663)
	[–0.11339]	[1.47858]	[0.66785]	[–0.53536]	[3.16728]
TR(–11)	–0.022972	0.109561	0.024612	–0.000461	0.858024
	(0.09850)	(0.25678)	(0.01803)	(0.00972)	(1.66478)
	[–0.23322]	[0.42668]	[1.36536]	[–0.04738]	[0.51540]
TR(–12)	–0.045364	–0.106733	0.018695	0.006822	1.032663
	(0.09691)	(0.25264)	(0.01773)	(0.00956)	(1.63794)
	[–0.46809]	[–0.42248]	[1.05414]	[0.71328]	[0.63047]
GDP(–1)	1.728147	4.247650	1.152537	–0.080419	–30.56518
	(1.36490)	(3.55810)	(0.24978)	(0.13470)	(23.0686)
	[1.26613]	[1.19380]	[4.61424]	[–0.59700]	[–1.32497]
GDP(–2)	–2.700659	–5.082614	–0.736259	0.074864	83.46892
	(2.26481)	(5.90403)	(0.41446)	(0.22352)	(38.2782)
	[–1.19244]	[–0.86087]	[–1.77642]	[0.33494]	[2.18059]
GDP(–3)	3.891573	6.145423	0.316260	–0.003879	–145.2896
	(2.73535)	(7.13065)	(0.50057)	(0.26996)	(46.2309)
	[1.42270]	[0.86183]	[0.63180]	[–0.01437]	[–3.14270]

GDP(–4)	–5.987042	–13.35528	0.411110	–0.206321	152.1442
	(3.04912)	(7.94862)	(0.55799)	(0.30092)	(51.5341)
	[–1.96353]	[–1.68020]	[0.73676]	[–0.68563]	[2.95230]
GDP(–5)	8.957057	15.64893	–1.167667	0.354497	–138.5000
	(3.61516)	(9.42419)	(0.66158)	(0.35679)	(61.1008)
	[2.47764]	[1.66051]	[–1.76497]	[0.99358]	[–2.26674]
GDP(–6)	–6.391110	–7.118135	1.374769	–0.348038	126.0763
	(4.07074)	(10.6118)	(0.74495)	(0.40175)	(68.8007)
	[–1.57001]	[–0.67077]	[1.84545]	[–0.86631]	[1.83249]
GDP(–7)	2.193193	1.714654	–0.631026	0.295744	–53.55265
	(4.05974)	(10.5831)	(0.74294)	(0.40066)	(68.6148)
	[0.54023]	[0.16202]	[–0.84937]	[0.73814]	[–0.78048]
GDP(–8)	–1.030055	–6.986465	–0.047477	–0.000860	–19.12325
	(3.76724)	(9.82065)	(0.68941)	(0.37179)	(63.6712)
	[–0.27342]	[–0.71141]	[–0.06887]	[–0.00231]	[–0.30034]
GDP(–9)	0.650273	9.552832	0.469207	–0.199070	55.83749
	(3.55970)	(9.27962)	(0.65143)	(0.35131)	(60.1635)
	[0.18268]	[1.02944]	[0.72027]	[–0.56665]	[0.92810]
GDP(–10)	1.099342	–8.212566	–0.348001	0.233155	–56.02486
	(3.06330)	(7.98557)	(0.56059)	(0.30232)	(51.7737)
	[0.35888]	[–1.02843]	[–0.62078]	[0.77122]	[–1.08211]
GDP(–11)	–2.599332	5.349135	0.297892	–0.140586	37.30793
	(2.13419)	(5.56353)	(0.39056)	(0.21063)	(36.0706)
	[–1.21795]	[0.96146]	[0.76273]	[–0.66747]	[1.03430]
GDP(–12)	1.183767	–3.984840	0.004028	0.050378	–15.60806
	(0.96811)	(2.52372)	(0.17717)	(0.09554)	(16.3623)
	[1.22276]	[–1.57895]	[0.02274]	[0.52727]	[–0.95390]
UNE(–1)	–1.379412	3.190965	–1.406797	1.806026	26.68535
	(2.79968)	(7.29836)	(0.51235)	(0.27630)	(47.3182)
	[–0.49270]	[0.43722]	[–2.74580]	[6.53635]	[0.56395]

UNE(–2)	4.619616	8.154132	1.813805	–2.035260	–27.78897
	(5.79179)	(15.0983)	(1.05990)	(0.57160)	(97.8886)
	[0.79761]	[0.54007]	[1.71129]	[–3.56064]	[–0.28388]
UNE(–3)	–11.91653	–18.54454	–1.453085	1.598628	5.474963
	(8.17605)	(21.3138)	(1.49623)	(0.80691)	(138.186)
	[–1.45749]	[–0.87007]	[–0.97117]	[1.98118]	[0.03962]
UNE(–4)	13.56433	10.77352	1.749199	–1.146286	–43.53725
	(9.92090)	(25.8623)	(1.81553)	(0.97911)	(167.676)
	[1.36725]	[0.41657]	[0.96346]	[–1.17075]	[–0.25965]
UNE(–5)	–11.80404	–4.934786	–2.374272	0.824916	67.58724
	(10.9976)	(28.6691)	(2.01257)	(1.08537)	(185.873)
	[–1.07333]	[–0.17213]	[–1.17972]	[0.76003]	[0.36362]
UNE(–6)	12.84187	8.979207	2.901098	–0.320998	–75.49881
	(11.5914)	(30.2169)	(2.12123)	(1.14397)	(195.909)
	[1.10788]	[0.29716]	[1.36765]	[–0.28060]	[–0.38538]
UNE(–7)	–16.39292	–15.95393	–1.677776	0.092404	110.5667
	(12.3997)	(32.3241)	(2.26915)	(1.22374)	(209.570)
	[–1.32205]	[–0.49356]	[–0.73938]	[0.07551]	[0.52759]
UNE(–8)	15.67667	10.05047	1.851114	–0.213730	–111.8485
	(13.4923)	(35.1723)	(2.46910)	(1.33157)	(228.036)
	[1.16190]	[0.28575]	[0.74971]	[–0.16051]	[–0.49049]
UNE(–9)	–11.36387	–6.239340	–2.471385	0.827270	107.3843
	(14.0367)	(36.5917)	(2.56874)	(1.38531)	(237.239)
	[–0.80958]	[–0.17051]	[–0.96210]	[0.59717]	[0.45264]
UNE(–10)	5.083813	4.565581	1.881498	–1.023513	–61.42023
	(12.6396)	(32.9495)	(2.31305)	(1.24742)	(213.625)
	[0.40221]	[0.13856]	[0.81343]	[–0.82051]	[–0.28751]
UNE(–11)	–0.306621	1.040849	–0.977376	0.626231	42.37856
	(9.08633)	(23.6867)	(1.66281)	(0.89674)	(153.571)
	[–0.03375]	[0.04394]	[–0.58779]	[0.69834]	[0.27595]

UNE(–12)	–1.862598	–1.736223	0.534146	–0.351625	–28.56581
	(4.07958)	(10.6349)	(0.74657)	(0.40262)	(68.9500)
	[–0.45657]	[–0.16326]	[0.71547]	[–0.87334]	[–0.41430]
INFL(–1)	–0.004344	–0.085923	0.003362	–0.001142	–1.797694
	(0.01086)	(0.02831)	(0.00199)	(0.00107)	(0.18357)
	[–0.39993]	[–3.03465]	[1.69140]	[–1.06502]	[–9.79293]
INFL(–2)	0.027404	–0.106621	0.001075	–0.001681	–2.642084
	(0.02284)	(0.05953)	(0.00418)	(0.00225)	(0.38597)
	[1.20001]	[–1.79100]	[0.25722]	[–0.74588]	[–6.84535]
INFL(–3)	0.033266	–0.037179	–0.006382	–0.002329	–2.341098
	(0.03152)	(0.08217)	(0.00577)	(0.00311)	(0.53276)
	[1.05532]	[–0.45245]	[–1.10631]	[–0.74863]	[–4.39431]
INFL(–4)	0.028554	0.000765	–0.007408	–0.001416	–1.464451
	(0.03402)	(0.08868)	(0.00623)	(0.00336)	(0.57495)
	[0.83937]	[0.00863]	[–1.18993]	[–0.42165]	[–2.54707]
INFL(–5)	0.004493	0.023215	–0.005621	0.000976	–0.663033
	(0.03058)	(0.07973)	(0.00560)	(0.00302)	(0.51691)
	[0.14692]	[0.29117]	[–1.00430]	[0.32326]	[–1.28269]
INFL(–6)	0.001130	0.006298	–7.72E–05	0.003302	–0.755618
	(0.02771)	(0.07224)	(0.00507)	(0.00273)	(0.46835)
	[0.04078]	[0.08719]	[–0.01523]	[1.20727]	[–1.61337]
INFL(–7)	–0.012414	–0.131505	0.006068	0.003032	–1.006177
	(0.02820)	(0.07352)	(0.00516)	(0.00278)	(0.47665)
	[–0.44019]	[–1.78874]	[1.17576]	[1.08931]	[–2.11095]
INFL(–8)	–0.001373	–0.120924	0.002050	0.002699	–1.333048
	(0.02758)	(0.07189)	(0.00505)	(0.00272)	(0.46606)
	[–0.04979]	[–1.68217]	[0.40613]	[0.99180]	[–2.86023]
INFL(–9)	–0.023152	–0.101497	0.001780	0.000738	–0.673057
	(0.02344)	(0.06109)	(0.00429)	(0.00231)	(0.39610)
	[–0.98786]	[–1.66133]	[0.41508]	[0.31893]	[–1.69922]

INFL(–10)	–0.019770	–0.102878	0.003237	–0.000792	–0.022506
	(0.02189)	(0.05706)	(0.00401)	(0.00216)	(0.36995)
	[–0.90319]	[–1.80293]	[0.80810]	[–0.36651]	[–0.06083]
INFL(–11)	–0.016274	–0.069399	–0.000947	–0.000597	–0.209476
	(0.01613)	(0.04205)	(0.00295)	(0.00159)	(0.27261)
	[–1.00896]	[–1.65051]	[–0.32072]	[–0.37518]	[–0.76842]
INFL(–12)	–0.012033	–0.006233	–0.001698	–0.000632	0.381016
	(0.01114)	(0.02904)	(0.00204)	(0.00110)	(0.18826)
	[–1.08023]	[–0.21465]	[–0.83290]	[–0.57523]	[2.02384]
C	0.001676	0.007104	–0.001780	0.000392	–0.165001
	(0.00668)	(0.01743)	(0.00122)	(0.00066)	(0.11298)
	[0.25072]	[0.40766]	[–1.45519]	[0.59470]	[–1.46048]
R-squared	0.982490	0.981869	0.987569	0.968027	0.982757
Adj. *R*-squared	0.907449	0.904162	0.934294	0.831002	0.908859
Sum sq. resids	0.011802	0.080204	0.000395	0.000115	3.371322
S.E. equation	0.029035	0.075689	0.005313	0.002865	0.490723
F–statistic	13.09268	12.63567	18.53729	7.064595	13.29886
Log likelihood	221.9657	150.1049	349.3354	395.6474	9.911479
Akaike AIC	–4.292418	–2.376131	–7.688944	–8.923932	1.362361
Schwarz SC	–2.407527	–0.491240	–5.804054	–7.039041	3.247251
Mean dependent	0.003106	0.006624	0.005104	0.000937	–0.001216
S.D. dependent	0.095439	0.244492	0.020729	0.006970	1.625474

Determinant resid covariance (dof adj.)	7.73E–17
Determinant resid covariance	1.75E–20
Log likelihood	1173.822
Akaike information criterion	–23.16860
Schwarz criterion	–13.74414

Table 5

VAR Lag Order Selection Criteria

VAR Lag Order Selection Criteria
Endogenous variables: *PEK TR GDP UNE INFL*
Exogenous variables: *C*
Sample: 1984Q1 2005Q2
Included observations: 75

Lag	Log*L*	*LR*	*FPE*	*AIC*	*SC*	*HQ*
0	414.1239	NA	1.26e–11	–10.90997	–10.75547	–10.84828
1	533.3486	219.3734	1.02e–12	–13.42263	–12.49563	–13.05249
2	615.8479	140.7988	2.22e–13	–14.95594	–13.25645	–14.27736
3	675.1133	93.24424	9.12e–14	–15.86969	–13.39770	–14.88265
4	722.4176	68.11820	5.25e–14	–16.46447	–13.21999	–15.16898
5	778.0519	72.69551	2.50e–14	–17.28138	–13.26440	–15.67745
6	847.6146	81.62027	8.52e–15	–18.46972	–13.68025	–16.55734
7	900.6333	55.13937*	4.77e–15	–19.21689	–13.65492	–16.99605
8	940.3081	35.97185	4.10e–15	–19.60822	–13.27375	–17.07893
9	974.9411	26.78288	4.45e–15	–19.86510	–12.75813	–17.02736
10	1030.261	35.40469	3.21e–15	–20.67363	–12.79417	–17.52744
11	1087.759	29.13253	2.71e–15	–21.54025	–12.88829	–18.08562
12	1173.822	32.13017	1.52e–15*	–23.16860*	–13.74414*	–19.40552*

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5 per cent level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

Table 6

Pairwise Granger Causality Tests

VAR Granger Causality/Block Exogeneity Wald Tests
Sample: 1984Q1 2005Q2
Included observations: 75

Dependent variable: *PEK*

Excluded	Chi-sq	Df	Prob.
TR	18.67930	12	0.0966
GDP	21.29292	12	0.0463
UNE	12.19144	12	0.4304
INFL	24.11573	12	0.0196
All	191.1908	48	0.0000

Dependent variable: *TR*

Excluded	Chi-sq	Df	Prob.
PEK	27.86564	12	0.0058
GDP	39.58349	12	0.0001
UNE	8.783501	12	0.7213
INFL	37.02847	12	0.0002
All	302.0944	48	0.0000

Dependent variable: *GDP*

Excluded	Chi-sq	Df	Prob.
PEK	38.83948	12	0.0001
TR	19.94338	12	0.0682
UNE	28.68738	12	0.0044
INFL	20.59297	12	0.0567
All	122.6372	48	0.0000

Dependent variable: *UNE*

Excluded	Chi-sq	df	Prob.
PEK	8.172736	12	0.7715
TR	4.804001	12	0.9642
GDP	4.737421	12	0.9662
INFL	4.964929	12	0.9591
All	18.15224	48	1.0000

Dependent variable: *INFL*

Excluded	Chi-sq	df	Prob.
PEK	20.14887	12	0.0643
TR	91.09239	12	0.0000
GDP	22.29338	12	0.0344
UNE	6.300453	12	0.9002
All	436.5091	48	0.0000

Table 7

Unit Root Test

Null Hypothesis: D(ORIG_GDP_X12_TC) has a unit root		
Exogenous: Constant		
Lag Length: 7 (Automatic based on SIC, MAXLAG=12)		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	–2.669638	0.0832
Null Hypothesis: D(ORIG_PE_X12_TC) has a unit root		
Exogenous: Constant		
Lag Length: 9 (Automatic based on SIC, MAXLAG=12)		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	–5.154067	0.0000
Null Hypothesis: D(ORIG_PEK_X12_TC) has a unit root		
Exogenous: Constant		
Lag Length: 1 (Automatic based on SIC, MAXLAG=12)		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	–11.63738	0.0001
Null Hypothesis: D(ORIG_TR_X12_TC) has a unit root		
Exogenous: Constant		
Lag Length: 6 (Automatic based on SIC, MAXLAG=11)		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	–4.037459	0.0020
Null Hypothesis: D(ORIG_UNE_X12_TC) has a unit root		
Exogenous: Constant		
Lag Length: 8 (Automatic based on SIC, MAXLAG=12)		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	–4.037847	0.0019
Null Hypothesis: D(ORIG_INFL_X12_TC) has a unit root		
Exogenous: Constant		
Lag Length: 7 (Automatic based on SIC, MAXLAG=12)		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	–3.763025	0.0046

* MacKinnon (1996) one-sided *p*-values.

REFERENCES

Blanchard, O. and R. Perotti (2002), "An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output", *The Quarterly Journal of Economics*, Vol. 117, No. 4.

Creel, J., P. Monperrus-Veroni and F. Saraceno (2005), "Discretionary Policy Interactions and Fiscal Theory of the Price Level: a SVAR Analysis on French Data", in Banca d'Italia (ed.), *Public Expenditure*, Roma, Banca d'Italia.

Enders, W. (1995), *Applied Econometrics Time Series*, John Wiley and Sons Inc., USA, Chapter 5.

Fair, R.C. (1979), "An Analysis of the Accuracy of Four Macroeconomic Models", *Journal of Political Economy*, No. 87.

Giordano, R., S. Momigliano, S. Neri and R. Perotti (2005), "The Effects on the Economy of Shocks to Different Government Expenditure Items: Estimates with a SVAR Model", in Banca d'Italia (ed.), *Public Expenditure*, Roma, Banca d'Italia.

Kamps, C. (2005), "The Dynamic Effects of Public Capital: VAR Evidence for 22 OECD Countries", *International Tax and Public Finance,* Vol. 12, No. 4.

Kopcke, R., G. Tootell and R. Triest (2006), *The Macroeconomics of Fiscal Policy*, Massachusetts Institute of Technology, USA.

Perotti, R. (2004), "Estimating the Effects of Fiscal Policy in OECD Countries", IGIER, Università Bocconi, Working Paper, No. 276, Milano.

Phillips, P.C.B. (1998), "Impulse Response and Forecast Error Variance Asymptotics in Non-stationary VARs", *Journal of Econometrics,* No. 83.

Utrera, G. (2004), "Vectores autorregresivos e identificación de shocks de política monetaria en Argentina", *Revista de Economía y Estadística*, I.E.F., F.C.E., U.N.C., Vol. XLII, No. 2.