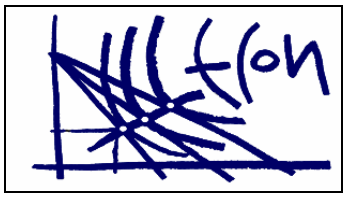

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Cost-push impact of motor spirit price on price indices and inflation

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Cost-push impact of motor spirit price on price indices and inflation

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Any increment in the prices of goods or services generally leads to an increase in different products prices indices and inflation. This paper examines the cost-push impact of a motor spirit price increment in Iran on different products prices indices and inflation. An Input-Output (I-O) table adjustment approach is applied. Iran input- output table for the year 2001-2002 is used as database. The empirical results of the model show how the cost-push impact of a 25% increment in the motor spirit price leads to an increment in different products prices indices, but the maximum effect of this increment, which is on transportation services prices, does not exceed 0.7492%. In addition, the cost-push effect of this increase on the Production Prices Index (PPI) is estimated at 0.2540%.

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I. Introduction

The parliament negotiation about the government plan in Iran on the motor spirit price finally led to a 25% increment in the motor spirit price in what concerns the quota and an adjusted price to stimulate consumption from May 22nd 2007[2]. The quota and the adjusted price will be assigned by the government in the future. Huge amounts of subsidies are annually spent on the motor spirit price for reasons such as preventing inflation, guaranteeing welfare, etc. It seems that this increment, as all prices increases, influences the products prices indices and inflation in the country.

In fact, any price increment's cost-push, irrespective of its origination, can influence all products prices indices by direct and indirect ways through intermediate consumption. Although some products may have no direct effect on each other, in an economy products usually are indirectly interrelated. Thus, any increment in the price of products can influence the price indices of all products through direct and indirect effects.

Irrespective of the internal or external origination of a price increment, many studies have been carried out to examine its impact on the economy. Focusing on the inflation problem, several types of models have been elaborated using computable general equilibrium models, as in Dorrodian and Boyd (2003) and Roeger (2005) or an econometric approach, as in Chaudhuri (2001), Driffield *et al.* (2003), Cunado and Gracia (2003) and Molina (2004). Using an I-O price model we can find works such as Boratyński's (2002), helpful to examine the direct and

[2] The newspaper of Khaneh Mellat, dated March7th, 2007, http://mellat.majlis.ir/archive/1385/12/16/Default.htm

indirect effects of an increment in the indirect taxes of the different sectors. Both a dynamic and a static version of this model were also employed by Bazzazan and Batey (2003) to compare the results of eliminating energy subsidies. In addition, the direct effects of an increase in the prices of the different sectors using an I-O price model and a Social Accounting Matrix (SAM) were studied by Cardenete and Sancho (2002) and Cansino *et al*. (2007), respectively.

Although econometric or Computable General Equilibrium (CGE) models can be employed to study the direct and indirect effects of a price increment on the prices of products and inflation, due to the amount of data required to elaborate these models, they are ignored in some studies. The most remarkable characteristic of the I-O price model is its ability to consider the direct and indirect effects of a price increase on the prices indices, but in a case such as that of the motor spirit price, which is established once a year and will not be adjusted with respect to any changes in intermediate consumption or primary factors prices, it lacks consideration of this situation or condition. Also, the so-called direct price effect model is unable to consider the indirect effect of any shocks on the price formation.

Hence, this paper employs an I-O adjustment approach to examine the direct and indirect cost-push effects of a 25% increase in the motor spirit products price on the prices indices of all products and inflation. As seen in the empirical results of its application, one of the advantages of this model is that it enables the researcher to consider one or several products prices on a given level. Furthermore, the I-O table adjustment model allows the researcher to consider any change in primary factors,

such as taxes or subsidies for the products that may be obtained from total inputs expenditures. This is still another advantage of this model in comparison to others.

The paper contains four sections. The analysis of the database and the research methodology are presented in the next section. The third section includes the discussion and the empirical results of the paper. Finally, the conclusion section puts an end to it.

II. The Analysis: Data and Methodology

a. The database

The latest survey based I-O table for Iran corresponding to the year 2001-2002 and elaborated by the Iran Statistics Center is employed as a database in this research[3]. To study the effects of a motor spirit price increment on other products prices indices and inflation, a product to product I-O table is required.

Fortunately, use and make tables are available. If *U* and *K* stand respectively for the technical coefficients of the use and make tables, *A*, the technical coefficient of a product to product I-O table is calculated as follows:

[3] Input-Output Table for the year 2001-2002 (2006), Iran Statistical Center, Management & Planning Organization, I. R. Iran.

$$A = K \times U = \begin{bmatrix} u_{11} & u_{12} & \cdots & u_{1m} \\ u_{21} & u_{22} & \cdots & u_{2m} \\ \vdots & \vdots & & \vdots \\ u_{n1} & u_{n2} & \cdots & u_{nm} \end{bmatrix} \times \begin{bmatrix} k_{11} & k_{12} & \cdots & k_{1n} \\ k_{21} & k_{22} & \cdots & k_{2n} \\ \vdots & \vdots & & \vdots \\ k_{m1} & k_{m2} & \cdots & k_{mn} \end{bmatrix}$$

$$= \begin{bmatrix} u_{11} \times k_{11} + u_{12} \times k_{21} + \cdots + u_{1m} \times k_{m1} & \cdots & u_{11} \times k_{1n} + u_{12} \times k_{2n} + \cdots + u_{1m} \times k_{mn} \\ \vdots & & \vdots \\ u_{n1} \times k_{11} + u_{n2} \times k_{21} + \cdots + u_{nm} \times k_{m1} & \cdots & u_{n1} \times k_{1n} + u_{n2} \times k_{2n} + \cdots + u_{nm} \times k_{mn} \end{bmatrix} \quad (1)$$

$$= \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{bmatrix}$$

Then the product to product table is calculated through equation (2):

$$X = A \times \hat{Z} \quad (2)$$

where X refers to the intermediated transaction between products in the production stage and $\hat{Z}$ is the diagonal matrix of the total production of commodities.

Thus, considering the final demand and primary factors parts together with the intermediated transaction part, the product to product table is perfectly defined.

b. Methodology

Since the input-output table is based on the value of goods or services, it is expected that any change in primary factors, imports or the amount of different kinds of taxes

or subsidies, if they are not compensated by changes in other factors, will relatively affect the total inputs value of products. Given the constancy in the level of products, it seems this is the origin of any increment in the prices of products.

It is worthwhile noting that, since products are consumed either as intermediate consumption for other goods and services or as final demand, the increment of prices leads to an increase in the expenditure on intermediate and final consumption goods. It is expected that an increase in the expenditure on intermediate products will lead to a new increase in the total inputs value of a greater number of products. Hence, this can be considered as a new effect of the increase in the prices of products.

The new increase in the prices works as the previous one. But since the original increase was partly absorbed by the final consumption, it is expected the effects of the new increase will be less than those of the former one. This process can continue until changes in the prices are ignored.

In fact, the model runs based on this process. An original increase in primary factors, imports or the volume of different kinds of taxes or subsidies leads to a relative increase in the total inputs of the related products and to a new table. Since the volume of products is constant, through dividing the new value of total inputs for all products by the corresponding value in the previous table, a price index for all products is obtained.

Multiplying these indices by the related rows in the most recent table, the third table results with a new volume for intermediate consumption. The adjustment

can be done through dividing the products value of the third table by the corresponding ones in the previous table. This process needs to be continued until the prices indices at this stage for all products come close enough to 1. Finally, through dividing the value of inputs for all products in the latest table by the corresponding value of inputs in the initial table, the price indices for all products will be calculated.

It should also be mentioned that, since indirect taxes can change according to the value of products, it is adjusted with respect to the new value of products. To this end, the indirect taxes concern to any products is adjusted with respect to the value of products in any iteration of intermediate consumption adjustment simultaneously. Thus, the products values are adjusted with respect to intermediate consumption and indirect taxes in any iteration.

To formulate this procedure, let I_{it} denote the price index for products i in the t^{th} iteration of the adjustment. Thus the k^{th} iteration of the process of adjusting the tables can be expressed as follows:

$$T^K = I^k \times T^{k-1} = \begin{bmatrix} I_1^k & 0 & \cdots & 0 \\ 0 & I_2^k & \cdots & 0 \\ & & \vdots & \\ 0 & 0 & \cdots & I_n^k \end{bmatrix} \times \begin{bmatrix} T_{11}^{k-1} & T_{12}^{k-1} & \cdots & T_{1m}^{k-1} \\ T_{21}^{k-1} & T_{22}^{k-1} & \cdots & T_{2m}^{k-1} \\ & & \vdots & \\ T_{n1}^{k-1} & T_{n2}^{k-1} & \cdots & T_{nm}^{k-1} \end{bmatrix} = \begin{bmatrix} T_{11}^k & T_{12}^k & \cdots & T_{1m}^k \\ T_{21}^k & T_{22}^k & \cdots & T_{2m}^k \\ & & \vdots & \\ T_{n1}^k & T_{n2}^k & \cdots & T_{nm}^k \end{bmatrix} \quad (3)$$

where T^k and T^{k-1} refer to the k and $k\text{-}1^{th}$ iterations of the adjusted tables including the intermediate and final consumption parts of the I-O tables, respectively. I^k stands for a diagonal matrix of prices indices in the k^{th} iteration of the table adjustment process.

Thus, T^t , the final adjusted table, can be defined as:

$$T^t = I^1 \times I^2 \times I^3 \times \cdots \times I^t \times T^0 \qquad (4)$$

where I^1 to I^t refer to the diagonal matrices of prices indices in different stages of the adjustment process and T^0 indicates the intermediate and final consumption parts of the initial I-O table.

Hence, I_i, the price index of products i, can be calculated through the following relation:

$$I_i = \prod_{k=1}^{t} I_i^t = I_i^1 \times I_i^2 \times I_i^3 \times \cdots \times I_i^t \qquad (5)$$

According to the indirect tax rule in Iran[4], indirect taxes are computed based on the products value. The indirect tax on products can thus be adjusted through the relation (6):

[4] The taxes integration rule (1381), The Country Tax Affairs Organization: http://www.storg.ir/laws/tajmi_avarez.htm.

$$Ta_j^k = \left(\frac{X_j^k + W_j^k + S_j^k - Suj_j^k}{X_j^{k-1} + W_j^{k-1} + S_j^{k-1} - Su_j^{k-1}}\right) Ta_j^{k-1} \tag{6}$$

Ta_j^k, Su_j^k, X_j^k, W_j^k & S_j^k respectively denote indirect taxes, subsidy, total intermediate consumption, wages and the operation surplus for products *j* in the k^{th} iteration of the table adjustment process. T_j^{k-1}, Su_j^{k-1}, X_j^{k-1}, W_j^{k-1} & S_j^{k-1} refer to the same items for products *j* in the $(k-1)^{th}$ iteration of the table adjustment process, as well respectively.

Finally, using Laspeyres price index procedure, it is possible to examine the PPI as a result of any increment in the price of products, as follows:

$$PPI = \sum_{i=1}^{n} Q_i^0 \times P_i \Big/ \sum_{i=1}^{n} Q_i^0 \times P_i^0 = \sum_{i=1}^{n} Z_i \Big/ \sum_{i=1}^{n} Z_i^0 \tag{7}$$

Q_i^0, P_i^0 and Z_i^0 respectively refer to the quantity, the price level and the level of the total products value for products i^{th} before any increment in the prices happened, whereas P_i and Z_i denote, also respectively, the level of the price index and the size of the total products value for products i^{th} after the increment in the price took place.

III. Empirical Results

The proposed model was applied to examine the effect of a 25% increment in the motor spirit price on the products prices indices and the PPI. The calculated symmetric 147 products to 147 products I-O table, was adjusted through 33 iterations. In order for it to be useful, 28 products included in the Central Product Classification (CPC) were aggregated to the adjusted table analyzed in this paper (see Table (1)).

According to calculation results, a 25% increment in the motor spirit price leads to an increase in the prices indices of all products. The cost-push impact of this increment on all of these products indices is less than one percent. The maximum impact, which is on transportation services, has been estimated to be of about 0.7492% on the price index of this service.

In addition, the outcome of the calculation shows that any increment in the motor spirit price has the most impact on transportation, fish and other fishing products, and forestry and logging products prices indices, respectively. In contrast, the results reveal as well that the price indices of crude petroleum and natural gas, gardening products and other personal services are the least affected by the motor spirit price increment.

The last row of Table (1) displays the impact of a 25% increment in the motor spirit price on the PPI of the economy. The results of the research demonstrate that the cost-push impact of that increment on the PPI is estimated at

0.2540%, about one percent the size of the increase in the motor spirit price. Thus, it seems the cost-push impact of the increase in the price of motor spirit is inconsiderable.

IV. Conclusion

The cost-push impact of an increase in the motor spirit price on products indices and inflation was studied in this paper. Procedures were reviewed. I-O table adjustment procedure was developed to examine the impact of an increase in the motor spirit price on products indices and inflation.

The results of the research demonstrate that the cost-push influence of an increase in the price of motor spirit on products prices indices is inconsiderable. So the maximum value of the resulted increments in response to a 25% increase in the motor spirit price does not exceed 0.7492%. In addition, the cost-push inflation rate is estimated at about one percent of the motor spirit price increment. Thus, despite the huge amount of subsidies annually spent on the motor spirit price to prevent inflation, increments on that price have inconsiderable effects.

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