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How Do Indirect Taxes on Tobacco Products Affect Inflation?[†]

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Abstract

This study examines the effects of price adjustments in the tobacco sector on inflation in Turkey. The findings show that the taxes on tobacco products increase inflation in the short-term. However, the effect is rather limited, a 16 basis points increase in inflation if the current 65.25% Special Consumption Tax (SCT) increases by 25 basis points. Factors that cause inflation in the long-run are cost and demand. The cost-driven impact of tobacco prices on inflation is rather limited due to the low weight of this product in the consumption basket. Nevertheless, the structure of the tax multiplier used in tobacco taxation increases cigarette prices in a non-linear fashion and, therefore, has the potential to disrupt inflationary expectations.

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Introduction

The tobacco and tobacco products sector contribute to Turkey's economy through various ways while tax revenues stand out as the primary economic contribution of the sector. This study examines the effect of taxes on tobacco products on the Consumer Price Index (CPI) inflation rate.

Special Consumption Tax (SCT) and Value Added Tax (VAT) which are indirect taxes on tobacco products constitute a significant weight in general budget revenues, tax revenues total, and total indirect tax collection in Turkey. While the calculation method of SCT on tobacco products has changed over time, currently it is calculated using an ad valorem rate, provided that tax per package is not less than a certain minimum amount. SCT on tobacco affects the CPI because tobacco products constitute a significant weight in CPI calculations.

As the producer price and VAT rate are kept constant, the increase in SCT increases the final sale price. Especially lately, the rate of SCT has reached a high level and the trend of the ratio of collected SCT per package and producer price has increased markedly (See Figure 1). In this study, we analyze the effects of indirect taxes applied to tobacco products on market price and inflation with the help of a variable called "cost multiplier" or "tax multiplier" which is calculated as the ratio between the market price and the producer price of a package of cigarette and depends on SCT and VAT rates.

In the VAR analyzes of our study, a shock to the tax multiplier variable was introduced and the effect of this shock on the CPI inflation rate was calculated. Specifically, a one standard deviation increase in the tax multiplier, an increase of 0.08 units according to the model projection, represents an increase of 0.16 units (statistically different than 0) in inflation. This increase in the tax multiplier corresponds to an increase of current SCT rates from 65.25% to 65.58%. A policy recommendation based on this finding is as follows: to reduce the impact of tax increases on inflation and to ensure the predictability of tax revenues, lowering the relative SCT and increasing

the specific SCT can be one of the targets in the midterm; as a way to keep the current tax burden constant, it is possible to continue the system by increasing specific tax level that will compensate for the reduction in the ad valorem tax and update inflation in accordance with Law No. 4760.

Taxation of Cigarettes in Turkey

Tax revenues stand out as the primary economic contribution of the sector. The SCT on tobacco products in 2017 amounts to approximately 7% of the total taxes collected by the government with approximately 37.4 billion TL and is an important component of the state budget (see Figure 2). Strikingly, government revenue obtained from SCT of tobacco products in 2017 corresponds to 71% of the amount of corporate tax collected from approximately 700 thousand taxpayers during the same tax year.

With the enactment of the Special Consumption Tax Act 4760, which was enacted on 1 August 2002, 16 different taxes, funds and fees were abolished. Various types of taxes on alcoholic and non-alcoholic beverages and tobacco products prior to the entry into force of the Special Consumption Tax Law were now collected under SCT. In the taxation of tobacco products, the retail price was taken as the basis of tax assessment and an ad valorem SCT rate was set as 49.5% of the retail price. It has been observed that the Council of Ministers has updated the SCT by adjusting the ad valorem rates and specific tax amounts over time. Table 1 shows the chronological changes of the regulations made in SCT for tobacco products.

Table 1: SCT Law and the Structure of Cigarette Tax

Date	Ad-valorem SCT (%)	Minimum Specific Tax (TL / Pack)	Specific Tax (TL/Pack)
08.01.2002	49.5		
01.8.2003	55.3		
02.26.2004	55.3		Depends on the price
08.09.2004	28		Depends on the content of Oriental tobacco*
07.25.2005	58	1.20	
12.29.2009	63	2.65	
10.12.2011	65	2.90	
01.01.2013	65.25	3.15	0.09
07.03.2013	65.25	3.23	0.0922
01.01.2014	65.25	3.75	0.13
07.01.2014	65.25	3.94	0.1366
01.01.2015	65.25	3.99	0.1866
07.01.2015	65.25	4.21	0.1968
01.01.2016	65.25	4.42	0.2468
07.01.2016	65.25	4.56	0.2546
12.01.2016	65.25	4.56	0.3246
01.01.2017	65.25	4.86	0.3246
07.01.2017	65.25	4.86	0.3246

*Specific tax was changed on January 31, 2005 with the Cabinet Decision 2005/8410 but the ad valorem rate remained fixed.

As seen in Table 1, in the early periods after the SCT Law was enacted, it is observed that taxes on the tobacco products are collected only through ad valorem taxation. In the later periods, in addition to relative taxation, specific tax rate was put into effect, making it necessary to pay the taxes calculated both by the ad valorem tax and the specific tax amounts, simultaneously. At the beginning of this period when the relative and the specific taxes were applied together, the specific tax amounts were determined based on the retail prices of tobacco-related cigarettes; in the following periods, the amount of tax levies was determined based on the Oriental-type tobacco ratios included in cigarettes.

With the amendment made in the taxation of tobacco-containing cigarettes on 25 July 2005 by the Decree of the Council of Ministers No. 2005/9145, the co-payment of the taxes calculated in the old regulations by the relative and the specific taxation has been abolished and the payment of the tax is calculated based on the advalorem rate, provided that it is not less than a minimum specified amount. Today, these principles still apply in the taxation of tobacco products.

Analysis of Tobacco Taxation

Before we empirically examine the effects of indirect taxes (SCT and VAT) on the final consumer prices of tobacco products, it is important to stress how the taxes effect the price of cigarettes. We can calculate the taxes on the retail price of a package cigarette by using the current average cigarette package price and current tax rates. For example, when the average cigarette price is taken as 11.25 TL / pack¹, for each 1 TL paid for cigarette, 0.6525 TL goes for proportional SCT, 0.1525 TL is collected by the government as effective VAT. In addition to these, for each packet 0.3246 TL is paid as specific tax - regardless of the price of the cigarette. As a result, "tax burden" corresponds to 83.4% of the average retail price of a pack of cigarette.

At this point, it will be more effective to compare cigarette taxes with CPI to understand the change in the tax burden over time. First of all, when we look at Figure 3, we see that a fairly large real increase in the cigarette prices of the formal cigarette market and the tobacco price sub-index which is part of CPI, since the beginning of 2007, due to the relatively high tax-induced price increases. The effect of the aforementioned variable called "cost multiplier" or "tax multiplier", which defines the relationship between the market price and the producer price of a pack of a

¹ Turkish Statistical Institute (TurkStat) Consumer Price Index (2003=100) basket items and average prices

cigarette, to the consumer cigarette price is very important. The effect of this variable on prices through cigarette taxes is non-linear because in addition to the VAT taken from SCT, SCT is also taken from VAT creating higher-order non-linear effects. (Atuk et al., 2011). Due to the non-linear relationship as the relative SCT rate increases, it is necessary to increase the price at a much higher rate for each 1 unit increase in the relative SCT. When the CPI and the average price of cigarettes were taken as 100 in January 2009, by the end of September 2017, the CPI increased by 213.8% while the average price of cigarettes increased by 486.43%. This means that the average price of cigarettes increased by 87% in real terms following frequent and high increases in ad valorem and specific taxes, in the specified period. In the same period, the average producer prices, excluding tax, increased by 121% from 0.778 TL to 1.715 TL, which is well below the increase observed in CPI.

We see in Figure 4 how the changes in taxation on tobacco products affect the sub-indices of CPI used for inflation calculation. As the graph illustrates, the effect of taxation appears as jumps in all indices used. When the weight of alcohol and tobacco products in CPI is considered (see Figure 4), the final price of tobacco products is highly-related to the increases in the indirect taxes.

Empirical Analysis

In the empirical analysis of the effects of indirect taxes on the final consumer prices of tobacco products, the use of the Vector Auto-regression (VAR) technique is desirable to control the endogeneity of variables used. The effect of indirect taxation on the CPI can thus be calculated using impulse-response functions. Another advantage of using the VAR method is that if there is a shift to other consumption items resulting from the tax increase of tobacco products, the effect of these changes in demand on inflation can also be controlled. In this general framework, a standard VAR model was used for analyses.

VAR Methodology

The VAR is a very popular model used to capture simultaneous and time-varying relationships between variables. If we put K variables in period t in a vector called $y_t = (y_{1,t}, y_{2,t}, \dots, y_{K,t})'$, we can write the VAR model as follows:

$$y_t = v + A_1 y_{t-1} + A_2 y_{t-2} + \dots + A_p y_{t-p} + \varepsilon_t \quad \varepsilon_t \sim N(0, \Sigma)$$

In this equation, the simultaneous relation between the variables is captured by Σ , which is the covariance matrix and contains the simultaneous correlations between the variables. In addition, time-dependent relations between the observations of the variables at time t , y_t , and the corresponding observations going back to past p months, denoted by y_{t-1}, \dots, y_{t-p} , are captured by the coefficient matrices A_1, A_2, \dots, A_p . Hence, the power of VAR model is its ability to capture both the simultaneous and time-dependent relations among the variables. Impulse-response analysis is generally used for the estimates of the VAR model (Sims, 1980). Impulse-response analysis consists of examining responses observed in other variables over time when a one unit or one standard deviation shock (impulse) is given to a variable. However, in the standard impulse-response analysis, only one variable is given a shock and the other variables are assumed to remain constant in the period corresponding to the shock. This is not compatible with the structure of VAR model, since VAR model is modeling the simultaneous relationship between variables as well, and because of this association, a shock given to a variable is simultaneously reflected in other variables. Therefore, rather than a standard impulse-response analysis we use a generalized impulse-response relationship that takes into account the simultaneous relationships among the various variables (Pesaran and Shin, 1998). Briefly, the generalized effect response function (GETF) can be calculated as follows:

$$GETF(h, \delta_j, \Omega_{t-1}) = E(y_{t+h} | \varepsilon_{jt} = \delta_j, y_{t-1}, \dots, y_{t-p}) - E(y_{t+h} | y_{t-1}, \dots, y_{t-p})$$

$E(y_{t+h} | \varepsilon_{jt} = \delta_j, y_{t-1}, \dots, y_{t-p})$ shows the predictions in h period when δ_j amount of shock is given to variable j , and $E(y_{t+h} | y_{t-1}, \dots, y_{t-p})$ shows the predictions of the same variables in h period when no shock is given. Here, the impulse-response analysis consists of calculating these values $h = 1, 2, \dots, 12$ months respectively, building the 95% confidence level windows of these predictions, and finally graphically showing and examining them.

Results

The variables included in the VAR model that we built for the period July 2005-July 2017 are:

- 1) Consumer price index (CPI) inflation
- 2) Tobacco price index inflation
- 3) Food and non-alcoholic beverage price index inflation
- 4) Clothing and footwear price index inflation
- 5) Entertainment and culture price index inflation
- 6) Restaurants and hotels price index inflation
- 7) Alcoholic beverage price index inflation
- 8) One-month deposit interest rate: Ideally, the short-term policy rate should

be used to measure the monetary policy. However, it is not possible to use a single interest rate policy for the analysis because throughout the sample period the Central Bank's policy rate changed several times in Turkey. For this reason, the average monthly deposit interest is included in the analysis as a variable close to the policy interest rate.

- 9) US Dollar / TL exchange rate
- 10) Industrial production index

11) The "tax multiplier" variable that shows the effect of taxes on tobacco products on their market price: When this variable is calculated, the ratio between the market price and producer price of a package of cigarette is calculated by using the SCT and VAT rates applied in the period. If the VAT is 18% in the tobacco products, the effective VAT (eVAT) in the final price of a good can be calculated as 18/118. As SCT rates are calculated based on the final price, the tax multiplier for tobacco products is formulated as:

$$\text{tax multiplier} = \frac{1}{1 - \text{eVAT} - \text{SCT}}$$

The relationship between tax (cost) multiplier and SCT is shown in Figure 1. As can clearly be seen, there is a non-linear, convex relationship between the tax multiplier and the SCT and as the SCT rate increases, the tax multiplier increase is higher than the increase in SCT. For example, when the SCT increased by 1% from 60% to 61%, the tax multiplier rises from 4.04 to 4.21, corresponding to an increase of 4.2%. When the rate of SCT increases from 70% to 71% with an increase of 1%, the tax multiplier increases by 7.3% from 6.78 to 7.28.

12) Tax-free average price per package ("cigarette price without tax"): This price is set by the producers and collected as a revenue and calculated by dividing the average package price of the cigarette sold in the market by the tax multiplier.²

13) A dummy variable that shows the year in which the law prohibiting the consumption of tobacco products in enclosed public places became effective on January 3,

² In this calculation, there is an assumption that all cigarette manufacturers pay ad valorem tax for each package.

2008. Unlike the above variables, this variable is added as an exogenous variable to the VAR analysis.

The variables selected for the VAR analysis aims to control the supply, demand and monetary policy factors on tobacco prices. In this framework, the exchange rate variable controls the supply side; industrial production index controls the demand side and interest rate controls for the monetary policy.

Predictions from VAR Analysis

From the variables in the above VAR model, the final result of this analysis is based on how inflation rate (variable 1) responds to a sudden change in the tax multiplier (variable 11), and the tax-free price of a cigarette (variable 12). The direction of these responses, their path in the course of time and the determination of whether they are statistically significant or not, will form the backbone of this analysis.

In this general framework, the impact of the taxes on tobacco products (variable 11) on the final inflation (variable 1) will also be captured by the impulse-response functions. The tax on tobacco products can affect the CPI through the following channels:

- i) The effect of change in tobacco prices on CPI: In the VAR model, this effect will be measured by the response of variable (1) after a shock is given to variable (3).
- ii) Direct effect of taxes on tobacco prices: In the VAR model this effect will be measured by the response of variable (2) after a shock is given to variable (11).
- iii) Promoting alternative expenditures instead of the consumption of tobacco products: the response of variables (3) - (7) to changes in variable (11).

Variables (8) - (10), which are included in the VAR model, are the variables that will control the effects of monetary policy, exchange rate and demand channels on inflation. The logarithmic value of the industrial production index is included in the analysis. In order to measure economic growth, the unemployment rate was also included in the analysis as an alternative to the industrial production index and it was checked whether the results were sensitive. No sensitivity has been observed in impulse-response analyses, which is the focal point of this study.

Finally, variable (13), which is included in the VAR model, is the dummy variable that controls the inflationary effects of the changes that may occur in the demand for tobacco products after the law regulation prohibiting smoking in enclosed public spaces in 2008. This variable has not been shown in impulse-response analyses because it is included as an exogenous variable in the system.

Results of Impulse-Response Analysis

Since we did not want to make any assumptions about the underlying economic structure, generalized response functions were created using the VAR model. The AIC and SIC criteria gave contradicting results in the time delay to be used in the VAR model. The AIC recommends a delayed value of 8 or more while SIC advises only one delayed value. However, since our VAR model contains quite many variables and the sample size we use is not too large, each additional delay used in the system reduces the effectiveness of the calculations. For this reason, 6 delayed values are included in the analysis by considering the average of these two criteria. The use of 6 lagged values in a study with monthly data is also consistent with the academic literature (see Bernanke and Blinder, 1992, Carpenter and Demiralp, 2008).

As mentioned above, the tax increase on tobacco products will directly cause a change in the same direction in the "tax multiplier" variable. For this reason, shocks were given to the tax

multiplier variable and the effect on other variables was calculated. The response of the other variables to the shock given to the "tax multiplier" variable will show the effects of the tobacco tax on the economic dynamics.

Figure 6 shows impulse-response function results in our most comprehensive VAR model. In the "the response of the inflation rate to the tax multiplier" panel, which is the second column of the first line, an increase in the tax applied to tobacco products causes a statistically significant increase in the inflation rate. Specifically, a one standard deviation increase in the tax multiplier, that is, an increase of 0.0877 units according to the model estimate, represents an increase of approximately twice as much in the inflation rate, i.e., 0.16 units (statistically different than 0), which dies out after the fifth month, and the induced change is not different statistically from 0 in the following months.

The increase in the tax multiplier corresponds to the different increases in SCT according to the SCT in circulation. For example, an increase of 0.0877 in the tax multiplier corresponds to 60.52%, 65.34% and 70.19% of the different SCT rates of 60%, 65% and 70%, respectively. If we give an example from the current rate of SCT; an increase of 0.0877 in the tax multiplier corresponds to an increase from 65.25% to 65.58% increase in the rate of SCT currently in circulation. If we assume that the change in inflation is linear, a one percentage point increase in the SCT ratio from 60% to 61%, from 65% to 66% and from 70% to 71% can be expected to increase inflation by 0.31, 0.65 and 0.70 points, respectively. If we increase current SCT ratio by a one percentage point, the inflation may be expected to increase by 0.66 points.

The other panel, complementary to this finding is the "Response to tax multiplier of tobacco products inflation" panel in the fourth column of the second row. Here the inflation in the tobacco product price index, which is one of the sub-items constituting the CPI, is under scrutiny. In this

panel, it is determined that the tobacco products have a much larger and statistically meaningful effect on tobacco prices compared to its effect on CPI. Specifically, a one standard deviation increase in the tax multiplier, that is, an increase of 0.0877 units based on the model estimate, leads to an increase of 2.2 units (statistically different than 0) in the tobacco price inflation which dies out after the second month and the change in the inflation of tobacco prices is statistically not different than 0.

When we look at other price sub-indices included in VAR to determine if the tax increase in tobacco products has created an impact on alternative product groups, we see that there is also an increase in the alcoholic beverages price index (first row, third column). One reason for this discovery could be that tax increases in tobacco products and alcoholic beverages often happen in the same period. (see Figure 4).

When we examine other sub-indices, we observe that the tax increase in tobacco products has no statistically significant effect on other consumption areas such as clothing and footwear, entertainment and culture, food, restaurants and hotels. Likewise, variables that reflect macroeconomic fundamentals such as exchange rate and industrial production index are not affected by the taxation on tobacco products.

In light of the findings in Figure 6, as the next step, lower consumption groups (clothing and shoes, entertainment, culture, food, restaurant and hotels indices) that do not show any economically significant relationships were removed from the model and a more parsimonious VAR model was calculated. The impulse-response functions of this model are shown in Figure 7. The results of this analysis confirm the earlier more comprehensive VAR analysis. The presence of fewer variables facilitates the measurement of the analysis and contributes to more statistically significant results.

In agreement with Figure 6, “the response of the inflation rate to the tax multiplier” (first row, second column) and “the response of the inflation on tobacco products to the tax multiplier” (second column, first column) panels of Figure 7 show that the taxes on tobacco products cause an increase in inflation and inflation of tobacco products.

One important caveat to keep in mind in the analysis so far is that the increase in the variable of the tax multiplier can result from both the taxes applied to tobacco products or the raised prices by producers. It is critically important to be able to differentiate and to determine whether the increase in inflation is due to taxes or producers raising prices. Two components of tobacco product index inflation rate are price changes by producers and tax rate changes by the government. Subsequently, the tax multiplier is deducted from the price of tobacco products and the remaining amount is called. This variable represents the non-tax component of the tobacco prices. The model shown in Figure 8 removes the tobacco product inflation variable from the model and substitutes the two subcomponents of this variable, the "tax multiplier" and the "producer price" variables in the VAR. Since the tax multiplier in this new system is not expected to be intrinsic to other variables, it is introduced as an exogenous variable to the system.³ As can be seen from the panel titled "The reaction of the inflation rate to the producer price", the non-tax price hikes on tobacco products have no effect on inflation. This finding confirms that the relationship between the tax multiplier and the CPI is purely tax-related in the results obtained in Figures 6 and 7. That is, tax increases in tobacco products cause upward pressure on inflation, while non-tax price increases do not add up much and do not affect CPI inflation.

³ Introducing the tax multiplier variable into the system endogenously like previous VAR calculations does not change the result.

Additional Analysis

The VAR model whose results are shown in Figure 6, has examined the effects of the tax multiplier variable, central focus of this research, on inflation. A complementary analysis is to analyze the effect of all the variables in the system on the inflation of tobacco products. Figure 9 shows the response of tobacco products price index inflation to shocks in other variables. It can be seen here that the variables of macroeconomic outlook do not have a statistically significant effect on tobacco prices. On the other hand, the increase in the general inflation rate is accompanied by the increase in the tobacco product index inflation. It is natural that these two variables act together because the generalized impulse-response functions also capture simultaneous relations. However, the findings of the previous analysis suggest that the correlation is due to tax increases rather than increases in producer prices. Other sub-indices of CPI inflation, especially alcoholic product price index, are moving together with tobacco products price index.

Conclusions and Recommendations:

In this study, the effects of price increases of tobacco products on inflation are determined. The results indicate that if the current rate of 65.25% SCT on tobacco products increases by 25 basis points it would cause an increase of 16 basis points over inflation. On the other hand, no significant effect of increases in producer prices of cigarettes on inflation has been found. The effects of tobacco taxes on inflation are limited to the two-month period following the tax increase. Considering that the weight of tobacco products in the CPI basket is around 5 percent, the resultant effect on inflation is limited.

While the research findings show that the price increases in tobacco products do not have a significant impact on inflation trend, they confirm that the main determinants of inflation are demand and cost channels. Factors determining long-term inflation are demand-driven and cost-

driven factors that can be directly controlled by the monetary policy. Turkey has adopted explicit inflation targeting regime after 2006, and the average inflation rate was between 7.5% to 8% from 2006 to 2017. This situation hints an economic fragility and requires a re-evaluation of the monetary policy.

This study has illustrated that tobacco prices, a small subcomponent of the cost channel, does not have a substantive impact on inflation. On the other hand, the increasing tobacco prices due to the policy of tobacco taxation, is likely to increase inflation by disrupting inflationary expectations, although they tend to extinguish in a short time. For this reason, revision of the policy of taxation on tobacco products may contribute to the fight against inflation provided that all the other concerns of the central authority are considered.

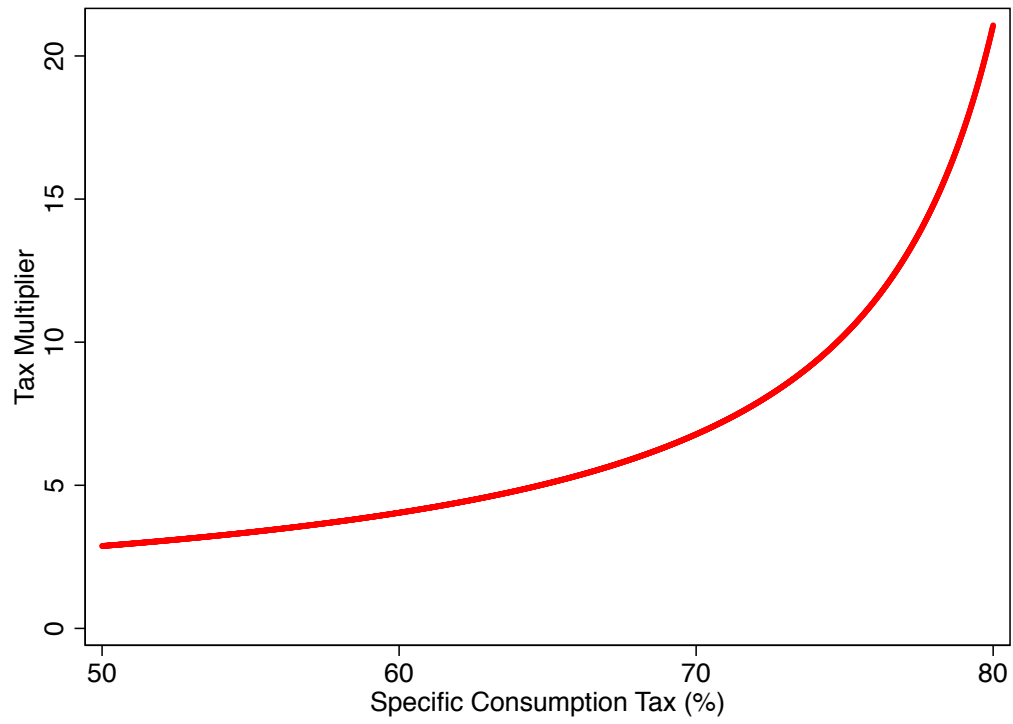


Figure 1: The relationship between SCT and the tax multiplier.

VAT rate is held constant at 18% in the calculation of this graph.

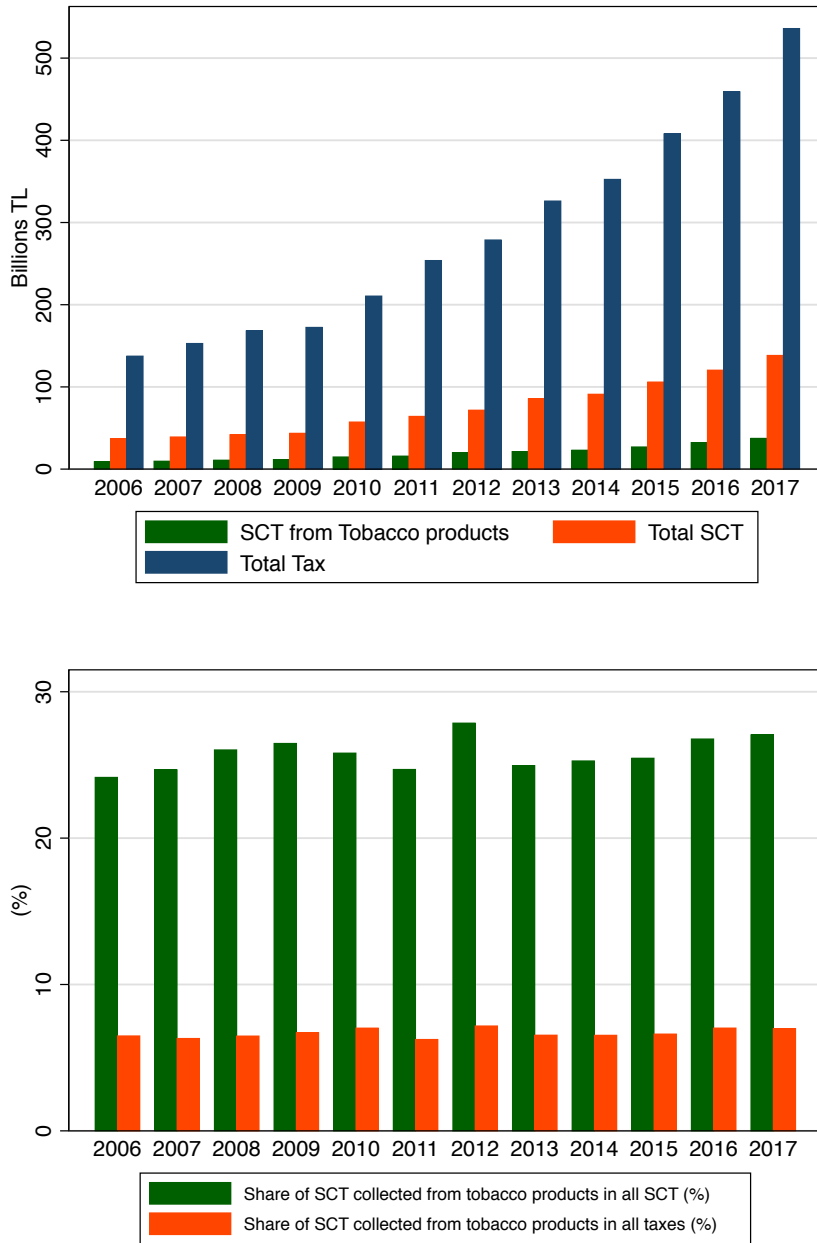


Figure 2:

(Panel Above) SCT collected from tobacco products, all collected SCT and all collected tax

(Panel Below) The ratio of SCT collected from tobacco products to all collected SCT and all collected taxes.

Source: Budget statistics of the Turkish Ministry of Finance General Directorate of Budget Financial Control.

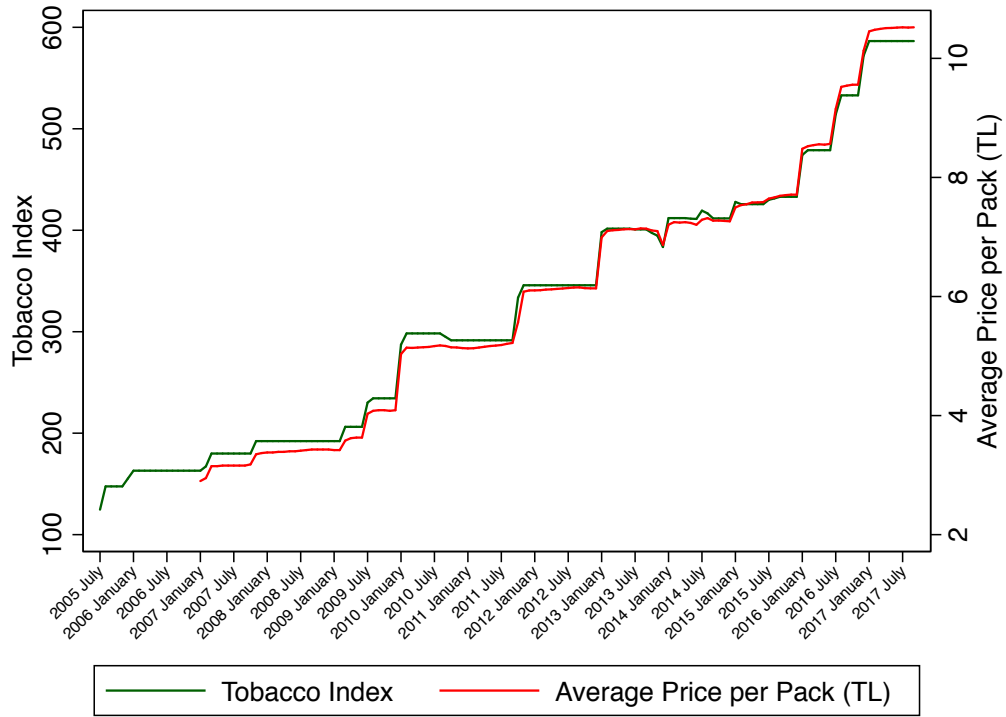


Figure 3: Tobacco index calculated by TurkStat and comparison of average package prices prepared by Philips Morris.

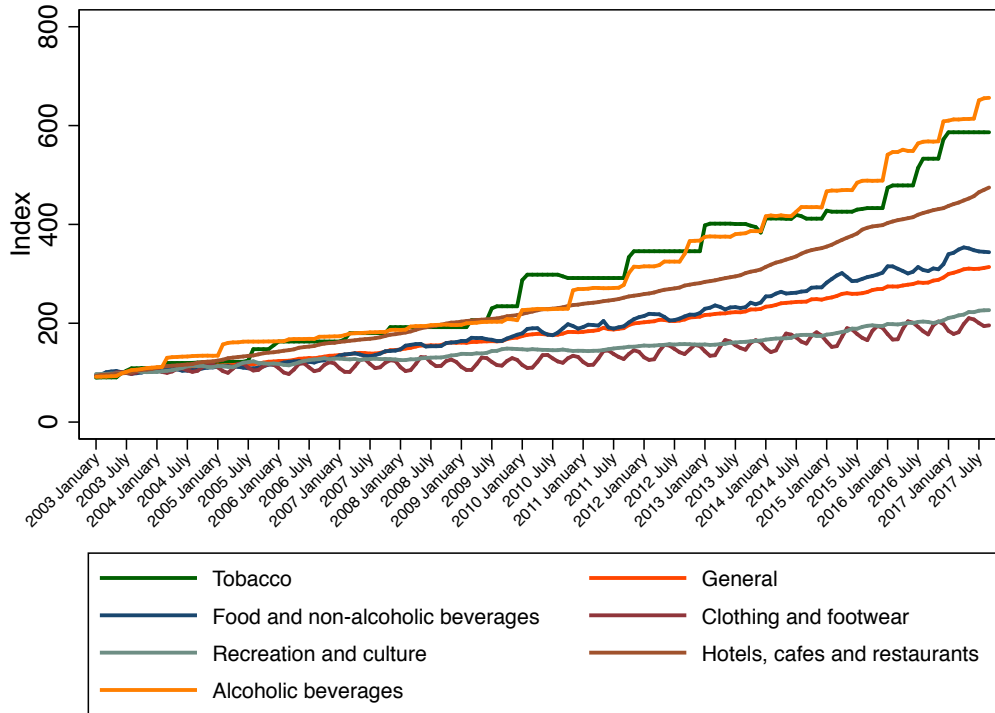


Figure 4: The change of Tobacco, CPI, Food and Non-Alcoholic Beverages, Clothing and Footwear, Entertainment and Culture, Restaurants and Hotels, and Alcoholic Beverage indices over time.

Source: TurkStat

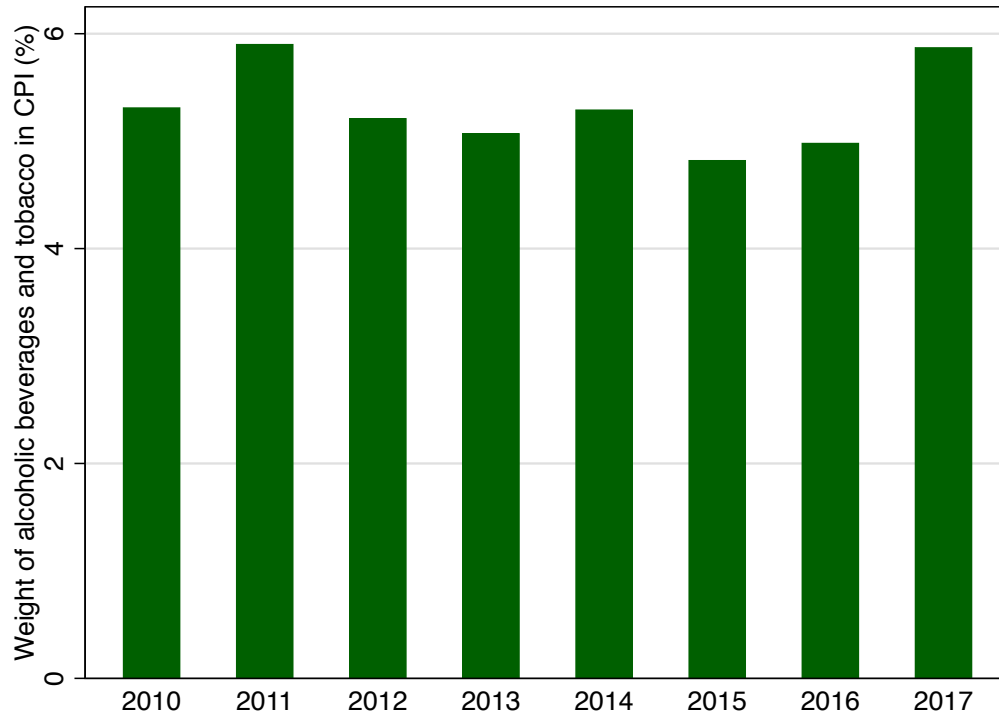


Figure 5: Weight of alcoholic beverages and tobacco used by TurkStat in CPI.

In 2017, cigarettes constitute 5.48 portion (93.4%) of 5.87, the total weight of alcoholic beverages and tobacco group. For other years, there was no separate data for the cigarettes subgroup on TurkStat.

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

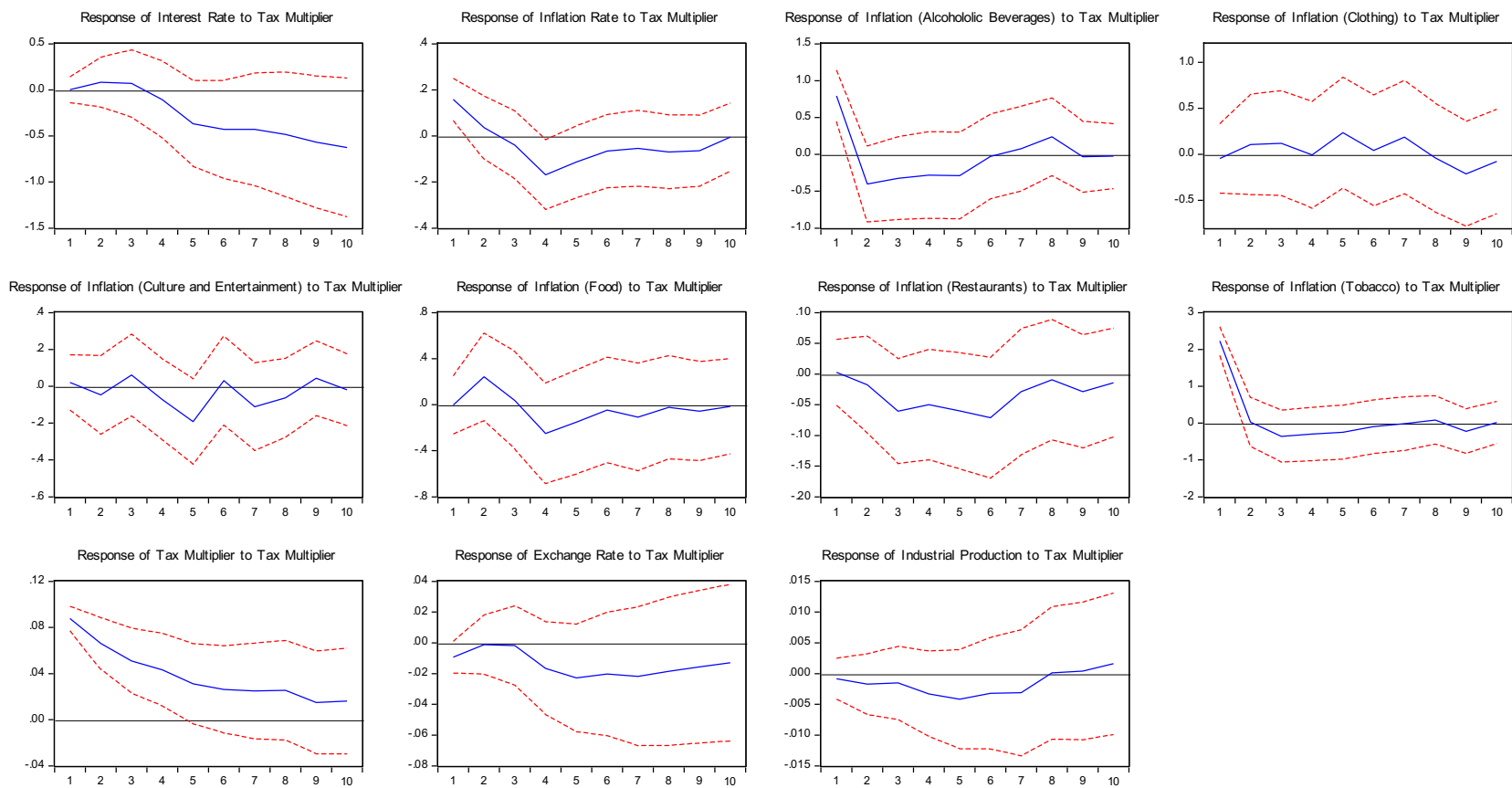


Figure 6: Response given to the tax multiplier in the multi-variable VAR model

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

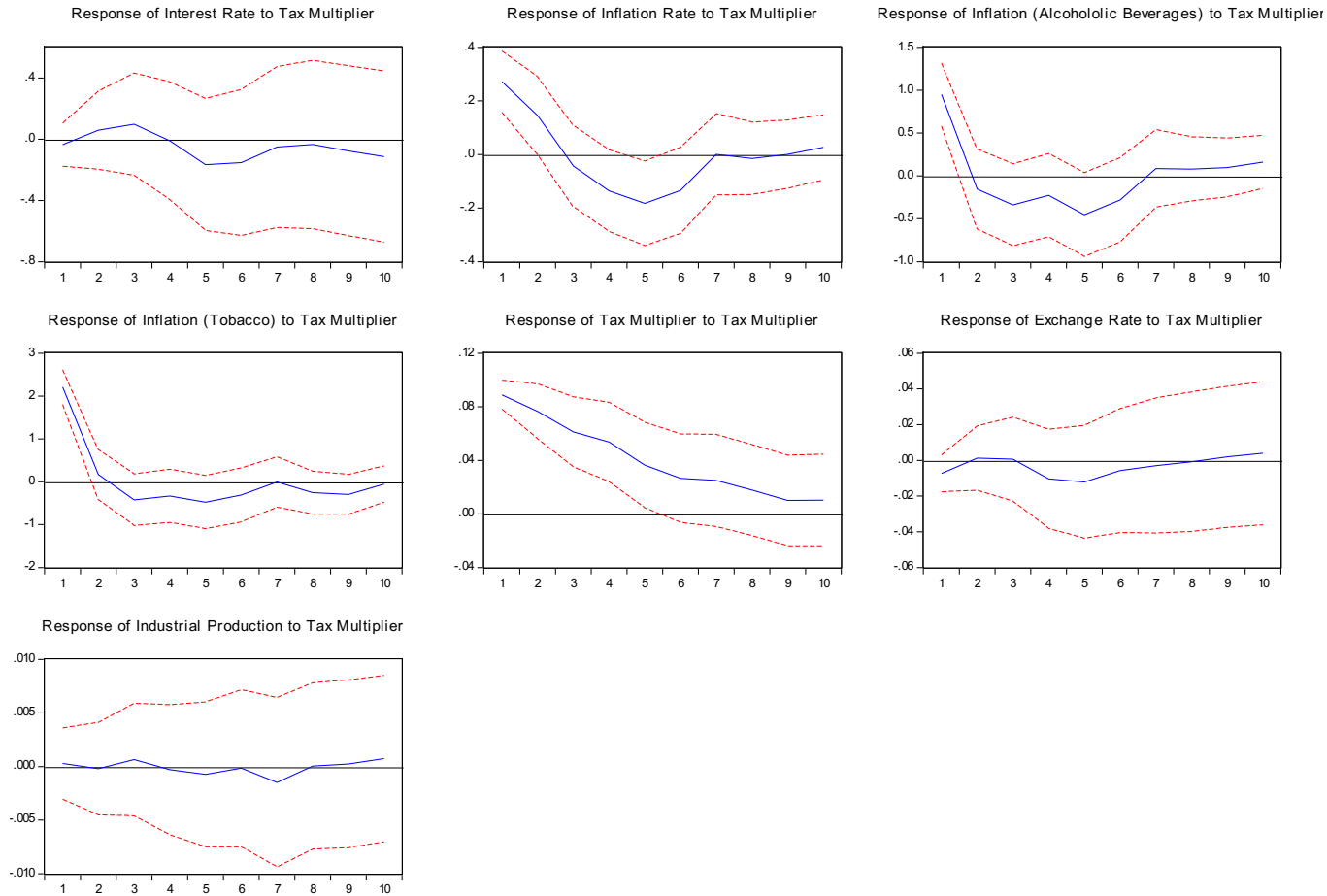


Figure 7: Response to the tax multiplier in the VAR model with fewer variables

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

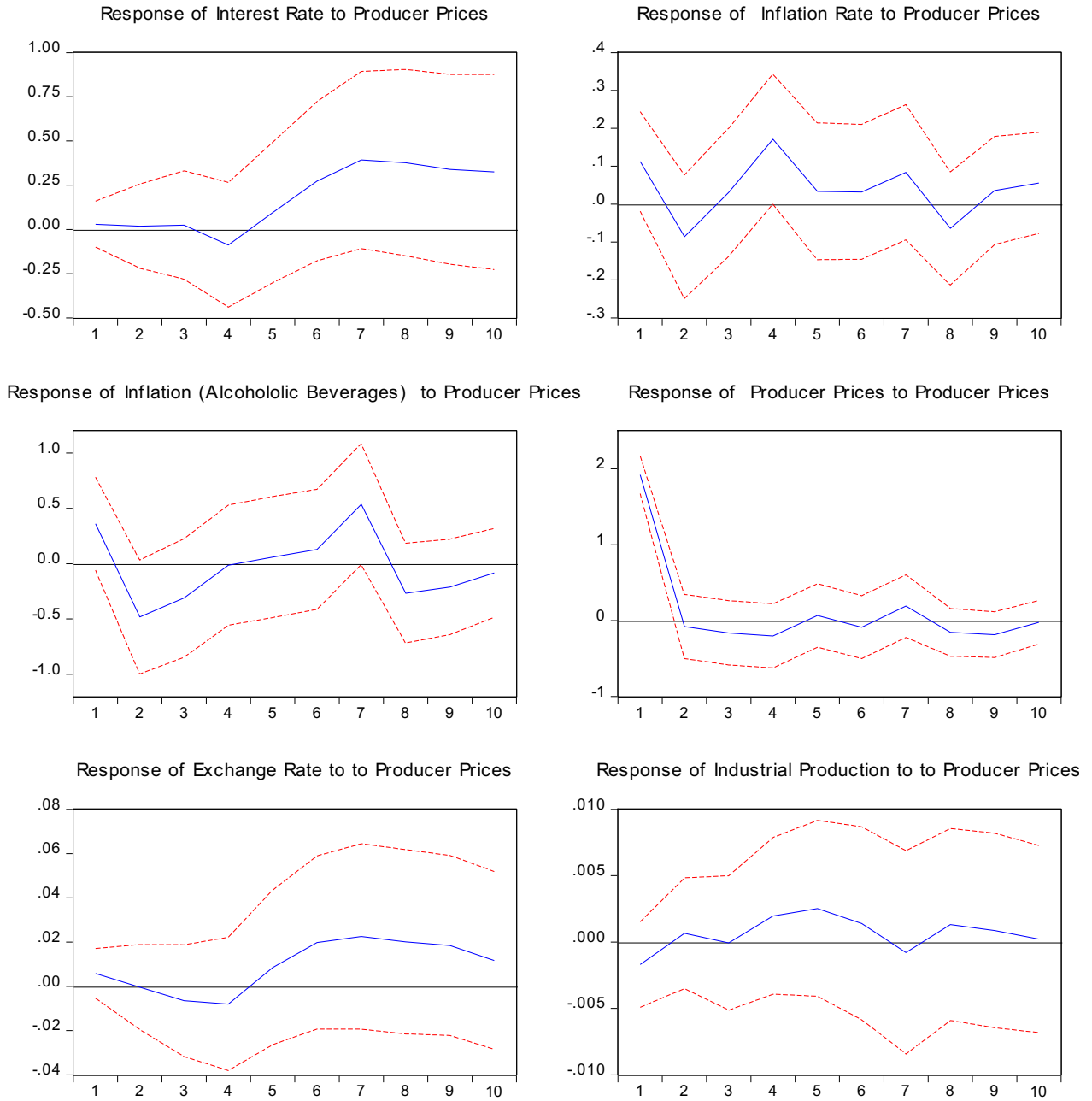


Figure 8: Response to producer price in the VAR Model with fewer variables

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

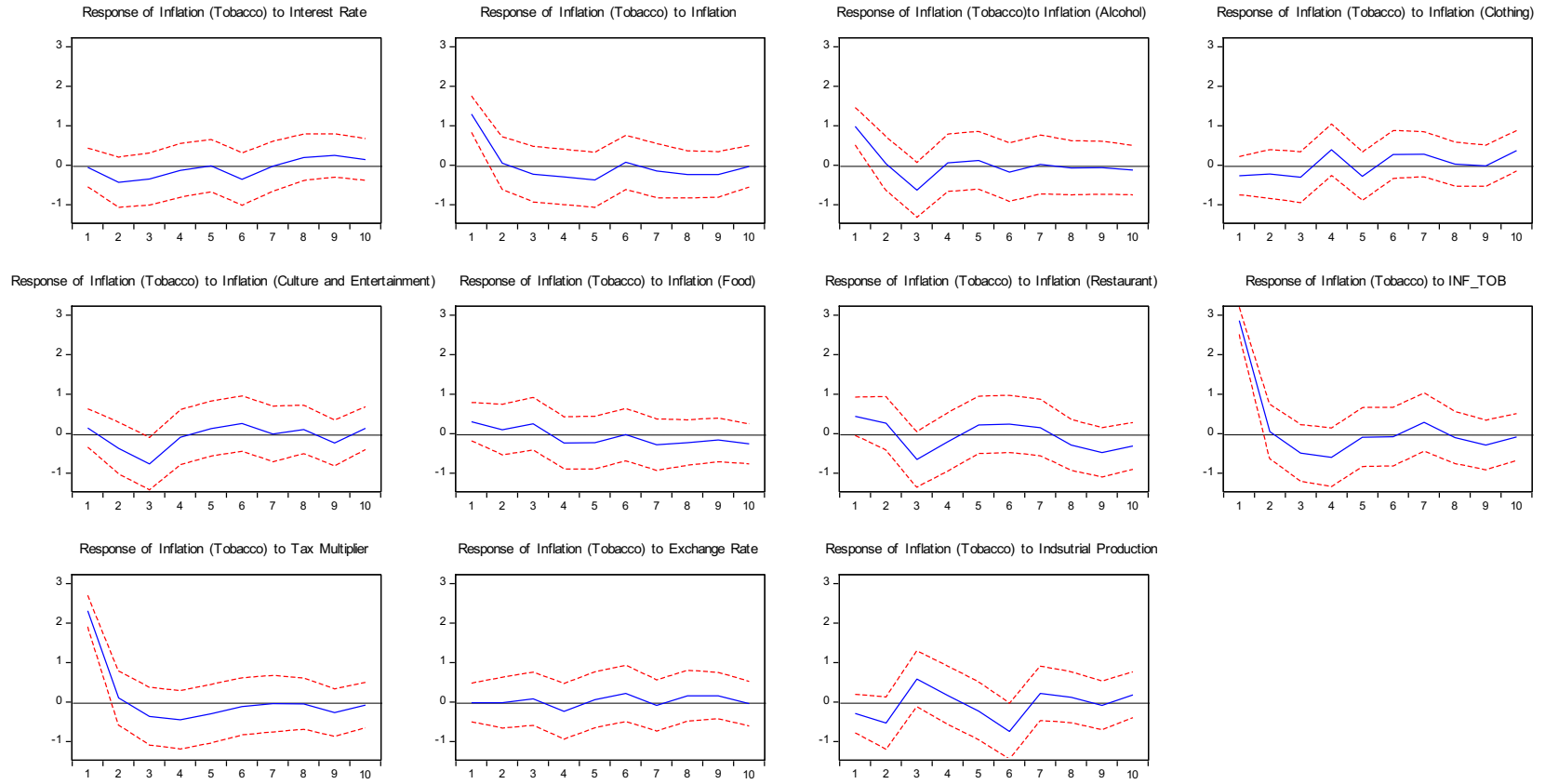


Figure 9: Response to tobacco inflation shock in the multi-variable VAR Model

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