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IMPACT OF ENVIRONMENTAL FACTORS ON THE EFFICIENCY OF TAX ORGANIZATIONS

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Abstract

The study examines the performance of tax organizations in Greece, based on data obtained from a sample of 35 tax offices. Performance evaluation was conducted using DEA with bootstrap methods. In addition, Tobit regression analysis was employed to examine the environmental variables that impact on the efficiency performance of these tax offices. From the analysis, weaknesses, and management issues are derived from the tax offices inefficiency. The general conclusion is that a robust governance structure within the tax office operational framework is needed in order to improve organisational efficiency.

Keywords: Taxation, tax evasion, performance management, Greece, DEA, Bootstrap, Public sector organisations, quantitative methods

1. INTRODUCTION

Global financial and economic crisis has brought to the fore the need for assessing public sector performance. Improving the functioning of public sector and enhancing

the efficiency of public administration constitute measures taken by governments to cushion the effect of the crisis on their country economies. Equal distribution of public expenditure and taxation countrywide is essentially important for social cohesion

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and sustainable development. Convergence in public expenditure could be used as an indicator of the rational distribution of welfare in all regions; on the other hand, tax revenue convergence is an indicator of the rational distribution of financing of public expenditure. Therefore taxation system efficiency is of pivotal importance to the longevity and well-being of any public sector activity. Increasing the revenues obtained from taxation can be achieved only at progressively higher marginal costs (Afonso et al., 2006). International literature can provide documentary evidence showing that tax offices are indeed coming under increasing scrutiny. Likewise, a number of countries now seek to maximize income by improving the efficiency of tax collection processes through a shake-up of the entire tax office system (Budryte, 2005).

In this context, the current international financial crisis, which has greatly impacted Greek financial activities has also brought to the fore the pathogenesis of the Greek economy, which is mainly structural. One of the main problems of the Greek economy is the functioning of the fraudulent 'informal' economy, which is linked to tax evasion, and therefore leads to complexities and distortions of the mainstream economic reality nationwide. The current economic climate underlines, as ever, the need for efficient tax administration, essential if any tax system is to attain its desired aims. The inefficiency of the tax system is expressed mainly by the amount of tax that is being evaded, high levels of which are attributed to:

- Ineffective tax collection mechanisms and failure to implement methods that would contribute to tax revenue increases; these include approaches aimed at rational handling of tax compliance and

systematic monitoring of tax and legal responsibilities;

- Fraudulent practices;
- Low level and minimally trained staff within tax authorities.

The Greek economy, while addressing the impact of the financial crisis, is mainly faced with high debt levels, an unacceptably high deficit, high unemployment, low competitiveness and an inherent inability to collect public revenues. The admitted lag in revenue raising is an indication of the ineffective operation of the tax collection mechanism stemming from and leading towards ever-increasing levels of tax evasion, by now a dominant issue in the context of the severe economic woes plaguing the country. The current levels of tax evasion can be attributed on the one hand to the existing institutional framework of the Internal Revenue system and on the other on the characteristics of the available human resources allocated to the individual tax offices and the socioeconomic environment within which each tax office operates. It therefore becomes evident that there is a pressing need to assess the functioning of the tax office system as a whole.

Literature survey provides documentary evidence showing that tax offices evaluations have to date been carried out using mostly DEA-based methodologies. Katharaki and Tsakas (2010) assessed the performance of 27 tax offices in Greece through the 2001 – 2006 period using DEA, window analysis and the Tobit model. Moesen and Persoon (2002) analysed the efficiency of 289 Belgian tax offices with free disposal hull (FDH) and DEA, while Gonzalez and Miles (2000) analysed the efficiency of 15 Spanish regional tax offices for the year 1995 with DEA, using a bootstrap technique. Thirtle et al. (2000)

analysed the efficiency of Indian tax offices from 1980-1981 to 1992-1993 using DEA and Malmquist indices. More recently, Barros (2007) assessed the technical and allocative efficiency of tax offices in Portugal, while the same team (2005) used a stochastic evolution model combined with the DEA approach for the evaluation of tax office activity. Forsund, Kittelsen and Lindseth (2005) applied DEA and a Malmquist productivity index for the evaluation of Norwegian tax offices.

In this context, the objective of the current study is firstly to estimate the relative technical efficiency (TE) by using a sample from Greek tax offices aiming to underline management issues that results from the manner in which the tax offices operate; and, secondly to emphasize the policy implications for tax system policy-makers. Considering that tax office evaluation has been limited so far, attributable mainly to the non-disclosure policy of public entities globally (Barros, 2007), the present study aims simply to highlight the importance of the information (without sensationalizing it) from the policymakers perspective and in so doing perhaps provide an additional information resource on which they can base their decisions and policies.

The paper is organized into the following sections:

- section 2 describes the sample selection and analysis plan, while a description of the techniques used to estimate the tax offices efficiency is also presented;
- section 3 provides an outline of the results obtained from the quantitative methods used along with their interpretation;
- section 4 provides a discussion on the managerial implications of the research and concludes with directions for future research.

2. MATERIAL / METHODS

The research is based on data collected from official public sources of the Greek Ministry of Economy and Finance spanning the period 2001-2006. The six (6) year duration of the data set is considered adequate for the investigation of the dynamic evolution of tax office performance in each case and its data-based evaluation. The selection of the 35 tax offices that make up the sample (for ethical reasons these will be referred to only as F1, F2, ..., F35) was made from the Attica and Piraeus regions, the wider metropolitan area of the Greek capital in other words, excluding tax offices that cover regions characterised:

- as tourist areas, or else the key characteristic of the regional economy is the operation of numerous tourist facilities;
- by rural economic activities.

The key feature of the tax offices that make up the sample is that their areas of responsibility are identified by the large numbers of taxpayers, but also by the complexity of their economic activities. In summary, the 35 tax offices in the sample covered in 2006, a total of 378,063 taxpayers (natural persons and legal entities), i.e. 19.7% of the total and earned 3,665,480,640.20 EUR, which accounts for 11.5% of total revenue raised by all the tax offices in the country. Table 1 shows the proportion of tax revenues attributed to individuals to those raised by legal entities.

The annual revenue raised for the total number of taxpayers (sum of natural persons and legal entities) for tax office is also shown in Table 1. It should be noted that the maximum annual taxpayer payment was 23,110.04 €, paid at F21, while the minimum was 5,926.77 EUR paid at F33, overall representing a spread, the causes of which

Table 1. Proportion of tax revenues and average annual recovery per tax office (Year 2006)

Tax Offices	Ratio of Natural to Legal entities	Average annual recovery per total taxpayers (€)	Tax Offices	Ratio of Natural to Legal entities	Average annual recovery per total taxpayers (€)
F1	1.48	8,459.1	F19	0.82	20,083.3
F2	1.94	9,737.7	F20	0.38	12,500.3
F3	1.94	8,116.8	F21	0.18	23,110.0
F4	1.46	12,208.4	F22	2.04	7,330.5
F5	2.04	7,559.8	F23	0.92	8,339.5
F6	1.59	13,080.5	F24	1.92	6,936.0
F7	1.62	11,768.4	F25	1.68	7,068.2
F8	2.39	8,637.4	F26	1.84	6,180.8
F9	1.81	8,482.9	F27	2.08	6,268.6
F10	3.93	6,411.8	F28	3.76	7,228.7
F11	2.07	7,119.1	F29	2.70	6,276.6
F12	1.11	7,495.6	F30	2.54	8,340.8
F13	0.63	12,842.3	F31	1.14	11,829.9
F14	3.04	5,814.3	F32	2.71	11,539.1
F15	1.65	9,452.5	F33	1.69	5,926.8
F16	0.77	7,964.0	F34	2.61	6,394.9
F17	0.89	11,508.1	F35	0.94	15,507.0
F18	0.65	12,625.5			

should be sought in specific areas of responsibility and individual tax offices.

Data analysis was based on data envelopment analysis (DEA), a method originating from Farrell's (1957) seminal work, popularised by Charnes, Cooper and Rhodes (1978) and Banker, Charnes and Cooper (1984), that provides a nonparametric alternative to parametric frontier production function analysis.

Our sample data set was analyzed using VRS output-oriented analysis assumption based on Banker, Charnes and Cooper's (1984) previous work, who proposed an extension of the CRS model to explain the cases of variable returns to scale (VRS). It is noted that using the CRS model when all tax offices are not operating under the same return to scale, can lead to unreliable technical efficiency results, not taking into account the scale effects. The literature reveals that for the purpose of estimating tax office performance, only the output-oriented

DEA measures have been empirically estimated (Barros, 2007).

Following Oum and Yu (1994) and Cantos, Pastor and Serrano (2002) work a two-stage model was applied, which regressed the first-stage DEA efficiency scores (dependent variable) against a selection of independent variables in the second stage. Hence, it is assumed that a significant proportion of the estimated inefficiency of the tax offices under analysis is a result of institutional and environmental/external factors, rather than a product of inefficient management.

Therefore to investigate the extent to which environmental factors influence tax office performance, a Tobit analysis was conducted (Kalina, 2014; McDonald, 2009; Katharaki, 2008; Barros, 2007; Simar and Wilson, 2007; Hoff, 2007; Bravo-Ureta et al. 2007; Latruffe et al., 2004; Fethi, Jackson and Weyman, 2002; Viitala and Hanninen, 1998; Chilingerian, 1995; Bjurek, Kjulín and

Gustafson, 1992). However, this approach has been recently challenged and found to result in inconsistent and biased parameter estimates, unless the DEA efficiency scores are corrected by a bootstrapping procedure (Merkert et al., 2010). According to Setnitar and Andoljsek (2005), DEA suffers from certain drawbacks, since its main disadvantage originates from its own non-stochastic nature. . In the present study, a bootstrap procedure was used to derive the efficiency scores based on the Simar and Wilson algorithm with some differentiations (Raptis, 2009). All calculations were run by the FEAR 1.12 package for R software (Wilson, 2008) and our bias-corrected scores are derived from 2000 bootstrap iterations. This way the benchmarking of the tax authorities is achieved under a "quasi" homogenous socio-economic environment, and efforts are focused on the examination of the weaknesses on the side of the management and essentially the degree of tax evasion that results from the way the tax offices operate. In any case, as far as the efficiency of Greek tax offices is concerned, bootstrapping applications that determine efficiency estimates precision are extremely infrequent.

2.1. Model Inputs and Output Specification

Based mainly on the data availability and the criteria of Barros (2005), two types of outputs were defined in this paper, namely the incoming taxation revenues related to natural persons (O1) and the incoming taxation revenues related to legal entities (O2). The following have been defined in this study as inputs (I):

- I1: labour in each tax office, measured by the number of employees;

- I2: the number of computers operating in each tax office;
- I3: the number of natural persons (NP) paying taxes; and
- I4: the number of legal entities (LE) paying taxes.

Labour was introduced as the key production coefficient in terms of available human resources (I1). The number of computers in each tax office was used as a "proxy" for the available equipment (I2). The choice of natural persons (I3) and legal entities (I4) paying taxes was guided by their impact on the overall service provision and performance of each office, given the different tax legislation which governs them.

3. RESULTS: MODEL INTERPRETATION

3.1. Efficiency Analysis using DEA and Second Stage Bootstrap approach

A DEA analysis of the BCC output-oriented model was applied as described above using as output measure the tax revenue collected from natural persons and legal entities. Alternatively, a bootstrap procedure is used where bias-corrected DEA efficiency scores are obtained by means of bootstrap. The results obtained and presented below in Table 2 show the resulting tax offices that operate in a comparatively excellent way (efficiency score > 1). The results are summarised. Detailed performance of individual units, sources of data and the assumptions made in the calculations are available from the author.

According to the BCC results of Table 2, F7, F19, F21, F32 and F35 tax offices are considered as best-practice units over the specific time period.

Table 2. Results of DEA and Bootstrap methods

Tax Office	BCC output-oriented results	Bootstrap results Mean Efficiency	% difference on efficiency scores
F1	0.63405	0.58781	-7.29
F2	0.82761	0.82605	-0.19
F3	0.69066	0.70323	1.82
F4	0.97223	1.00000	2.86
F5	0.60029	0.43828	-26.99
F6	0.97576	0.95812	-1.81
F7	1.00000	1.00000	0.00
F8	0.75404	0.70789	-6.12
F9	0.75912	0.79388	4.58
F10	0.66023	0.54063	-18.11
F11	0.60485	0.49723	-17.79
F12	0.49782	0.38126	-23.41
F13	0.77165	0.77444	0.36
F14	0.63008	0.61489	-2.41
F15	0.96779	0.99569	2.88
F16	0.58693	0.66371	13.08
F17	0.89842	0.96511	7.42
F18	0.93187	0.97291	4.40
F19	1.00000	0.99992	-0.01
F20	0.73107	0.71721	-1.89
F21	1.00000	1.00000	-0.00
F22	0.66779	0.73512	10.08
F23	0.57909	0.52686	-9.02
F24	0.52819	0.41422	-21.58
F25	0.58423	0.52937	-9.39
F26	0.53231	0.56147	5.48
F27	0.53311	0.53333	0.04
F28	0.69756	0.64962	-6.87
F29	0.60855	0.60474	-0.63
F30	0.84268	0.84122	-0.17
F31	0.78129	0.72585	-7.10
F32	1.00000	0.98382	-1.62
F33	0.50252	0.55093	9.63
F34	0.62487	0.63758	2.03
F35	1.00000	0.99122	-0.88
Average	0.74219	0.72639	-2.13%
Median	0.69756	0.70789	1.48%
Minimum	0.49782	0.38126	-23.41%
Stand. Dev.	0.17232	0.19819	15.01%

The application of Bootstrap indicates that the tax offices that in comparison make use of their productive factors in the best way are F4, F21, F7, F19 and F15, of which F21, F7, F19, and among the best-functioning on the basis the DEA BCC results. In contrast, the group of five most inefficient tax offices according to the

Bootstrap comprises F12, F24, F11, F23 and F25, of which F12 and F24 are within the bottom five based also on the DEA BCC results.

Additionally, the application of bootstrap leads to increased efficiency score in 13 of 35 tax offices in relation to that resulting from the first stage DEA analysis,

demonstrating that environmental/external factors affect tax office performance and that they could in principle operate effectively, but the general conditions do not allow it. Furthermore, in a greater number of tax offices (20 out of 35) of the sample, applying the bootstrap leads to reduced efficiency scores demonstrating that the "quasi" environment adversely affects performance. For example, F11 has a tax efficiency score equal to 0.60, while the bias-corrected DEA efficiency score is 0.49 meaning that the tax office reduces its income using the same resources. In this context the effect of environmental factors and the reasons behind the drop in revenue should be further examined.

3.2. Interpretation of Tobit Analysis results

The results are presented in Table 3 for the year 2006.

Table 3. Censored Tobit Model (dependent variable y_i^*)

Variable	2006
Constant	0.59 (4.50)*
x_1	-2.31 (8.07)*
x_2	1.38 (3.56)*
sigma	0.43
Log likelihood	3.12
Number of observations	35

Note: the t-statistic in brackets followed by * are significant at 5%.

It follows that the negative and statistically significant values of variable x_1

is indicative of the fact that a growing relationship between income per taxpayer, and the average per capita gross product reduces the operational inefficiencies of the tax office. The positive and statistically significant values of variable x_2 is indicative of the fact that the increased number of tax-paying legal entities increases the inefficiency of the tax offices, which should be attributed to legal entities making full use of the available legal and accounting framework in order to locate loopholes in the system and evade tax.

4. DISCUSSION

The main characteristic of the sample is that all the tax offices therein operate in the broader Attica area, characterized by the complexity of the economic activities of its residents. The diversification of the economic activities is evident in the differences in revenue per tax-paying natural person and legal entity amongst the tax offices in the sample (Table 1).

The DEA BCC results of Table 2 summarize the efficiency score that each tax office reaches, making use of the available productive factors (inputs). In particular and from the output perspective, the top performer achieves twice as much output as the least efficient tax office with the same input. However, these data sets are not dynamic in nature and during the comparative analysis the contribution of the internal and external environment affecting the operation of each tax office is not taken into account. For example, factors like the moral and educational background of the tax office employees is disregarded as are external factors like the ones that contribute to the creation of a tax evasion ethos.

The use of the Tobit model facilitated the overarching efforts towards investigating and defining parameters/factors that were not taken into account in the DEA but nonetheless are considered as having an impact on the efficiency of each tax office. From the analysis presented above, it was deduced that the increased number of Legal entities (LE) increases in turn the inefficiency of the respective tax office, a fact which can be attributed to the time-consuming and painstaking handling and processing of LE-related tax issues. This could also be attributed to LE making full use of accounting and legal 'tricks' made possible by the current fiscal institutional framework, thus enabling the development of tax evasion. The analysis illustrated that there are additional parameters to be taken into account given that the sigma coefficient was estimated at 0.43; in other words, the independent variables used in the Tobit model 'interpret' the efficiency score only by 43%. In addition, the increased tax revenues with respect to the gross regional product in the area in which the tax office operates limits its inefficiency, since the economic development of the area is harmonized with the associated tax revenues and in turn with the tax office's income. This result is expected since seven (7) of the tax offices, namely F4, F6, F7, F19, F21, F32, F35 display excellent comparative scores as derived from DEA estimates. The average annual per taxpayer recovery of these seven (7) tax offices is higher than 15,057 EUR, comparatively higher than the corresponding value of the sample as a whole, which is set at 9,695,42 EUR. It should also be noted that the Bootstrap estimates show that these seven (7) tax offices display an excellent comparative degree of evaluation. After all, according to Barros (2007) the richer the

municipality, the more efficient the tax office.

Given the differences in average revenue among tax offices, the deterministic nature of DEA BCC results and those of Tobit analysis, the method of Bootstrap analysis was used in order to obtain new estimates of performance assessment of tax offices in quasi 'homogeneous' socio-economic environment. From the data in Table 2, which presents the percentage variation between the DEA BCC and Bootstrap results, the following can be discerned:

- 20 of the tax offices display a reduced degree of benchmarking evaluation, 13 of the tax offices of the sample display an increase and two display no change in the extent of benchmarking.
- the maximum negative trend is shown in F5, while the maximum positive development is observed in F16
- the tax offices F21, F7 and F19, and F12 and F24 appear as performing best and worse respectively, compared to other tax offices both at the first stage as well as the second stage bootstrap analysis.

These differences in efficiency scores could be attributed, inter alia, to:

- specific management practices;
- the way the institutional framework is applied, often enabling tax evasion;
- the structure of the economic activities developed in the area of responsibility of each tax office;
- the extent and quality of entrepreneurial taxpayers;
- the sense of civic duty of taxpayers;
- per capita gross national product in the area of responsibility of each tax office, and;
- factors that make up the socioeconomic environment within which the tax offices operate.

The degree of contribution of these factors varies across location and can greatly impact their operational standing. The bias-corrected DEA efficiency scores in a large number of tax offices (20 of 35) are presented at values lower than those obtained by the first-stage DEA BCC analysis. One could say that by applying the Bootstrap and under the assumption that a virtual 'quasi' homogeneous socio-economic operational environment is created, sample tax authorities are shown to operate inefficiently in using their production factors (inputs) to increase revenue from taxpayers (outputs) and thus the need for further investigation into the extent of tax evasion is highlighted. Overall, taking into account that the 'quasi' homogeneous environment has an adverse effect, it is then possible to argue that the inadequate functioning of the tax offices to attain their goals in combination with the tax evasion phenomenon comprise factors that justify the results and can interpret the data sets that emerge.

5. CONCLUSION AND MANAGERIAL IMPLICATION OF RESEARCH

The importance of the efficient use of public resources has been brought to the fore by the need to limit expenditure in the public sector. The adequate measurement of public sector efficiency is a difficult empirical issue and the literature on it, particularly when it comes to aggregate and international data, is rather scarce. Measuring and assessing tax offices efficiency is also complicated (Vlasenko, 2001). Tax offices fall under public sector control in the vast majority of national environments. In Greece, tax offices fall under the responsibility and audit of the Ministry of Finance that seeks to enhance

accounting control, accountability and tax office performance. In this context, "an efficient tax system is one that minimizes distortions that affect working, saving, investing and entrepreneurship and diverts resources into high productivity uses" (Katsios, 2006). In that sense the main argument for tax reform in Greece is to achieve greater efficiency in the way the tax framework works.

This present study investigated the relative efficiency of 35 Greek tax offices during the period 2001-2006 using a benchmark tool, DEA, and by bootstrapping the DEA results. The main output was the ranking of the tax offices and the identification of those 'efficient' tax offices that might serve as a best-practice benchmark for the inefficient ones. The DEA BCC efficiency scores indicated that a high number of tax offices operate in the appropriate scale size. Additionally, the Tobit analysis revealed that a significant part of the estimated inefficiency of the analyzed tax offices is a result of environmental factors, rather than a product of inefficient management. Moreover, the study overcomes biased related to DEA problems with the application of bootstrap techniques as have been introduced by Simar and Wilson (1998, 2000). The implementation of the bootstrap reduces the efficiency score of the tax offices, showing that there are environmental factors that influence tax office performance. And because the estimated model is output oriented (revenue growth) it could be said that such factors relate to issues of resource mismanagement, or to tax evasion.

From a policy perspective, one should be careful when drawing conclusions, since any application of quantitative analysis in decision-making is governed by restrictions,

especially when complex problems are approached as the question of assessing the performance of tax offices. In this study the combination of DEA and Tobit analysis and the application of Bootstrap analysis tend to approach the issue at hand through the definition of general principles as dictated by conventional policy. The emerging data were used to shed light on "best practice tax offices" used as reference for comparison purposes. Moreover, the findings indirectly highlight the need for measures designed to reduce tax evasion. Specifically, the inefficiency of the tax authorities to fully exploit their available productive factors for the collection of taxes (and consequently the ensuring revenue increase) is made evident from the results of the bootstrap analysis, indicating the inadequacy of the tax offices to serve as efficient tax collection bureaus. In addition, the need to further examine the extent of tax evasion and non-compliance and how these affect the performance of tax offices is also made evident.

Nonetheless, a number of future research initiatives can stem from this present study. More comprehensive input and output measurements, namely, allowing for no discretionary factors, such as socio-economic and quality inputs and outputs, need to be taken into consideration. A possible direction for further research is also the application of the Malmquist productivity index (Sigbjørn et al., 1991; Bjurek & Hjalmarsson, 1995; Odeck, 2005), as well as the combination of available techniques in the investigation of tax offices efficiency over a time period. Additionally, despite the limitations related to the data set, the empirical work here suggests that future research may need to concentrate on the dynamic factors i.e. characteristics of the area where the tax office is located or even

financial crisis and inflation, which could play a significant role in a tax office performance.

Nevertheless, the general conclusion is that a governance framework within the tax offices, taking into account their characteristics and intending to improve organisational efficiency, is needed. Similar conclusions are also drawn by Barros (2007), who highlighted the need for an organisational government environment, with accountability, transparency and efficiency incentives which explicitly oblige the tax offices to achieve efficiency in their operational activities. Inevitably increasing tax collection by introducing real discernible actions against tax evaders and its impact in tax offices efficiency is an issue which requires further research. Nonetheless, the nature of the economic activities, the characteristics of all taxpayers (natural persons or legal entities), the broader social environment in which the tax offices operate, social realities and other specific characteristics shaping the region in which the tax offices operate impact the effective implementation of the tax system. All of the above may in fact play a decisive role in the creation of a framework that prevents/discourages the violation of the rules of the existing laws, thus limiting tax evasion overall.

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УТИЦАЈ ФАКТОРА ОКРУЖЕЊА НА ЕФИКАСНОСТ ПОРЕСКИХ ОРГАНИЗАЦИЈА

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Извод

Студија проучава перформансе пореских организација у Грчкој. Студија је заснована на подацима добијеним од 35 пореских канцеларија. Евалуација перформанси је урађена уз коришћење ДЕА методе. Поред тога коришћена је Тобит регресиона анализа како би се процениле варијабле окружења које утичу на ефикасност перформанси ових пореских организација. На основу анализе, изведени су закључци о слабостима и начину руковођења који утичу на неефикасност пореских организација. Општи закључак је да робустна управљачка структура, у оквирима операција пореских организација, може довести до унапређења организационе ефикасности.

Кључне речи: Опорезивање, избегавање пореза, менаџмент перформанси, Грчка, ДЕА, Организације јавног сектора, квантитативне методе

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