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# Regional differences between North and South Greece at the turn of the century

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# **REGIONAL DIFFERENCES BETWEEN NORTH AND SOUTH GREECE AT THE TURN OF THE CENTURY**

by

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## **I. INTRODUCTION**

Despite the confusion surrounding the measurement of public sector outputs with respect their demand and their distribution the growing abundance of statistical data on public expenditures has been given intensives to the investigators of public economics to undertake research on the determinants of such expenditures. Attention has been focused upon public expenditures in an attempt to redress the imbalance emphasized on the role of taxation only. For some one hundred years back Adolph Wagner, the German economist has suggested that as the development of a Nation proceeds government expenditure would increase. The so called «law of expanding state activity» has since empirically tested by a number of investigators. Wagner's law is tested by all these studies<sup>1</sup> by observing the statistical significance of the income elasticity of public expenditures. Timm [27] was the first to interpret Wagner's law from Wagner's original writings. Since Timm's important contribution there is a significant number of researchers that attempted to verify Wagner's law. In these studies it seems that the investigators have some problems in identifying the correct definitions of the dependent and independent variables that enter Wagner's relation. As we will see the problem of the correct specification of Wagner's relation is also unsolved and in the present study.

The present article presents an attempt to verify Wagner's law in Greece. In order to have a significant result about the validity several specifications are estimated and tested. These specifications refer to the traditional as well as to some structuralistic ones that associate the law with some special characteristics of the Greek economy. Therefore, in order to answer the question of what the Greek households get back for their money paid on

taxes, in section two we describe and give the traditional as well as the structural specifications of Wagner's relationship that we estimated in the present study. In section three we describe the statistical data we used and comment on the econometric problems that are associated with the estimation of the relationships. In section four we present the results of the estimations and in the concluding one, we summarize our findings from the point of view of their precision and for the implications that Wagner's law has, when accepted, on other macroeconomic variables of the Greek economy.

## **II. TRADITIONAL AND STRUCTURAL SPECIFICATIONS OF WAGNER'S LAW.**

As we noted early at the introduction, there have been numerous specifications of Wagner's law. These specifications are often named as traditional as well as structural. The former refer directly to Wagner's relationship whereas the latter specifications are associated by the law with some special conditions (structure) that hold for the Country in question. But let us now consider the candidate variables for Wagner's relation. The variables that are candidates for the independent variable in Wagner's law (development accordingly<sup>2</sup>) are National income alone or in per capita terms, gross domestic product and gross National product alone or expressed in per capita terms. On the other hand candidates for the dependent variable in the relationship (public expansion) are government expenditure and consumption in aggregate or desegregated terms. Both candidate dependent variables mentioned above are used alone, in per capita terms, or in share form, ie., divided by figures of the alternative set of the candidate independent variables that were mentioned previously.

The structural specifications are based on the preposition<sup>3</sup> that government expenditures increases as an economy passes through the transition from agricultural - rural to industrial-urban and per capita incomes rise. Based on the above argument, Pryor's [23] suggestion is that the relation that expresses Wagner's law appears more random in advanced industrialized Nations. Because of the above preposition there is a number

of studies at international level that compare public expansion with special reference to the stage of development of the countries<sup>4</sup>. Thus, given the above suggestion candidates for the independent variable (additional ones) are the share of manufacturing and agricultural sector in the Gross Domestic Product (GDP), the rate of urbanization, the population size and unemployment rates for the county(ies) in question. All the above structural variables relate public expansion with the structure of the economy in investigation. But let us now describe each of the suggested in the literature traditional and structural specifications for Wagner's relationship.

Bird [5] suggests per capita income and share of public expenditure in National income as the relevant independent variables that identify Wagner's law in industrialized Nations. The law holds true when the income elasticity for a number of public expenditure categories is larger than one and positive. The traditional Peacock - Wiseman [20] version of Wagner's law relates government aggregate expenditure and gross domestic product in a period for the Nations to hand that is not necessarily of growth and development. The same is true for Pryor [23] but where the level of government expenditure/consumption serves for the dependent variable. Thorn [26] as well as Pryor [23] mentioned for a «ratio - income elasticity» and used an alternative formulation for the dependent variable in Wagner's law, namely the share of public expenditure/consumption in gross National product. Musgrave [17] regressed the above mentioned variable on income per capita in order to test the hypothesis of «expanding scale activity» in public expenditures<sup>5</sup>. Goffman<sup>6</sup> [10] is in line with Bird's [5] and Musgrave's [17] suggestions as well as that of Williamson's [29]. Michas [16] and Gupta [12] introduced the notion of «absence of development illusion» in Wagner's relation by the deflation of both dependent and independent variables in the relation by the size of the population<sup>6</sup>. Thus, the scale of increase in public expenditures per capita is independent of the increase in population. In other words, public expenditure is a homogeneous of degree one function in income (development) and population variables and there are no economies of scale in public expenditures and consumption. Finally, for all the above traditional

specifications of Wagner's law we have to note that the share forms have been found by Peacock and Wiseman to be the superior ones.

The independent variables that enter the structural versions of Wagner's law refer to manufacturing and agricultural sectors portion of gross domestic product, to the total population living in urban areas, to total population figures and to unemployment rates. The latter variable is an index of counter - cyclical policies that affect the level of government expenditures.

The above mentioned candidate variables that illuminate Wagner's law do not exhaust the set of determinants of public expenditures.

In brief, we refer some factors that determine also the size of growth of public expansion. These are, the effect of wars<sup>7</sup>, the expenditure patterns of households in the country that change over time, the consideration of public goods as those of better quality, the change in perception of what the public sector can do, the declining importance of public debt for the present generation<sup>8</sup>, international demonstration effects<sup>9</sup>, the partisan composition of government and constitution, political/budgeting influence and other factors. In the present study all the above factors that determine public expansion are held constant except population, urbanization and rates of unemployment that we consider to play significant role in explaining the growth of the non-market sector.

Summarizing, the specifications of both traditional and structural versions of Wagner's law that we estimate and test in the present study are as following:

#### A. Traditional specifications

##### 1. Peacock - Wiseman [19, 20] version

$$G_e = F(\text{GDP}) \quad (1)$$

##### 2. Pryor's [23] version

$$G_c = F(\text{GDP}) \quad (2)$$

##### 3. Goffman's [10] specification

$$G_e = (\text{GDP}/N) \quad (3)$$

##### 4. Musgrave's [17] suggestion

$$G_e/\text{GDP} = F(\text{GDP}/N) \quad (4)$$

5. Gupta's [12] and Michas [16] form

$$G_e/N = F(GDP/N) \quad (5)$$

6. Modified Peacock - Wiseman [19,20] version

$$G_e/GDP = F(GDP) \quad (6)$$

## B. Structural specifications

1. Manufacturing sector portion of GDP

$$G_e/GDP = F(M/GDP) \text{ and/or}$$

$$G_c/GDP = F(M/GDP) \quad (7)$$

2. Agricultural sector portion of GDP

$$G_e/GDP = F(A/GDP) \text{ and /or}$$

$$G_c/GDP = F(A/GDP) \quad (8)$$

3. Urbanization considerations

$$G_e/GDP = F(U) \quad (9)$$

4. Economies of scale version

$$G_e/N = F(GDP/N, N) \quad (10)$$

5. Both manufacturing and agricultural sectors portions of GDP introduced

$$G_e/GDP = F(M/GDP, A/GDP) \text{ and /or}$$

$$G_c/GDP = F(M/GDP, A/GDP) \quad (11)$$

6. Ganti and Kolluri [9] counter - cyclical considerations.

The authors consider the unemployment rate variable in association with public expansion as an index of some cyclical movements of the latter. In the present study the unemployment variable (UR) has been introduced in inverse form in each of the above listed structural specifications except the relation in (10).

Finally, the definitions of the variables are as following:

$G_e$  = government expenditure

$G_c$  = government consumption

GDP = Gross Domestic Product

N = Population

M = Manufacturing output

A = Agricultural output

U = Urbanization rate (people living in urban areas/total population)

UR = Unemployment rate.

### **III. COMPUTATIONAL CONSIDERATIONS**

#### **A. The Statistical Data**

The Statistical Data<sup>10</sup> on the previous section listed variables are derived from the National accounts of Greece for the period 1980 - 1995 provided by the National Statistical Service (NBS) of the Country. Given that the unit of analysis is the state (Central Government), the variable of government expenditure ( $G_e$ ) includes government consumption ( $G_c$ ) plus government capital formation and transfer payments minus expenditure of local government.

#### **B. Econometric Considerations**

These are three distinguished econometric problems when one attempts to validate Wagner's law. The first refer to identification or demand and supply of government expenditures. The second arises from the fact that the traditional specifications for the law that we describe in section II are empirical ones without any econometric plausibility with the consequence of arbitrary specifications of the relationship and the increase in the probability of committing specification error. Finally, there is the problem of simultaneous bias that arises when one attempts to estimate the specifications of Wagner's law that we consider in the present study by original least squares (OLS) method<sup>11</sup>. But let us see how each of the above mentioned econometric problems are given a solution in our study.

Identifications of demand and supply of public goods is indeed a difficult problem. This is a major shortcoming of empirical studies of Wagner's law, given that the observed statistical data on government expenditures may be are a Combination of demand and supply conditions that prevailed in the period of observation.

The only solution we can give is the suggestion that like the other empirical studies on Wagner's relation the present study is demand oriented. Our suggestion relies on the observation that the factors that are thought to

explain public expenditures are largely associated with demand rather than supply of such expenditures.

Coming now to the problem of the correct specification of Wagner's law we note that besides the attempts to identify economic plausibility in demand functions for public goods<sup>12</sup> the Arrow's impossibility theorem warns us that there is no logically consistent mechanism for the aggregation of individual preferences. Thus, the researcher has the alternative to give more than one specifications for the relationship. Choosing among different specifications can be made easy by considerations of statistical criteria such as t-ratios, coefficient of determination, Durbin - Watson statistics, etc. Thus, in the present study we acknowledge the absence of economic plausibility of Wagner's relation and consider the different specifications for it with an eye on the previously mentioned statistics when choosing or comment on the true specification of the relation.

The simultaneity problem has been suggested by the investigators of public expansion. Henning and Tussing [14], Hadjimatheou [15]. Ganti and Kolluri [9] and Wagner and Weber [28] refer to bias that arises when one estimates the specifications of Wagner's law outlined in section II of the present study by OLS. This bias is due to the fact that GDP is the endogenous variable in the relation and also that  $G_e$  is a component of GDP. Hadjimatheou [13] shows that simultaneity affects income elasticity in Wagner's relation upwards and when the elasticity is larger than one, Wagner's law is accepted whereas it has to be rejected due to this bias. Henning and Tussing [14] acknowledge the problem that both  $G_e$  and GDP are endogenous variables and estimated the equation

$$G_e = a + bGDP \quad (12)$$

by indirect least squares where by definition

$$GDP = C + I + X - M \quad (13)$$

where C denotes private consumption, I investment, X exports and M imports. Ganti and Kolluri [9] used Zellner's [30] method of multiproxy search<sup>13</sup> where  $GDP/N$  is the unobservable variable being a function of potential  $GDP/N$  and business cycle variables such as unemployment. Finally, Wagner and Weber [28] in order to give a solution to the



simultaneity introduce permanent income per capita in the specifications for Wagner's relationship but their estimation of permanent income figures is rather arbitrary<sup>14</sup>.

#### **IV. THE RESULTS**

To provide evidence on the convergence criteria we performed cointegration tests using the Johansen test. The idea for the Johansen test is as follows: if there is a set of endogenous variables which are integrated in the same order, i.e. each is non - stationary, or each has a unit root, or it has a stochastic trend, then there can be as many as N-1 linearly independent cointegrating vectors. If there is evidence of co-integration among a group of non- stationary variables this means that there is a long run equilibrium relationship and thus indicates that convergence is possible because we know that the variables do not diverge. In order to perform the cointegration test, one needs first to test for unit roots in the time - series data of all the variables. The Augmented Dickey - Fuller (ADF) test was performed for all time series variables.

**TABLE 1. (GDP)**

	<b>CONSTANT</b>		<b>CONSTANT AND TREND</b>	
	<b>LEVEL</b>	<b>1<sup>ST</sup> DIFF.</b>	<b>LEVEL</b>	<b>2<sup>ND</sup> DIFF.</b>
East Macedonia and Thraki	-1.43	-2.43	-2.49	-4.44*
Central Macedonia	-1.10	-2.07	-1.98	-5.99*
West Macedonia	-1.40	-2.56	-2.28	-4.32*
Epirus	-1.45	-1.97	-1.99	-4.38*
Thessalia	-1.15	-1.65	-1.72	-2.38*
Ionian Island	-1.02	-1.94	-1.83	-4.32*
West Greece	-0.80	-1.91	-1.92	-5.92*
Central Greece	-0.92	-2.13	-2.15	-3.18*
Attiki	-0.92	-2.77	-2.69	-4.10*
Peloponissos	-0.94	-2.42	-2.18	-3.85*
North Egeo	-1.14	-1.58	-2.32	-3.17*
South Egeo	-1.17	-2.05	-1.08	-4.72*
Creta	-0.78	-2.16	-3.18	-3.78*
North Greece	-0.99	-2.31	-2.43	-3.99*
South Greece	-0.77	-2.21	-1.85	-5.31*
Greece	-0.99	-2.44	-2.18	-4.15*

In Table 1 above, the stationarity test was performed for the GDP. The test was performed in two different versions. According to the ADF test, all areas have a unit root at the levels. In order to utilize the best cointegrating model, we plotted the data of the time series variables and choose the model(s) in accordance to the shape of the time plot of the data. We found that particular subsets of areas cointegrate with cointegrating vectors subsets of areas cointegrate with cointegrating vectors equals to one less than the number of variables. Such relationship implies that there is a common trend in all those areas GDP and this suggests that these all areas constitute an optimum currency area.

\* Agricultural Bank of Greece, Research and Planning Division.

**TABLE 2. (Ge)**

	<b>CONSTANT</b>		<b>CONSTANT AND TREND</b>	
	<b>LEVEL</b>	<b>1<sup>ST</sup> DIFF.</b>	<b>LEVEL</b>	<b>2<sup>ND</sup> DIFF.</b>
East Macedonia and Thraki	-1.98	-5.87	-2.02	-4.32
Central Macedonia	-1.53	-3.48	-1.03	-6.38
West Macedonia	-1.74	-4.39	-1.61	-6.41
Epirus	-1.32	-3.18	-1.72	-4.16
Thessalia	-1.78	-2.93	-1.18	-2.79
Ionian Island	-1.34	-4.10	-0.73	-3.43
West Greece	-1.18	-2.19	-0.39	-2.99
Central Greece	-1.32	-4.22	-1.16	-3.14
Attiki	-1.17	-3.92	-0.93	-3.56
Peloponissos	-1.42	-4.76	-0.81	-4.14
North Egeo	-1.84	-2.70	-0.90	-4.03
South Egeo	-1.43	-4.56	-1.06	-3.02
Creta	-1.81	-6.17	-1.46	-8.34
North Greece	-0.32	-2.44	-2.56	-3.91
South Greece	-1.42	-3.18	-1.83	-4.11
Greece	-1.38	-2.41	-2.18	-4.52

In order to carry out cointegration tests we first performed stationarity tests (Table 2) using ADF. According to the Augmented Dickey Fuller Test, all areas have a unit root at the levels. This means that the areas integrate of order zero. The results of cointegration indicate that there is a long run equilibrium relationship of the long run government expenditures of the areas.

**TABLE 3.****he Results of the Regressions of the Traditional version of Wagner's****Law. Peacock - Wisemann version.****Dependent Variable ln Ge****TABLE 1. (GDP)**

	<b>C</b>	<b>ln GDP</b>	<b>R<sup>2</sup> :0,9948</b>
East Macedonia and Thraki	-6.4032 (-5.675)	1.402 (14.53)	DW <sup>1/5</sup> 1,832
West Macedonia	-4.832 (-4.942)	1.382 (10,472)	R <sup>2</sup> : 0,9478 DW: 1,648
Central Macedonia	-6.4838 (-7.415)	1.672 (12.438)	R <sup>2</sup> : 0.9653 DW <sup>1</sup> : 1,748
Epirus	-3.8483 (-4.686)	1.0233 (9.748)	R <sup>2</sup> : 0.9190 DW: 1,6174
Thessalia	-5.3848 (-6.738)	1.4142 (10.747)	R <sup>2</sup> : 0.9291 DW <sup>1</sup> : 1,842
Ionian Island	-4.6763 (-3.883)	1.3111 (9.123)	R <sup>2</sup> : 0,9208 DW: 1,7767
West Greece	-8.3318 (-4.663)	1.2132 (5.483)	R <sup>2</sup> : 0.9010 DW <sup>1</sup> : 1,7892
Central Greece	-6.7178 (-6.812)	1.2158 (5.6117)	R <sup>2</sup> : 0,8992 DW: 1,6189
Attiki	-8.7112 (-5.432)	1.7818 (8.748)	R <sup>2</sup> : 0.9892 DW <sup>1</sup> : 1,8732
Peloponissos	-5.6732 (-9.1012)	1.6218 (7.748)	R <sup>2</sup> : 0.9717 DW <sup>1</sup> : 1,6182
North Egeo	-4.3892 (-3.4748)	1.2108 (6.1832)	R <sup>2</sup> : 0.9092 DW <sup>1</sup> : 1,832
South Egeo	-4.6192 (-6.832)	1.3482 (7.8921)	R <sup>2</sup> : 0.9393 DW: 1,7617

Creta	-5.8391 (-7.8917)	1.5114 (9.3314)	R <sup>2</sup> : 0.9698 DW <sup>1</sup> : 1,8972
North Greece	-4.9978 (-6.1892)	1.4372 (8.7372)	R <sup>2</sup> : 0.9792 DW <sup>1</sup> : 1,7232
South Greece	-5.6636 (-7.1819)	1.6232 (7.7749)	R <sup>2</sup> : 0.9982 DW <sup>1</sup> : 1.9831

The results of the regressions of the traditional version of Wagner's law are recorded in table 3. It seems from the results that each equation more or less satisfy certain statistics such as the value of t ratios, coefficients of determination and Durbin - Watson statistics. Furthermore, given that income elasticity of public expansion is statistically significant in the traditional version of Wagner's law at least, we may conclude from our findings that Wagner's law of expending state activity is valid for the Country<sup>16</sup>. According thus to the evidence that the estimated traditional version gave to us public expansion occurs at higher rates than Gross Domestic Product. The results of the present study give some irritations to the researcher of public sector to undertake some further study on the consequences of the validation of Wagner's law in the study. Several questions arise from the validation. At first a reasonable one is how to finance the increases. Should one suggest increases in taxes or in deficits? Another implied question that naturally comes in is if the financing of the increase in public expenditures by taxes or debt issues also matters. Finally, the validation of Wagner's law in the present study arises questions such as the interconnection between, public expenditure and inflation in the Country as well as the search for effects of public on private expenditures that are described by the term "crowding out".

## **V. CONCLUSIONS**

The main purpose of the present study was to find out the applicability of Wagner's law for Greece. For this purpose, we tested the traditional version of the law using data of the relevant variables over the period 1980 - 1995. The results of the estimation of the traditional version of the relationship, show to us that public expenditure, are not determined by social and political history of the Country but they follow an economic law, which explains the behavior of expenditures over economic development of the Country.

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<sup>1</sup> For a review, see Michas [16]

<sup>2</sup> In fact Wagner used the term "developing cultured people" or "communities". See Michas [16]

<sup>3</sup> See basically Pryor [23]

<sup>4</sup> See Bacon and Eltis [2] and Bacon and Bacon [1]

<sup>5</sup> See Musgrave [17]

<sup>6</sup> For the notion of economies of scale but for the case of private goods, see Prais - Houthakker [21] and Sapounas [24]. Peacock [19] considers also household composition as another additional variable that determines government expenditure. On the other hand Shoup [25] analyses the association of public sector costs and the growth in population.

<sup>7</sup> The effects of war on public expenditure are revealed after its end (displacement effect). See Peacock and Wiseman [19]

<sup>8</sup> See Burkhead and Miner [6]

<sup>9</sup> This "catching up hypothesis" is suggested in Gould [11]

<sup>10</sup> Available from the authors or request

<sup>11</sup> Another problem that is met is the problem of the true functional form of the general specifications of the law listed in section II of the text. Unlike Engel's law in Wagner's one we seldom find in studies other functional forms except the logarithmic one. Perhaps this is due to the fact that some other functional forms such as the linear, semilog and log - inverse one s imply some a priori behaviour for the elasticity of public expenditures. This behaviour is not generally accepted by Wagner's law itself.

<sup>12</sup> See for instance Bergstoand Godman [4] and Ferris [8] as well as Noam [18]

<sup>13</sup> Zellner's [30] method consists in the estimation of the following system of equations:

$$\ln(G_e/N) = k + a \ln(GDP/N) + 1 \ln(D/N) + u_1$$

$$\ln(GDP/N) = \ln(GDP/N)^* + u_2$$

$$\ln(GDP/N)^* = b_1 \ln(GDP/N)_f + b_2 \ln(UR)$$

where, D/N denotes per capita real defense expenditures, the asterisk over the variable denotes expected values,  $(GDP/N)_f$  denotes potential GDP being defined as  $GDP/(1/UR)$  and  $u_1$  and  $u_2$  denote the error terms in the equations. The reduced form of the above system of equations requires for efficiency the use of an algorithm that incorporates the coefficient restrictions that are involved across the equations. See Ganti and Kolluri [9] for an exposition.

<sup>14</sup> Wagner and Weber [28] estimated the following equation:

$$\ln(G_e/N) = b_0 + b_1 t + b_2 t + b_2 \ln(Y^P/N)$$

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where  $Y^p$  denotes permanent income and  $t$  the time variable. Permanent income figures are estimated as following:

$$Y^p/N = -0.5(RNI/N)_t + 0.5(RNI/N)_{t-1}$$

with RNI representing figures of real national income that incorporates other determinants of  $G_e/N$  that are not included in the above equation.

<sup>15</sup> Durbin - Watson statistics adjusted for autocorrection by Cochrane - Orcutt technique.

<sup>16</sup> The same conclusion has been reached by Bacon and Bacon [1], when searching for the growth of the non-market sector in Greece.