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# The Harmonization within EEC: Single Market and its Impacts on Greece's Private Consumption and Vat Revenue

by

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DISCUSSION PAPERS

# The Harmonization within EEC: Single Market and its Impacts on Greece's Private Consumption and Vat Revenue

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# 1. INTRODUCTION

The package of proposals aiming at removing the need for tax controls at the borders within EEC, was finally adopted by the European Community in July 1987.

The creation of the Single European Market, consisting of an area of economic activity totally free of internal borders is impossible unless, among others, the rates of excise duties and VAT rates are harmonized.

The required changes in the indirect tax system will inevitably change the relative prices of commodities and therefore the structure of their demand, production, trade and VAT revenue and will have further micro and macro-economic impacts.

This study is confined to the evaluation of the impacts on private consumption structure and the associated VAT revenue changes.

For this purpose a linear expenditure system, proposed by Stone(1954) and modified by Gamaletsos(1974,1980), has been specified and implemented on time series of the ten main National Accounts Private Consumption categories.

## 2. THE COMMISSION'S PROPOSALS

The Commission's proposals would involve major changes in the operation of VAT.[1] Among others it is held that:

a. The member-States should fix their VAT rates within two rate bands, a standard rate between 14-20% and a reduced rate band of 4-9%.

b. The reduced rate will be applied to certain items of basic necessity such as food (except alcoholic drinks), supplies of water, books-newspapers-periodicals, energy products for heating and lighting, passenger transport and Pharmaceutic products.[2]

A number of differing views expressed by representatives of several member states concern: the number and the level of VAT rates, the introduction of minimum rates (instead of ranges) and the adoption of zero rates. Since no final decision as yet has been taken, in this paper the original EEC propositions are considered with average rates of 6.5% and 17% for the low and the high range respectively.

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1. See, Commission of the European Comminities (1985, 1987, 1989).

2. See, for more details, Lee-Pearson-Smith (1988), Bos-Nelson (1988), Mcaleese-Mathews (1987) and Pelkans-Robson (1987).

## 3. THE EXISTING GREEK VAT AND REVENUE STRUCTURE

The VAT system was introduced in Greece at 1.1.1987. This tax was originally levied under four rates: 3%, 6%, 18% and 36%. From 1.1.1988 to 1.6.1990, the standard rate was reduced to 16% and some goods were transferred from 36% to 16% and from 16% to 6%. Since 1.6.1990 the rates were changed.....

On the consumption goods both Private Consumption expenditure and Government expenditure are treated in the same way as far as VAT is concerned. VAT is not imposed on exported commodities and on entrepreneur purchases of capital goods.

In view of the absence of any official statistics or any study for the distribution of the VAT either by tax rate or by categories of expenditure, these data have to be estimated, mainly on the base of (a) the VAT law for the classification of products by VAT rate and (b) the Private Consumption figures as given by National Account for the year 1987 (the latest available).

The Domestic Private Consumption is about 85% of the total taxable basis of VAT. The rest of the taxable basis refers mainly to the purchases of the Public Sector (current and investment expenditures) and it is concentrated on the standard tax rate 18%.

The expenditure for products which are out of the VAT system, according to the VAT law (i.e. expenditure for rent, water, domestic services, health), is firstly separated from the expenditures for those products on which the VAT rate 3% is levied (books, newspapers, periodicals). It was impossible to isolate the consumption expenditures for self consumption and for the direct sales by the producers. It should be noticed, however, that the share of these expenditures is very insignificant in the whole consumption expenditure.

The classification of private domestic consumption expenditure during 1987 according to the rates (3%, 6%, 18% and 36%) also led to possible estimations of the corresponding tax revenue structure.

In Table 1, a distribution of each of the main ten categories of private domestic consumption has been made according to the existing VAT structure in Greece. It is shown

that total VAT tax revenue for 1987 coming from the private consumption expenditure amounts to 474 bill. drachmas. This constitutes about 85% of total VAT tax revenue.

It can be seen also that 23% of VAT on private consumption expenditure comes from the rate of 6%; 48% from the 18% rate and 28% from the high rate (36%). This VAT revenue structure differs significantly from that of VAT base. The latter's distribution is 52% in the low rate, 37% in the rate of 18% and only 11% in the high rate. The average VAT rate on private consumption is 13.7% compared with the 13.8% average VAT rate on total taxable base.

TABLE 1

Existing Structure of Greece's Taxable Base
and VAT Revuneu in 1987

(Bill. Drachmas)

| Commodity Categories | Total Con/on | VAT Structure | | | | | Effective VAT Rate (1987) |
|---|---|---|---|---|---|---|---|
| | | 3% | 6% | 18% | 36% | Total | |
| 1. Good | 1425 | - | 1148 | 257 | 19 | 1425 | 8.3 |
| 2. Drinks | 163 | - | 49 | 81 | 33 | 163 | 17.1 |
| 3. Tobacco | 136 | - | - | - | 136 | 136 | 36.0 |
| 4. Clothing | 409 | - | - | 409 | - | 409 | 18.0 |
| 5. Housing | 509 | - | 56 | 83 | - | 140 | 12.9 |
| 6. Durable | 373 | - | 44 | 263 | 15 | 321 | 16.9 |
| 7. Personal Care | 176 | - | 34 | 42 | - | 76 | 12.3 |
| 8. Transport | 585 | - | 347 | 121 | 117 | 585 | 13.4 |
| 9. Recreation | 291 | 42 | 25 | 50 | 148 | 266 | 22.9 |
| 10.Others | 545 | - | 215 | 202 | 36 | 454 | 13.1 |
| (Total Economy) | 4522 | 42 | 1918 | 1510 | 504 | 3975 | 13.5 |
| Taxable Base% | | 41 | 1809 | 1280 | 371 | 3501 | |
| (Total Economy) | | (41) | (1916) | (1700) | (381) | (4038) | |
| Persentages % | | 1.2 | 51.7 | 36.6 | 10.6 | 100.0 | |
| (Total Economy) % | | (1.0) | (47.4) | (42.1) | (9.4) | (100.0) | |
| VAT Revenue | | 1 | 109 | 230 | 133 | 474 | 13.5 |
| (Total Economy) | | (1) | (115) | (306) | (137) | (559) | 13.8 |
| Percentages % | | 0.3 | 22.9 | 48.6 | 28.2 | 100.0 | |
| (Total Economy) % | | (0.2) | (20.6) | (54.7) | (24.5) | 100.0) | |

Source: Ministry of Finance.

## 4. THE VAT STRUCTURE AND THE PRICE CHANGES IMPLIED BY EEC PROPOSITIONS

It can be inferred from above that the Greek VAT system needs the following adjustments:

a. Abolition of the high rate of VAT (36%) and the removal of the highly taxed goods to the standard rate (16%).

b. Transfer of many goods from the low to the standard tax rate and introduction to the VAT system of a number of commodities previously free of VAT.

In Table 2 a distribution of total Private Domestic Consumption as well as of each of its main ten categories has been made according to the two rate bands proposed by EEC.

It can be seen that 52.4% of total private consumption expenditure will be taxed with the low VAT rate and 47.6% with the high rate. This shows that the structure of the tax base does not change significantly.

There are, however, significant changes in the rates applied on individual commodity categories. More specifically, as it can be seen looking at both Tables 1 and 2, all food commodities are to be moved from 16% or 36% to the low rate. The same holds for beverages (especially for beer). Tobacco products also move from 36% to the maximum rate of 20%. Clothes and footwear will not have any significant additional tax burden since they are taxed today by 16% and they will remain of the high EEC rate. Fuel and power products will pass to a lower tax rate since they are expected to be included in the lower EEC ratewhile today they are taxed at a 16% rate. The same is true to Medical Care and Health Expenses, the operation of personal transport equipment as well as the Recreation, Entertainment and Personal Care.

The Personal Transport Equipment category will be taxed at a higher rate since they will move to the high EEC rate from the low Greek rate at which it is taxed today.[3] The same holds for Hotel and Restaurant services.

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[3]. This, however, constitutes a separate issue from possible changes in the specific taxes on cars, held now in Greece.

It can also be seen from the comparison of Tables 1 and 2 that the VAT approximation will increase the average tax burden of the products: Clothing and Footwear from 18 to 20%, Furniture etc. from 16.9 to 20%, Transport and Communications from 13.4 to 15.0% and the Miscellaneous goods and services from 13.1 to 20%. A reduction of the average tax burden will take place in the categories: Food, Drinks and Tobacco from 10.9 to 9.5%, Gross rent, Fuel and Power from 12.9 to 8.0%, Medical Care and Health expenses from 12.3 to 8.0% and Recreation-Entertainment and Education from 22.9 to 17.5%.

It can be expected that for the commodities for which the average tax burden will increase(decrease) prices will also increase(decrease). This will result in changes of their relative prices and the structure of their consumption. This will also result in changes in the structure and the level of revenue coming from VAT. Furthermore, according to the extent of the import components entailed in each category, the trade structure and the trade balance will be affected.

Looking at the total average effective tax burden in Tables 1 and 2, it seems that the Community's proposal will favour the consumers.

A wider picture will be provided if estimates could be obtained rergarding the extent to which private consumption and VAT revenue budget are to be changed in level and structure.

The latter is of significant importance since Greece currently draw a substantial proportion of its revenue from VAT and the public sector in Greece is characterized by considerable deficits, deterioration of which will be resisted by any Greek government.

TABLE 2

Domestic Private Consumption
and Value Added Tax under EEC Rates

(Bill. Drachmas)

| Commodity Categories | Total con/tion | Low Rate (4-9%) 6.5% | Standard (14-20%) 17% | Effective VAT Rate (1987) |
|---|---|---|---|---|
| 1. Food | 1425 | 1399 | 26 | 8.2 |
| 2. Drinks | 163 | 91 | 72 | 13.1 |
| 3. Tobacco | 136 | - | 136 | 20.0 |
| 4. Clothing | 409 | - | 409 | 20.0 |
| 5. Housing | 152 | 152 | - | 8.0 |
| 6. Durable | 321 | - | 321 | 20.0 |
| 7. Personal Care | 76 | 76 | 1 | |
| 8. Transport | 585 | 227 | 357 | 15.0 |
| 9. Recreation | 266 | 50 | 216 | 17.5 |
| 10.Others | 454 | - | 454 | 20.0 |
| Total | 3987 | 1996 | 1992 | 13.7 |
| Taxable Base | 3576 | 1874 | 1702 | |
| (Percentages %) | (100.0) | (52.4) | (47.6) | |
| VAT Revenue | 411 | 122 | 289 | |
| (Percentages %) | (100.0) | (29.6) | (70.4) | |

Source: Ministry of Finance.

## 5. THE IMPACT ON VAT REVENUE

The effect of VAT approximation upon VAT revenue will be examined under the assumption of changing demand structure after the introduction of the new harmonized VAT rates :

The empirical investigation of the impact of greek VAT harmonization with EEC VAT rate structure is made by estimating a Linear Expenditure System which includes the 10 private domestic consumption categories.

The specified system is based on that proposed by Stone and modified by Gamaletsos when his dynamic LES was derived. The use of the dynamic system of allocation seems to be more realistic since in these systems the commited expenditure on each commodity is considered to depend on previous year consumption expenditure, allowing, thus, for the habit persistent hypothesis.

It is based on a direct additive Cobb-Douglas type utility function of the form:

$$u(q) = \Pi(q_i - g_i)b_i \quad \text{or} \quad u(q) = \Sigma b_i \, \mathrm{Log}(q_i - g_i) \qquad (1)$$

which is maximized with respect to $q_i$ subject to the income (total consumption expenditure) constraint

$$\Sigma \, p_i q_i < CU \qquad (2)$$

where:

- $q_i$ the quantity of category i consumed
- $g_i$ the committed consumption in quantity of commodity category i
- $p_i$ the price of commodity category i
- CU total expenditure on private consumption
- bi share parameter(see below)

and $q_i > 0$

$0 < g_i < q_i$

$1 > b_i > 0$

$\Sigma b_i = 1$

The maximization procedure results to the form

$$q_i = g_i + b_i \; p_i^{-1}(CU - \Sigma p_i g_i) \tag{3}$$

and after multiplying by $p_i$

$$p_i q_i = CU_i = p_i g_i + b_i(CU - \Sigma p_i q_i) \tag{4}$$

It is recalled that,

$$b_i = \partial CU_i / \partial CU$$

represents the so called "marginal budget shares" and $\Sigma p_i q_i$, the total committed expenditure. The sum refers over the n commodities. The dynamic LES can be deduced by assuming that

$$p_i g_i = a_i CU_i(t-1) = a_i p_i(t-1) q_i(t-1) \tag{5}$$

where $a_i > 0$

i.e. the committed expenditure $p_i g_i$ on the commodity i is directly and proprortionally affected by last years total consumption expenditure on commodity i $CU_i(t-1)$.[4]

After substituting (5) into (4) the following relation results.

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4. In fact the essence of the dynamic LIS system was presented by Th. Gamaletsos after the "General LES System" was specified by him. Here for simplicity, a slight modifica-tion of his assumptions is adopted. The meaning of the General LES is that bi are not considered as constant parameters but they are dependent on prices $P_i$.

$$CU_i = a_i p_i(t-1)q_i(t-1)+b_i(CU - \Sigma a_i P_i(t-1)Q_i(t-1) \quad (6)$$

## 5.1. Stochastic Specification and Estimation Method

Equation (6) can be considered as giving the mean values of expenditure (the mathematical expectation E(CUi)) for commodity i on given values of the exogenous variables: prices and quantities of the previous year ($p_i(t-1)$, $q_i(t-1)$) as well as total consumption expenditure CU.

The stochastic presentation of equation (6) can, thus, be derived by appending additive errors $e_i$ to this deterministic relation.

$$CU_i = a_i p_i(t-1)q_i(t-1) + b_i(CU - \Sigma a_i p_i(t-1)q_i(t-1)+e_i \quad (7)$$

It is a nonlinear, equation.in its parameters. Considering the n commodities represented by n equations, a nonlinear (in the parameters) seemingly unrelated system is formed in which

- There are parameters restrictions across equations since the same parameters ($a_i$) are present in more than one (in fact in all) equation.
- There exists correlation of the error terms across equations.[5]
- Heteroskedasticity across equations could be assumed to be present because of the different shares of each category into total consumption.

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5. The correlation of the errors between equations is caused by the condition $\Sigma b_i = 1$.
It can be seen if (7) is summed with respect to i

$$\Sigma CU_i = CU = \Sigma a_i P_i(t-1)q_i(t-1)+ (CU-\Sigma a_i p_i(t-1)q_i(t-1)\Sigma b_i+\Sigma e_i$$

which implies

$$\Sigma e_i = 0$$

i.e. the errors $e_i$ are linear dependent.

These imply that

- The stationary properties of ei should be
  $E(e_{it})=0$ and $E(e_{it}e'_{it}) = \Omega$ (8)

with terms $w_{ij}$ for $t=t'$ and 0 for $t \neq t'$

Where ei denotes the transposed vector of the error terms, (e1t.....e10t). $\Omega$ is, an nTxnT positive definite variance-covariance matrix of errors across equations (T=number of observations) and $p_i(t-1)q_i(t-1)$ are taken to be independent of ei. It is, thus, assumed that there is not serial correlation in the error terms while correlation of the errors between equations are taken into consideration.

- The method of estimation should take into account the
  - nonlinearity of the relations
  - the parameters restrictions across equations
  - the correlation and heteroskedasticity of the errors across equations

The multivariate least squares which is a generalized least squares method is used. It is a minimum distance procedure which is computationally simple and takes into account the variance-covariance matrix of the residuals. The steps followed by this procedure are:

a. Form an estimate of the variance-covariance matrix of the residuals

$$M^*ee = 1/T \; {}^*\Sigma e_t e_t$$

Such estimates of $e_t$ could come from the minimization of the sum of squares of the residuals

$$\mathrm{Min}(e_i^2) = \sum_n \sum_T [( p_i q_i - a_i p_i(t-1)q_i(t-1)$$

$$+b_i(CU-\Sigma a_i p_i(t-1)q_i(t-1))]$$

with n indicating the number of commodities and T the number of observations. This is the procedure proposed by Stone (1954) for the LES system.

b. These estimates are used to weight the observations when the equations are reestimated. The function to be finally minimized with respect to parameters (a), is the following.

$$\Sigma\Sigma e(a)'(M^{*}ee)e(a),$$

where e(a) is the vector of stacked residuals.

The algorithm used to estimate the model is the LSQ which use the minimum distance estimator proposed by Gauss. The statistical package is the TSP. Estimation is implemented by omitting 1 equation and obtaining the parameter bi of this equation by subtracting from 1 all estimated bi. According to the method adopted the estimates in this kind of systems are invariant with respect to which equation is dropped.

## 5.2. Estimation Results

The time series for the period 1970 to 1987 and the ten Domestic Private Consumption categories were taken from National Account Statistics. The implicit deflators of domestic private consumption by category represents the time series for their prices.

The parameters estimated together with their T statistics as well as the coefficient of determination for each equation are given in Table 3.

It can be seen that the estimated parameters are all statistically significant and satisfy the conditions $0<b_i<1$, $a_i>0$ and $g_i<q_i$.[6] The coefficient b1 is taken as the residual from the sum $\Sigma b_i = 1$.

It can be proved that the income elasticities $\eta_i$ as well

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6. The $g_i$s vary within the period and they are derived from the relation (5) by solving it with respect to gi.

as the own and cross price elasticities $\eta_{ii}$ and $\eta_{ij}$ are given by the following formulas.[7]

Income elasticities:

$\eta_i = b_i/w_i$, where $w_i = CU_i \backslash CU$

the average budget share

Own price elasticities:

Uncompensated: $\eta_{ii} = (1-b_i)a_i CU_{i(-1)}/CU_i - 1$

Compensated: $\eta_{ii} = -(1-b_i)(1 - a_i CU12i_{(-1)}/CU_i)$

Cross elasticities:

Uncompensated: $\eta_{ij} = -b_i a_j CU_{i(-1)}/CU_i$

Compensated: $\eta'_{ij} = b_j(1-a_i(CU_i(-1)/CU_i)$

Their estimates for the year 1989 are shown on Tables 4, 5, and 6. It can be seen from Table 4 that the estimated elasticities have the right sign and they range within reasonable sizes. Income elasticities are relatively high for Clothing, Personal Care, Transport, Recreation and Tabacco and relatively low for Food, Drinks, Housing, Durables and Others.

Estimates of own price elasticity are negative in both compensated and uncompensated as required by the underlying utility theory. As it was also expected, the most price elastic categories are those of Tranport, Personal Care, Recreation and Durables. The values of uncompensated cross price elasticities are negative indicating that income effects override the substitution effect. Similarly the compensated cross price elasticities are positive indicating the correct sign for the implied substitutability effect. The highest degree of substitution between categories are shown in the couples of Durables-Transport, Personal Care-Transport and Recreation-Transport.

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7. See Th. Gamaletsos (1974). Also C. Lluc - A. Pawell and R. Williams (1979). In their formulas $p_i g_i$ is replaced by $a_i p_i(-1)q_i(-1)$.

TABLE 3

Parameters Estimation, their T Statistics
and the Coefficient of Determination $R^2$
by Commodity Category

| Marginal Budget Share | Estimate | T-Statistic | $R^2$ |
|---|---|---|---|
| 1. Food | 0.13375 | | |
| 2. Drinks | 0.00652 | 2.89 | 0.997 |
| 3. Tobacco | 0.03929 | 5.08 | |
| 4. Clothing | 0.08055 | 6.00 | 0.996 |
| 5. Housing | 0.07969 | 5.64 | 0.998 |
| 6. Durable | 0.10020 | 6.68 | 0.999 |
| 7. Personal Care | 0.07864 | 7.59 | 0.995 |
| 8. Transport | 0.29000 | 9.42 | 0.992 |
| 9. Recreation | 0.09828 | 9.18 | 0.998 |
| 10. Others | 0.09306 | 6.68 | 0.996 |
| Parameter $a_i$ | | | |
| 1. Food | 1.01860 | 10.67 | |
| 2. Drinks | 0.85329 | 8.21 | |
| 3. Tobacco | 0.76784 | 8.80 | |
| 4. Clothing | 0.87603 | 18.97 | |
| 5. Housing | 0.93738 | 16.35 | |
| 6. Durable | 0.75676 | 9.79 | |
| 7. Personal Care | C0.37026 | 3.47 | |
| 8. Transport | 0.40052 | 3.88 | |
| 9. Recreation | 0.59159 | 8.09 | |
| 10. Others | 0.85525 | 17.49 | |

TABLE 4

Estimated Income and own Price Elasticities

| Commodity Categories | Income Elasticity $n_i$ | Uncompensated Own Price Elasticity $n_{ij}$ | Compensated Own Price Elasticity $n'_{ij}$ |
|---|---|---|---|
| 1. Food | 0.53370 | -0.15420 | -0.02045 |
| 2. Drinks | 0.30513 | -0.21525 | -0.20873 |
| 3. Tobacco | 1.94276 | -0.29762 | -0.25833 |
| 4. Clothing | 1.40991 | -0.18339 | -0.10284 |
| 5. Housing | 0.90593 | -0.18629 | -0.10659 |
| 6. Durable | 0.77709 | -0.39162 | -0.29162 |
| 7. Personal Care | 1.11449 | -0.68821 | -0.60957 |
| 8. Transport | 1.95176 | -0.75114 | -0.46114 |
| 9. Recreation | 1.19456 | -0.51425 | -0.41597 |
| 10.Others | 0.70336 | -0.31376 | -0.22069 |

TABLE 5

Uncompensated Cross Price Elasticity $n_{ij}$

| Commodity Categories | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| 1. Food | -0.154 | -0.126 | -0.130 | -0.138 | -0.129 |
| 2. Drinks | -0.005 | -0.215 | -0.005 | -0.006 | -0.005 |
| 3. Tobacco | -0.029 | -0.028 | -0.298 | -0.031 | -0.028 |
| 4. Clothing | -0.068 | -0.065 | -0.067 | -0.183 | -0.067 |
| 5. Housinh | -0.072 | -0.069 | -0.071 | -0.076 | -0.186 |
| 6. Durable | -0.131 | -0.005 | -0.029 | -0.072 | -0.070 |
| 7. Personal Care | -0.028 | -0.027 | -0.028 | -0.030 | -0.028 |
| 8. Transport | -0.111 | -0.108 | -0.111 | -0.118 | -0.110 |
| 9. Recreation | -0.056 | -0.054 | -0.055 | -0.059 | -0.055 |
| 10.Others | -0.076 | -0.074 | -0.076 | -0.081 | -0.075 |

TABLE 5 (continued)

| Commodity Categories | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|
| 1. Food | -0.122 | -0.125 | -0.119 | -0.124 | -0.121 |
| 2. Drinks | -0.005 | -0.005 | -0.005 | -0.005 | -0.005 |
| 3. Tobacco | -0.027 | -0.028 | -0.026 | -0.027 | -0.027 |
| 4. Clothing | -0.063 | -0.065 | -0.062 | -0.064 | -0.062 |
| 5. Housing | -0.067 | -0.068 | -0.065 | -0.068 | -0.111 |
| 6. Durable | -0.392 | -0.026 | -0.106 | -0.092 | -0.070 |
| 7. Personal Care | -0.026 | -0.688 | -0.025 | -0.027 | -0.026 |
| 8. Transport | -0.104 | -0.106 | -0.751 | -0.106 | -0.103 |
| 9. Recreation | -0.052 | -0.053 | -0.051 | -0.514 | -0.051 |
| 10. Others | -0.071 | -0.073 | -0.070 | -0.073 | -0.314 |

TABLE 6

Compensated Cross Price Elasticity $n'_{ij}$

| Commodity Categories | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| 1. Food | -0.020 | 0.000 | 0.001 | -0.003 | 0.003 |
| 2. Drinks | 0.024 | -0.209 | 0.007 | 0.011 | 0.016 |
| 3. Tobacco | 0.035 | 0.001 | -0.258 | 0.018 | 0.022 |
| 4. Clothing | 0.021 | 0.001 | 0.007 | -0.103 | 0.014 |
| 5. Housing | 0.014 | 0.001 | 0.004 | 0.004 | -0.107 |
| 6. Durable | 0.003 | 0.001 | 0.011 | 0.009 | 0.009 |
| 7. Personal Care | 0.086 | 0.004 | 0.025 | 0.050 | 0.052 |
| 8. Transport | 0.082 | 0.004 | 0.024 | 0.048 | 0.050 |
| 9. Recreation | 0.058 | 0.003 | 0.017 | 0.032 | 0.035 |
| 10. Others | 0.024 | 0.001 | 0.007 | 0.011 | 0.015 |

TABLE 6 (continued)

| Commodity Categories | (6) | (7) | (8) | (9) | (10) |
|---|---|---|---|---|---|
| 1. Food | 0.009 | 0.005 | 0.031 | 0.007 | 0.009 |
| 2. Drinks | 0.024 | 0.017 | 0.073 | 0.022 | 0.023 |
| 3. Tobacco | 0.031 | 0.023 | 0.095 | 0.030 | 0.030 |
| 4. Clothing | 0.022 | 0.016 | 0.068 | 0.020 | 0.021 |
| 5. Housing | 0.016 | 0.011 | 0.052 | 0.014 | 0.016 |
| 6. Durable | -0.291 | 0.053 | 0.183 | 0.006 | 0.023 |
| 7. Personal Care | 0.067 | -0.610 | 0.196 | 0.065 | 0.063 |
| 8. Transport | 0.064 | 0.050 | -0.461 | 0.062 | 0.060 |
| 9. Recreation | 0.047 | 0.036 | 0.140 | -0.416 | 0.044 |
| 10. Others | 0.024 | 0.017 | 0.073 | 0.022 | -0.221 |

## 5.3. Formulation of the Problem and Simulation Results

The estimated model has been simulated historically giving a Root Mean Square Error which ranged from 1.5% to 3.5% for all categories of Commodities.

Using the existing effective VAT rates by commodity categories as shown in Table 1, and the effective rates implied by taking the middle of EEC proposed rate bands as shown in Table 2, it is assumed that prices will be changed as follows:

If $P^B_i$ represents the initial price of commodity i, $R^B_i$ and $R^A_i$ the initial and the new average effective VAT rate respectively for the same commodity category, the new price $P^A_i$ after the VAT approximation will be : $P_{Ai}=P_{Bi}(1+R_{Ai}/1+R^B_i)$.[8] It is, thus, assumed that the tVAT change is totaly felt on final prices.There is not any change because of this, on pre-VAT price. This could not be so, however, especially in the cases of VAT reductions.

Incorporating the new prices exogenously into the model, a new simulation is applied for the year 1989.

The percentage differences of prices quantities and expenditures from the baseline simulation are shown in Table 7.

The new revenue figures are estimated as the product of the new values of expenditures and the new effective average VAT rate. The initial and the new values of expenditure and VAT Revenue (after the VAT adjustment) are presented on Table 8. Their structure as well as their percentage changes from the baseline estimates are shown on Table 9.

It can be seen that, adopting the middle rates of the EEC VAT proposed bands, and the assunption that the post-VAT price

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8. For any commodity i consider:
$P^B_i = PO^B_i \ (1+RBi)$ where $PO^B_i$ the price before VAT burden.

Under the assumption that $PO^B i$ remains unchanged

$P^A_i = PO^B i(1+R^A i$

$P^A_i/P^B_i = (1+R^A i/(1+R^B_i)$ and

$P^A i=P^B i(1+R^A_i)/1+R^B_i)$

of each commodity bears the whole burden or reduction of VAT, the implicit deflator of the total private consumption would be reduced by -1.6%. The higher reductions are shown in Tobacco (-11.8%), Recreation (-4.4%), Housing (-4.3%). Drinks and Medical Equipment will present a reduction between 3.4-4.4%, while Miscellaneous Goods and Services would bear the most significant increase (6.1%). Transport, Durable and Clothing would show a moderate increase of 1.5 - 2.6% and the price of food seems to be practically unchanged.

Given total expenditure implied by the Linear Expenditure System, the total volume of private consumption would increase by 1.6% due to the aforementioned reduction on the average in prices.

As a result of their "own" and "cross" elasticities and the price changes effected by VAT harmonization, Tobacco, Recreation, Personal Care, Housing, and (to a lesser extent) Drinks and Housing show the most significant increase in quantities consumed. Miscellaneous Goods and Services show the most significant reduction(-1.5%) while the quantities consumed of the categories: Food, Clothing, Durables and Transport can be considered that they will be virtually unchanged.

Looking at the Tables 8 and 9, it can be inferred that whilst the structure of expenditure is not significantly changed, that of revenue shows a considerable change. The share of the revenue coming from the categories Miscellaneous and Housing into total renenue increases by 5-6 percentage points while the share of the revenue coming from Tobacco decreases by 4 percentage points. Moderate changes in their percentage share are shown in Durables and Transport(+2%) and in Recreation (-2%).

Similarly, in terms of percentage changes, revenue from Tobacco and Miscellaneous show the most significant change -48 and +58% respectively, while Housing, Medical Care, Recreation and Drinks follow with +40, -36 -26, and 26% change respectively. VAT revenue from food remains unchanged.

## 5.4. Conclusions

It is found that relative price changes and the related

demand structure and VAT revenue will be marginally affected in Greece after VAT harmonization is put in effect.

Total VAT Revenue seems to be affected negatively but not significantly while the changes in demand for commodity categories seems to change by no more than 6.5% for Tobacco (related with a relative significant price change of 11%) and 3% for a number of categories.

These results suggest that VAT harmonization with EEC proposals (a) will not have any significant effect on the demand structure and thus on the production and external trade activity (b) will not create any significant lost of Public revenue.

TABLE 7

Percentage Difference from the Baseline

| Commodity Categories | Prices | Quantities Demanded | Expenditure |
|---|---|---|---|
| 1. Food | -0.09 | 0.06 | -0.03 |
| 2. Drinks | -3.42 | 1.08 | -2.38 |
| 3. Tobacco | -11.76 | 4.64 | -7.67 |
| 4. Clothing | 1.69 | -0.33 | 1.37 |
| 5. Housing | -4.34 | 1.01 | -3.38 |
| 6. Durable | 2.65 | -0.78 | 1.85 |
| 7. Personal Care | -3.83 | 2.99 | -0.96 |
| 8. Transpsort | 1.41 | -0.66 | 0.74 |
| 9. Recreation | -4.39 | 2.44 | -2.06 |
| 10. Others | 6.10 | -1.55 | 4.55 |
| Total | -1.60 | 1.60 | 0.00 |

TABLE 8

Expenditure and VAT Revenue

(Bill. Drachmas)

| Commodity | Initial Exp/ture | Initial Revenue | New Exp/ture | New Revenue |
|---|---|---|---|---|
| 1. Food | 1.911 | 159 | 1.910 | 157 |
| 2. Drinks | 44 | 8 | 43 | 6 |
| 3. Tobacco | 218 | 78 | 201 | 40 |
| 4. Clothing | 585 | 105 | 593 | 119 |
| 5. Housing | 721 | 93 | 697 | 56 |
| 6. Durable | 530 | 90 | 540 | 108 |
| 7. Personal Care | 211 | 26 | 209 | 17 |
| 8. Transport | 844 | 113 | 851 | 128 |
| 9. Recreation | 378 | 87 | 370 | 65 |
| 10. Others | 635 | 83 | 663 | 133 |
| Total | 6.077 | 842 | 6.077 | 829 |

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TABLE 9

Structure and Percentage Changes

| Commodity Categories | Structure % | | | | Perc/age |
|---|---|---|---|---|---|
| | Initial Exp/re | Initial Revenue | New exp/ure | New Revenue | % change of exp/tur |
| 1. Food | 31.4 | 19.3 | 31.4 | 19.0 | 0.0 |
| 2. Drinks | 0.7 | 0.9 | 0.7 | 0.7 | -2.4 |
| 3. Tobacco | 3.6 | 9.6 | 3.3 | 4.9 | -7.7 |
| 4. Clothing | 9.6 | 12.8 | 9.8 | 14.3 | 1.3 |
| 5. Housing | 11.9 | 11.3 | 11.5 | 6.7 | -3.4 |
| 6. Durable | 8.7 | 10.9 | 8.9 | 13.1 | 1.8 |
| 7. Personal Care | 3.5 | 3.2 | 3.4 | 2.0 | 1.0 |
| 8. Transport | 13.9 | 13.8 | 14.0 | 15.4 | 0.7 |
| 9. Recreation | 6.2 | 10.5 | 6.1 | 7.8 | -2.1 |
| 10. Others | 10.4 | 10.1 | 10.9 | 15.9 | 4.5 |
| Total | 100 | 100 | 100 | 100 | 0.0 |

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