TESTING THE VALIDITY OF WAGNER'S LAW IN TURKEY: THE BOUNDS TESTING APPROACH

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Wagner Yasası'nın Türkiye'deki Geçerliliğinin Sınanması: Sınır Sınaması Yaklaşımı

Özet

Bu makalenin amacı, Wagner yasasının Türkiye için ampirik geçerliliğini "sınır sınama yaklaşımını" kullanarak sınamaktır. Bu yaklaşım, kamu sektörü faaliyetleri ve ekonomik gelişme arasında bir uzun dönem ilişkisi olup olmadığını sınarken, eşbütünleşme sınamalarının ön koşulu olarak bütünleşme derecesinin doğru belirlenmesi gereğini ortadan kaldırma olanağı tanımaktadır. Wagner yasasının ampirik incelemesi, iki adet yıllık veri öbeği ve yasanın beş ayrı ifade şekli kullanılarak yapılmıştır. 1923-2003 zaman aralığını kapsayan veri öbeğinde, genel bütçe harcama rakamları kullanılırken, 1950-2003 zaman aralığını kapsayan veri öbeğinde, konsolide bütçe harcamaları verisi kullanılmıştır. Ancak, bu çalışmada, verilerle desteklenen herhangi bir uzun dönem Wagner ilişkisinin varlığına dair bir bulguya rastlanılmamıştır. Bu sonuç, geleneksel eşbütünleşme sınamaları kullanılarak yapılmış olan çalışmaların bulgularının aksine, Türkiye'de kamu sektörü faaliyetleri ile ekonomik gelişme arasında zayıf bir ilişkinin olduğunu göstermektedir.

Anahtar Kelimeler: Kamu harcamaları, Wagner Yasası, sınır sınama yaklaşımı, eş-bütünleşme, Türkiye.

Abstract

The objective of this paper is to test the empirical validity of Wagner's law in Turkey by using the "bounds testing approach". This approach makes it possible to overcome the dependency of cointegration tests on the precise knowledge of the order of integration while testing the presence of a long-run relationship between government activity and economic development. The empirical investigation of Wagner's law is based on two samples of annual data and five different specifications of the law. The sample covering the period of 1923-2003 depends on general budget expenditure figures while the other, which covers the period of 1950-2003, depends on the consolidated budget expenditures data. However, in this study, no empirical evidence of a long-run Wagnerian relationship could be found supported by the data. This outcome implies a weak association between government activity and economic development in Turkey, contrary to the findings of previous studies that use conventional cointegration tests.

Keywords: Government expenditures, Wagner's law, bounds testing approach, co-integration, Turkey.

Testing the Validity of Wagner's Law in Turkey: The Bounds Testing Approach

The debate on the size of government has been on the agenda of public finance studies for years. Wagner's 'law of increasing state activity' is a well-known controversy of the relevant literature introduced by the German economist Adolph Wagner in the 1880's, which postulates the increasing expansion of government activities as the result of increases in real income during the industrialization process. As summarized in the literature, there are three main reasons for the increased government involvement stated in Wagner's writings. First, government activity increases because industrialization leads to a substitution of public for private sector activity. Second, the government activity increases with the supply of cultural and welfare services for which the demand is stimulated by the increase in wealth along with the economic growth on the one hand and by social problems due to the industrialization and population concentration on the other. Finally, expanding government activities are related to increases in government interventions to manage and finance natural monopolies.

Wagner's law has been put alternatively by Meltzer and Richard (1981) in the context of the public choice theory. Meltzer and Richard measure the relative size of government with the share of income redistributed by government where the size of government depends on the relation of mean income to the income of the decisive voter who is in fact the median voter. As the number of voters below mean income increases votes for redistribution increase. Under majority rule, an increase in mean income relative to the income of the median voter increases the size of the government because the welfare maximizing median voter prefers governments that redistribute income through higher taxes. In this sense, Meltzer and Richard suggest amending Wagner's law by including the effect of relative income in addition to absolute income.

In the Wagner's law framework, a positive long-run relationship between public expenditure and income is proposed with a causality running from the latter to the former. However, Peacock and Scott (2000) argue that Wagner's writings imply an association between government activity and economic development rather than a cause and effect relationship between them. In this regard, testing for cointegration between public expenditure and income is a theoretically plausible way of verifying the validity of the Wagnerian relationship. Particularly when variables of interest carry non-stationarity characteristics, testing for Granger causality can be illustrative only if a cointegration relationship exists between variables of interest. Causality and cointegration tests are not mutually exclusive econometrically, but if variables of interest are not cointegrated, a causal relation between government activity and economic development would be questionable as evidence of a Wagnerian relationship.

In this paper, the validity of Wagner's law has been tested by using the "bounds testing approach" for the first time in the literature. This approach, proposed by Pesaran et al. (2001), allows testing the presence of a long-run (cointegration) relationship irrespective of whether the regressors are purely I(0), purely I(1) or mutually cointegrated. However, the conventional cointegration techniques, such as Engle-Granger (1987) and Johansen (1988 and 1992) approaches, require the underlying time series data to be integrated of order one. The bounds testing approach outperforms the conventional techniques when there is the uncertainty of mixed order of integration resulting from the lack of power of unit root tests. In this regard, this paper is an attempt to reveal whether or not there exists a valid long-run Wagnerian relationship in Turkey irrespective of the uncertainty of the order of integration. The presence of variables denoted in ratios in empirical specifications of Wagner's law is a factor leading to uncertainty of the order of integration because variables in ratios may become integrated of order zero. Thus, the bounds testing approach can be considered as a more appropriate way of testing the Wagnerian hypothesis than conventional cointegration approaches.

The empirical investigation of Wagner's law is based on two sets of annual data in this paper. The set covering the period of 1923-2003 depends on general budget expenditure figures while the other, which covers the period of 1950-2003, depends on the consolidated budget expenditures data. Therefore, the validity of Wagner's law is being tested from a narrow perspective in this study in the sense that the total government activity is represented with budget expenditures only, ignoring off-budget expenditures of governments, due to the lack of consistent data covering total expenditures. However, no evidence of a long-run Wagnerian relationship could be found supported by these data sets.

The plan of the paper is as follows. An overview of the recent empirical literature is presented in section II below. After giving a brief description of the methodology in section III, the models and the data are presented in section IV. The empirical findings and concluding remarks are provided in sections V and VI, respectively.

I. Review of the Recent Empirical Literature

The empirical validity of Wagner's law has been tested for various countries in several studies in the literature. However, with the introduction of advanced econometric methods, i.e. unit root tests and the cointegration technique, most of the past empirical findings based on time series data have been deemed to be spurious. Valid tests of Wagner's law which is hypothesized to be a positive long-run relationship between the public expenditure and income can be performed only if the variables in question are either stationary or cointegrated. In this sense, Murthy (1993), Henrekson (1993), Ashworth (1994), Hayo (1994) and Murthy (1994) investigated spuriousness in testing the validity of Wagner's law relationship for the first time in the literature and used the cointegration technique within this context. However, in these studies no consensus is reached about the presence of a cointegration relationship between public expenditure and income. Murthy (1993 and 1994) find results supporting Wagner's law in Mexico while Ashworth (1994) and Hayo (1994) find results rejecting the validity of Wagner's law in Mexico and Henrekson (1993) in Sweden. In subsequent studies by Hondroyiannis and Papapetrou (1995) and Chletsos and Kollias (1997) for Greece, Asseery et al. (1999) for Iraq, Burney (2002) for Kuwait and Legrenzi and Milas (2002) for Italy, no empirical evidence of a long-run relationship supporting Wagner's law is found. On the other hand, Oxley (1994) for Britain, Ahsan et al. (1996) and Biswal et al. (1999) for Canada, Thornton (1999) for six European countries (Denmark, Germany, Italy, Norway, Sweeden and UK), Kolluri et al. (2000) for G7 countries, Islam (2001) for USA, Chang (2002) for two of the three emerging industrialized countries of Asia (South Korea, Taiwan but not for Thailand) and three industrialized countries (Japan, USA and UK) and Dritsakis and Adamopoulos (2004) for Greece, report strong support for the long-run validity of Wagner's law.

There are very few studies concerning the validity of Wagner's law in Turkey. Among these, while Önder (1974), Ulutürk (1998) and Halıcıoğlu (2003) find no supporting empirical results, Kyzyzanick (1974), Yamak and Zengin (1997), Yamak and Küçükkale (1997) and Günaydın (2000) find evidence of Wagner's law relationship. However, only the recent studies by

Yamak and Küçükkale (1997), Günaydın (2000) and Halıcıoğlu (2003) address the spuriousness problem and test for cointegration.

Focusing on a positive cointegration relationship between government activity and economic development rather than on a causality relationship seems to be the appropriate way of testing the validity of Wagner's law. In this regard, Peacock and Scott (2000), who criticized studies testing Wagner's law empirically, state the consistency of the cointegration approach with Wagner's view. Peacock and Scott (2000: 3) criticize the studies based on causality tests with the rationale that in his writings "... Wagner does not present an articulated model of the growth process in which cause and effect are clearly delineated."

The next section briefly illustrates the cointegration approach used in this study, which is different from the ones used for testing the validity of Wagner's law in the literature.

II. The Methodology

The bounds testing approach developed by Pesaran et al. (2001) allows testing for cointegration based on the parameter estimates of a conditional unrestricted Equilibrium Correction Model (ECM),

$$\Delta y_t = \alpha_0 + \alpha_1 t + \beta_1 y_{t-1} + \beta_2 x_{t-1} + \sum_{i=1}^{p-1} \delta_{1i} \Delta y_{t-i} + \sum_{i=1}^{p-1} \delta_{2i} \Delta x_{t-i} + \phi \Delta x_t + u_t \qquad (1)$$

which is derived from the Vector Autoregression (VAR) model. In the above representation, which can also be interpreted as an Autoregressive Distributed Lag (ARDL) equation for y, x is the *long-run forcing variable*, p is the order of the VAR system, t is a deterministic trend and Δ is the first-difference operator. The presence of a long-run relationship is tested in two alternative ways as proposed in Pesaran et al. (2001). One is an F-statistic to test the null of H_0:β_1=β_2=0 and the other is a t-statistic proposed by Banerjee et al. (1998) to test the null of H_0:β_1=0. The rejection of either of these null hypotheses indicates that underlying variables in levels are cointegrated, irrespective of whether these variables are purely I(0), purely I(1) or mutually cointegrated. However, the asymptotic distributions of both statistics are non-standard. Pesaran et al. (2001) provide two sets of critical values that construct a lower and an upper critical value bound assuming that the forcing variables are purely I(0) and purely I(1), respectively. With respect to this *bounds testing* procedure, an F- or a t-statistic smaller than the lower bound represents the non-rejection of the null of no cointegration whereas a statistic greater than the

upper bound provides evidence of a relationship in levels between variables in question.

The next section proceeds with the description of different versions of models used in the literature and with the sources and the definitions of the data used to estimate these models in the paper.

III. The Model and the Data

Wagner's law relationship is represented in varying forms in the literature due to different interpretations of Wagner's original exposition. Empirical studies exhibit no unanimity in the definitions of government activity and economic development. With reference to fifteen studies, Peacock and Scott (2000) show that there can be at least thirteen specifications of the law, in which government activity appears with fourteen different definitions and three specifications leading to forty two possible dependent variables. In this respect, this study exploits the most frequently used five versions of the Wagner's law relationship in the literature. These are as follows:

$$G = f(Y) \tag{2.1}$$

$$G = f(Y/N) \tag{2.2}$$

$$G/N = f(Y/N) \tag{2.3}$$

$$G/Y = f(Y/N) \tag{2.4}$$

$$G/Y = f(Y) \tag{2.5}$$

where G is real total government expenditure, Y is real gross national product (GNP) and N is population. Hence, Y/N and G/N denote per capita real GNP and per capita real total government expenditure respectively, while G/Y is the share of real total government expenditure in real GNP.

The unavailability of a long span disaggregated government expenditures data in Turkey restricts the scope of the study to the broadest definition of government activity. Therefore in this paper, estimations of the relationships given in equations (2.1)-(2.5) were carried out once for the sample period of 1923-2003 by using *general budget expenditures* including intra-budgetary transfers, and once for the 1950-2003 sample period by using *consolidated budget expenditures*[1]. However, high off-budget government

1 A descriptive analysis of the budget expenditures data used in the study is given in Appendix 1.

expenditures and high interest payments on borrowings especially in the post-1980 period prevent the accurate measurement of government activity in Turkey. In this sense, the scope of the analysis is restricted to expenditures that are reported in government budgets. Hence, in this study, the validity of Wagner's law is tested with respect to a narrow definition of the government size due to the lack of a consistent data set which might allow a broader analysis.

The source of the consolidated budget expenditures data is the State Institute of Statistics (SIS) whereas the source of the general budget expenditures data is the State Planning Organization (SPO). Nominal figures of the government expenditure data are transformed in real terms by using the GNP deflator. The real GNP figures used for calculating the deflator are with 1987 prices. The GNP data and the population (N) figures are also from the State Institute of Statistics of Turkey.

Table 1. Unit Root Tests

	Sample Period: 1923-2003				Sample Period: 1950-2003			
	ADF		KPSS		ADF		KPSS	
	no trend	trend	no trend	trend	no trend	Trend	no trend	trend
Y	-1.19(0)	-2.95(0)	1.26(6)**	0.09(6)	-2.29(0)	-2.32(0)	0.88(0)**	0.22(5)**
ΔY	-10.6(0)**	-10.6(0)**	0.12(3)	0.06(3)	-7.96(0)**	-8.41(0)**	0.39(0)	0.04(3)
G	-0.22(1)	-3.14(0)	1.26(6)**	0.12(6)	-0.02(0)	-2.69(0)	0.87(6)**	0.09(5)
ΔG	-11.0(0)**	-10.9(0)**	0.05(2)	0.05(2)	-9.21(0)**	-9.14(0)**	0.08(2)	0.06(3)
(Y/N)	-1.55(0)	-3.67(0)*	1.25(6)**	0.07(6)	-1.98(0)	-2.98(0)	0.87(6)**	0.18(5)*
Δ(Y/N)	-10.9(0)**	-10.9(0)**	0.13(5)	0.05(5)	-8.26(0)**	-8.42(0)**	0.25(2)	0.04(3)
(G/N)	-0.44(1)	-3.30(0)	1.23(6)**	0.11(6)	-0.05(0)	-2.56(0)	0.96(5)**	0.09(5)
Δ(G/N)	-11.1(0)**	-11.1(0)**	0.05(2)	0.05(2)	-9.13(0)**	-9.10(0)**	0.11(2)	0.06(3)
(G/Y)	-0.46(1)	-3.41(0)	1.09(6)**	0.16(4)	-0.31(0)	-2.60(0)	0.83(5)**	0.12(5)
Δ(G/Y)	-12.4(0)**	-12.4(0)**	0.05(0)	0.13(3)	-9.45(0)**	-9.60(0)**	0.19(1)	0.06(3)

*Notes: (1) * and ** denote 5 % and 1 % statistical significance levels, respectively. (2) Figures in parentheses are lag lengths. (3) All variables are in natural logarithms. (4) G denotes "general budget expenditures" in the sample period 1923-2003 while it denotes "consolidated budget expenditures" in the sample period 1950-2003.*

IV. Empirical Findings

The test for the presence of a long-run relationship, which is suggested by Pesaran et al. (2001), is not conditional on the order of integration of the underlying variables. However, to investigate the possible uncertainty due to mixed order of integration, it would be worthwhile to carry out some basic unit root tests prior to bounds testing procedure. Table 1 presents a conventional unit root test (ADF) suggested by Dickey and Fuller (1979) and a Lagrange Multiplier test (KPSS) suggested by Kwiatkowski, Phillips, Schmidt, and Shin (1992). The latter enables testing the null hypothesis of stationarity against the alternative of a unit root, unlike the ADF test that treats non-stationarity as the null hypothesis. This feature of the KPSS statistic is argued to provide a confirmatory analysis in unit root testing. According to the computed statistics in Table 1, unless a deterministic trend is included in regressions, all variables in both sets of data are found to be integrated of order one with respect to the ADF and KPSS statistics unanimously. However, in trend included cases, computed KPSS statistics imply that all variables are stationary, except for Y and Y/N in 1950-2003 sample period. On the other hand, Y/N seems to be stationary in the sample period 1923-2003 with respect to the ADF statistic with trend. As can be seen from the results, there is an uncertainty in the order of integration of the underlying variables when a deterministic trend is included in the unit root regressions. However, the bounds testing approach used in this study is not affected by such a mixed order of integration.

As a preliminary step in the bounds testing procedure, the appropriate lag length (p) of the VAR representation should be selected so that the conditional ECM given in (1) does not suffer from over-parametrization and serial correlation problems. In this sense, for each of the bivariate models (2.1)-(2.5) and for both samples used in the study, Akaike Information Criteria (AIC) and Schwarz Bayesian Criteria (SBC) were computed to select a lag length between p=5 and p=1. The lag length selection process was performed with and without a linear deterministic trend, together with the first- and second-order serial correlation tests. According to the computed statistics (not reported[2]), p=1 appears to be the appropriate lag length in all estimated models.

As the next step in the bounds testing procedure, the conditional ECM derived from the underlying bivariate VAR(1) model is estimated for the five versions of Wagner's law relationship. Table 2 reports F- and t-statistics computed to test the presence of a level equation for the government activity.

2 Estimation results of the lag selection process are not reported here to save space. However, the estimation output can be provided upon request.

All computed test statistics are far below the lower bound critical values. Therefore, the null hypothesis of no level relationship between government activity and economic development can not be rejected for all five versions of the

Table 2. F- and t-statistics for Bounds Tests

	Sample Period: 1923-2003					Sample Period: 1950-2003				
	trend			no trend		Trend			no trend	
	F_{IV}	F_V	t_V	F_{III}	t_{III}	F_{IV}	F_V	t_V	F_{III}	t_{III}
G = f (Y)	1.84	2.41	-2.18	2.79	-2.19	1.41	1.46	-1.61	2.08	-1.64
G = f (Y/N)	2.10	2.78	-2.33	2.69	-2.13	1.61	1.91	-1.80	2.19	-1.77
G/N = f (Y/N)	1.87	2.45	-2.19	2.83	-2.21	1.51	1.49	-1.56	2.28	-1.65
G/Y = f (Y/N)	1.87	2.45	-2.19	2.83	-2.21	1.51	1.49	-1.56	2.28	-1.65
G/Y = f (Y)	1.84	2.41	-2.18	2.79	-2.19	1.41	1.46	-1.61	2.08	-1.64

Notes: (1) The 5 percent critical value bounds for the F-statistic are F_{III}: (4.94, 5.73), F_{IV}: (4.68, 5.15), F_V: (6.56, 7.30) and those for the t-statistic are t_{III}: (-2.86, -3.22), t_V: (-3.41, -3.69). (2) The subscript III denotes computations only with an unrestricted intercept while the subscripts IV and V denote computations not only with an unrestricted intercept but also with a deterministic trend which is restricted in the former and unrestricted in the latter.

government activity equation regardless of how G is defined, either by general budget expenditures in the sample period 1923-2003 or by consolidated budget expenditures in the sample period 1950-2003. Thus, there is no evidence of a valid long-run Wagner's law relationship supported by the data[3]. Economic development cannot be accepted as a long-run forcing variable of the government activity in Turkey.

The absence of a valid Wagner's law relationship does not imply the absence of a Keynesian-type relationship which postulates the government activity as the long-run forcing variable of economic development. However, estimations based on an ECM which is conditioned on the government activity instead of the economic development neither provide any evidence supporting

3 All estimations were carried out also by excluding the post-1980 period to investigate whether or not the presence of high off-budget expenditures and high interest payments on borrowings in this period distort results. However, previous findings did not change except for a borderline case. (see Appendix 2).

the presence of a level equation for economic development (not reported). Hence, neither a Wagnerian nor a Keynesian long-run relationship could be supported by the data based on the general and consolidated budget expenditures in Turkey.

V. Concluding Remarks

Wagner's law has been a crucial topic for economists since Adolph Wagner's expositions in the 1880's. The law has been discussed theoretically and empirically in numerous studies in the literature. However, findings of most of the empirical studies lose their validity or become doubtful as new quantitative techniques are introduced in the literature. In this respect, this study is the first attempt known in the relevant literature to test the validity of Wagner's law by exploiting a new time series technique introduced by Pesaran et al. (2001). The technique, called the *bounds testing approach*, makes it possible to overcome the dependency of cointegration tests on the precise knowledge of the order of integration.

In this paper, the validity of a positive long-run relationship between government activity and economic development is tested empirically for Turkey by using two samples of data. In the first sample, which covers the period 1923-2003, general budget expenditures are used as an indicator of the government activity while in the second, which covers the period 1950-2003 due to unavailability of data, consolidated budget expenditures are used. In this regard, the test of the validity of Wagner's law in this study is being based on the narrowest measure of government activity due to difficulties in obtaining off-budget expenditures of governments. Based on five versions of Wagner's law relationship frequently used in the literature, results of the bounds test do not provide supporting evidence of a long-run Wagnerian relationship in Turkey. That is, neither government activity nor economic development can be considered a long-run forcing variable of each other in the context of cointegration tests suggested by Pesaran et al. (2001). This conclusion is contrary to some recent studies that make use of conventional cointegration approaches to test the validity of Wagner's law for Turkey. Despite the fact that the data and the sample period used in these recent studies overlap with those in this study, the reason for such contradictory empirical evidence might be the result of the lack of power of unit root tests, which is overcome in this study through the bounds testing approach.

The basic implications of the absence of a long-run relationship between government activity and economic development in Turkey may be argued to be twofold. The *first* may be the weak association between government activity

and economic development in Turkey resulting from the dominance of other factors on government activity. This is referred to as "the role of omitted variables in identifying a long-run equilibrium relationship..." by Legrenzi and Milas (2002: 435), who attempt to model the growth of Italian government in the Wagner's law framework. However, testing the validity of an 'augmented' version of Wagner's law for Turkey is beyond the scope of this study. The *second* may be the use of inappropriate measures of government activity and economic development. However, this does not seem to be a strong argument since most of the studies in the literature make use of variables similar to those used in this study and verify the validity of Wagner's law for many countries. The only exception to this argument may be the vagueness in measuring government activity in broad sense in Turkey. Additionally, disaggregating total government expenditures into defense, justice, education, etc. may contribute to testing the validity of the law for particular welfare services of governments. However, the unavailability of long span disaggregated data on government expenditures in Turkey makes carrying out such a long-run analysis of Wagner's law for Turkey unfeasible.

The failure in finding a long-run Wagnerian relationship in this study creates a need for future studies that focus on the weak association of government activity and economic development in Turkey. It may be worthwhile to investigate whether or not there are periods in which the government activity is exposed to structural distortions breaking its association with the economic development. Moreover, the robustness of the empirical findings can be verified through tests on alternative specifications of Wagner's law augmented with relevant variables.

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Appendix 1

Table A1. General and Consolidated Budget Expenditures in Turkey

	General budget expenditures		Consolidated budget expenditures	
	G/Y (%)	G/N (thousand TL)	G/Y (%)	G/N (thousand TL)
1923-29	8	0.27	-	-
1930-39	12	0.55	-	-
1940-49	11	0.53	-	-
1950-59	11	0.70	12	0.76
1960-69	13	1.10	14	1.14
1970-79	18	2.05	18	2.07
1980-89	17	2.21	17	2.18
1990-99	24	4.02	25	4.04
2000-03	41	6.86	41	6.95

Source: SIS and SPO

In the study, the consolidated budget expenditure refers to the sum of the general and annexed budget expenditures, which is net of the Treasury aid to annexed budget institutions. General budget expenditures are the total spending of the legislative, executive and judicial institutions while annexed budget expenditures are the total spending of government institutions that assist the central government in higher education, social security services, public works and so forth. In fact, the government activity represented by budget expenditures is the narrowest way of measuring the government size, because in addition to general and annexed budget institutions there are local governments, state economic enterprises, social security institutions, revolving funds and other funds determining the actual size of the public sector. However, due to measurement problems such as double counting and deficiencies in recording, there is no statistical database that provides such a broad measurement of the government size in Turkey.

As seen in the table above, according to general and consolidated budget figures, both the shares of expenditure in GNP (G/Y) and the figures of per

capita real expenditure (G/N) follow similar patterns over time. These figures indicate a sharp rise in expenditure shares beginning in the 1990s. It is apparent that this rise is due to continuously increasing interest payments on government borrowings from 1993 onwards. Such characteristic of the expenditure data distorts the accurate measurement of government size in Turkey. Moreover, the expansion of extra-budgetary funds in the second half of the 1980s is another factor distorting the computable size of government expenditures. In this context, Oyan and Aydın (1991: 29) calculate that, in the mid1980s, GNP shares of total government expenditures including extra-budgetary funds are twice as high as those excluding these extra-budgetary funds.

Appendix 2

Table A2. F- and t-statistics for Bounds Tests excluding the post-1980 period

	Sample Period: 1923-1980					Sample Period: 1950-1980				
	trend			no trend		Trend			no trend	
	F_{IV}	F_V	t_V	F_{III}	t_{III}	F_{IV}	F_V	t_V	F_{III}	t_{III}
G = f(Y)	4.39[a]	6.55[a]	-3.61[b]	5.18[b]	-3.19[b]	2.83[a]	4.01[a]	-2.83[a]	4.04[a]	-2.76[a]
G = f(Y/N)	3.85[a]	5.66[b]	-3.36[a]	5.43[b]	-3.26[c]	2.98[a]	4.28[a]	-2.89[a]	2.75[a]	-2.29[a]
G/N=f(Y/N)	4.15[a]	6.16[a]	-3.51[b]	5.76[c]	-3.37[c]	2.81[a]	3.94[a]	-2.77[a]	3.79[a]	-2.67[a]
G/Y=f(Y/N)	4.15[a]	6.16[a]	-3.51[b]	5.76[c]	-3.37[c]	2.81[a]	3.94[a]	-2.77[a]	3.79[a]	-2.67[a]
G/Y = f(Y)	4.39[a]	6.55[a]	-3.61[b]	5.18[b]	-3.19[b]	2.83[a]	4.01[a]	-2.83[a]	4.04[a]	-2.76[a]

Notes: (1) The 5 percent critical value bounds for the F-statistic are F_{III}: (4.94, 5.73), F_{IV}: (4.68, 5.15), F_V: (6.56, 7.30) and those for the t-statistic are t_{III}: (-2.86, -3.22), t_V: (-3.41, -3.69). (2) The subscript III denotes computations only with an unrestricted intercept while the subscripts IV and V denote computations not only with an unrestricted intercept but also with a deterministic trend which is restricted in the former and unrestricted in the latter. (3) [a] indicates that the statistic lies below the 0.05 lower bound, [b] that it falls within the 0.05 bounds, and [c] that it lies above the 0.05 upper bound.

Table A2 shows the results of estimations carried out by excluding the post-1980 period to investigate whether or not the presence of high off-budget expenditures and high interest payments on borrowings in this period distort results. However, previous findings did not change except for a borderline case where computed F- and t-statistics slightly exceeded the 0.05 upper bound. Such rejection of the null of no cointegration is observed only in the third and fourth models that exclude a deterministic trend and that are estimated for 1923-1980 period. Test statistics computed for other specifications estimated for the 1923-1980 are either inconclusive or in favor of the null of no cointegration while those of computed for the sample period 1950-1980 are all in favor of the null of no cointegration. Therefore, new findings with the exclusion of the post-1980 period could not be accepted as evidence against previous findings of the study.