

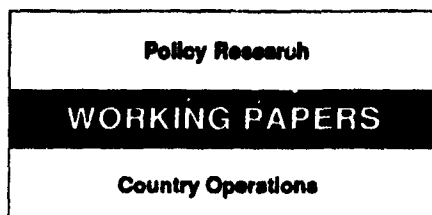
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Effects of Tax Reform on Argentina's Revenues

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and
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In Argentina, changes in tax legislation, tax administration, and individual taxpayers' attitudes toward tax evasion improved tax revenues. Here is a method to measure how much.



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This paper — a product of the Country Operations Division, Latin America and the Caribbean, Country Department IV — is part of a larger effort in the department to understand fiscal reforms in Argentina. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Gerald Carter, room I6-020, extension 30603 (September 1993, 23 pages).

Too often, a good tax policy proposal is considered sufficient to improve the tax system — too little consideration is given to weaknesses in tax administration, perhaps because of measurement problems. Analyzing legal and administrative measures and quantitatively evaluating their impact on tax revenues is generally arduous.

Morisset and Izquierdo develop a simple approach to assessing how tax effort affects tax revenues (performance). By “tax effort” they mean changes in tax legislation (except changes in nominal taxes), tax administration, and individual taxpayers’ attitudes toward tax evasion. Changes in tax administration include increasing tax penalties, new technologies, and administrative reform.

They measure tax effort as a residual: the variations in tax revenues that cannot be explained by changes in economic variables and tax structures. Using this approach, one can easily identify factors that influence tax revenues over time, and understand the behavior of tax revenues in developing countries, particularly where macroeconomic conditions are volatile.

The authors apply this approach to Argentina; it can as easily be applied to other countries. Their main conclusions in this application:

- The administrative dimension of tax reform is at the heart of Argentina’s recent fiscal adjustment. Since 1991, tax effort is an average 80 percent higher than during the preceding (temporary) successful adjustment period (under the Austral Plan).

- An efficient tax administration and an improvement in taxpayer compliance levels appear to precede rather than follow increases in tax revenues.

- Tax effort is influenced significantly by such macrovariables as GDP growth and inflation, as well as by political (in)stability. It is influenced less by such fiscal variables as alternative sources of financing.

- In Argentina, the sequence of the tax effort was, first, to broaden the potential value-added tax base, and then to reduce tax evasion through higher tax penalties and improvements in the basic functions of tax administration (inspection, audits, tax management, and personnel policy).

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Summary

1. The objective of this paper is to assess the contribution of tax effort to tax revenue performance. Tax effort, used in a somewhat unconventional way, includes *changes in tax legislation (except the changes in nominal taxes), in tax administration and in individuals' attitudes toward tax evasion*. Although the importance of administrative reform is widely acknowledged by those concerned with tax reform in developing countries, this issue has been relatively little explored in the economic literature, perhaps reflecting measurement problems.

2. Changes in tax administration, ranging from increasing tax penalties to technological progress and administrative reforms, would require careful analysis of a myriad of legal and administrative relationships. It would be even more arduous to evaluate quantitatively the impact of these actions on tax revenues. An alternative approach is developed in this paper; tax effort is viewed as a residual; i.e. the variations in tax revenues that cannot be explained by the changes in economic variables and in tax structure. The major benefit from this approach is that the factors that influence tax revenues can be easily identified over time, and provides a good understanding of tax revenues behavior in developing countries, particularly with volatile macroeconomic conditions. This approach has been applied to Argentina, but can be readily applied to other countries as well.

3. The major conclusions can be summarized as follows. First, the administrative dimension of tax reform is at the center of the recent fiscal adjustment in Argentina. Since 1991, tax effort is on average 80 percent higher than during the precedent (temporary) successful adjustment episode (the Austral Plan). Second, an efficient tax administration and an improvement in taxpayers compliance levels appear to precede rather than to follow increases in tax revenues. Third, tax effort is influenced significantly by macrovariables such as GDP growth and inflation as well as by the stability of the political environment, but relatively less by other fiscal variables such as alternative sources of financing. Finally, the sequencing of tax effort in Argentina was, first, to broaden the potential VAT base, and, then, to reduce tax evasion through higher tax penalties and improvements of the basic functions of tax administration: inspection and audits, tax management, and personnel policy.

INTRODUCTION

In the economic literature on taxation, policy reveals little concern for weakness in tax administration. A good tax policy proposal and technological progress is thought to unambiguously improve the tax system. However, administrative constraints may prevent the establishment of an optimal tax system, particularly in countries suffering from a scarcity of trained administrators. *"In short, there may well be too much preoccupation with what to do and too little attention to how to do it"* (Bird, 1992, p.189).

The objective of this paper is to assess the contribution of changes in tax administration to the evolution of tax revenues. The virtual absence of studies on this issue may reflect both conceptual and measurement problems. Changes in tax administration, ranging from increasing tax penalties to technological progress and administrative reforms, would require careful analysis of a myriad of legal and administrative relationships. It would be even more arduous to evaluate quantitatively the impact of these actions on tax revenues. For these reasons, an alternative approach is developed in this paper. The effect of economic variables such as inflation and GDP growth, and changes in tax structure on tax revenues is distinguished from the impact of changes in tax administration and in the taxpayers behavior. These two last factors, defined as tax effort, are viewed as a residual; i.e. the variations in tax revenues that cannot be explained by the changes in economic variables and in tax structure. The major benefit from this approach is that the factors that influence tax revenues can be easily identified over time.

The approach is applied to the case of Argentina. One of the prominent features of the Argentine tax system is the high volatility of total tax collection. Abrupt changes from year to year reflected increases or decreases in the level of economic activity, in the rate of inflation, tax rates, in taxpayer compliance levels, and tax administration efficiency. The approach developed in this paper will place the administrative dimension of tax reform at the center of the success of the current adjustment program. During the 1989-92 period, tax revenues increased by more than 200 percent in Argentina. Using simple procedures, we will show that changes in tax effort are likely to have preceded rather than followed tax revenues variations. We will also attempt to identify the economic and political variables that influenced tax effort as well as the channels used by the Argentine Government to increase tax effort.

The paper proceeds as follows. In Section 1, we identify the main factors that influence tax revenues fluctuations by developing a simple approach to measuring tax effort. In Section

2, this approach is applied to the case of Argentina. In Section 2.1, the contribution of different factors, including tax effort, to tax revenues fluctuations are measured over the 1983-92 period. Section 2.2 discusses the issue of the causal relationship between tax effort and tax revenues. In Section 2.3, we attempt to identify empirically the variables that have influenced tax effort in Argentina over the last decade. In Section 2.4, we focus on the microeconomic aspect of the tax reforms implemented during the 1989-92 years in assessing to which extent the improvement in tax effort was due to a reduction in tax evasion or in tax exemptions. We also review changes in the enforcement regime and loopholes, and then tax administration itself. Finally, Section 3 contains our conclusions.

1. A SIMPLIFIED APPROACH TO MEASURING TAX EFFORT

The purpose of the approach is to identify the main factors that influence tax revenue fluctuations. In particular, we need to elaborate on the meaning of tax effort in the context of the paper, as this concept is used in a somewhat unconventional way. As a starting point, tax receipts collected by the tax administration can be defined as:

$$(1) \quad T_t = t_t B_t$$

where T_t is tax revenue collected at time t by the administration, t_t the average nominal tax rate, and B_t the tax base.

Since the inflation rate may be high and very volatile, the Olivera-Tanzi effect should be included in equation (1). As suggested by Olivera [1967] and Tanzi [1978], tax revenues are influenced negatively by the rate of inflation given that taxes are collected with a certain lag. Following these authors, tax revenues can be expressed as follows :

$$(2) \quad T_t = t_t [B_t^* / [(1 + \Theta g_t)(1 + \Theta \pi_t)]]$$

where B_t^* is the potential tax base, Θ the estimated delay in collection (days/month ratio), g_t the growth rate of the tax base and π_t the inflation rate.

Equation (2) states that tax revenues depend on the average tax rate and the potential tax base adjusted for the Olivera-Tanzi effect. Using this equation, we can determine the factors

$$(3) \Delta \ln T_t = \Delta \ln t_t + \Delta \ln B^*_t - \Delta \ln(1 + \theta g_t) - \Delta \ln(1 + \theta \pi_t)$$

The percentage change in tax revenue; depends on the percentage changes in the theoretical tax base, on the average nominal tax rate, and on the Olivera-Tanzi effect.

Equation (3) can be used to derive changes in the theoretical tax base, which is the only variable not directly observable. Moreover, assuming that the variations in the tax base are attributable to changes in economic activity or in tax administration, we can write the following equation:

$$(4) \quad \Delta \ln B^*_t = \Delta \ln Y_t + \Delta \ln E_t$$

where $\Delta \ln Y_t$ is the percentage change in the tax base owing to variations in economic activity. Substituting equation (4) into equation (3), the percentage change in tax effort equals ($\Delta \ln E$):

$$(5) \Delta \ln E_t = \Delta \ln T_t - \Delta \ln t_t + \Delta \ln(1 + \theta g_t) + \Delta \ln(1 + \theta \pi_t) - \Delta \ln Y_t$$

The percentage change in tax effort is therefore defined as the change in tax revenues that is not explained by variations (i) in nominal tax rates; (ii) in the Olivera-Tanzi effect; and (iii) in the tax base due to changes in economic activity. The variable $\Delta \ln E_t$ is assumed to reflect important *changes in tax legislation (except the changes in nominal taxes), in tax administration and in individuals' attitudes toward tax evasion*. In Section 2.4, the variations in $\Delta \ln E_t$ due to changes in the tax base are distinguished from the other effects.² While the results of such a simple accounting approach should be interpreted with care, they nevertheless offer a framework in which to appraise comparative tax effort over a period of time.

2 See footnote 10, for further details.

2. AN EMPIRICAL ANALYSIS OF TAX EFFORT IN ARGENTINA

2.1 Estimation of Tax Effort (1983-92)

The approach developed in the precedent section was applied to the case of Argentina over the 1983-92 period. After the poor performance of the Argentine tax system during the 1980s, tax revenues increased significantly from 12.7 percent of GDP in 1989 to 22.5 percent of GDP in 1992. One of the major achievements has been unambiguously the surge in VAT revenues from 0.6 percent of GDP in the second quarter of 1989 to 9.2 percent of GDP in the fourth quarter of 1992 (Figure 1). While part of this increase was due to more favorable macroeconomic conditions, improvements in tax administration and tax legislation also contributed to this positive evolution.

To assess the contributions of these different factors on tax revenues, the percentage variations of the main components derived from equation (5) were calculated during the 1983-92 period on a monthly basis. Without loss of generality, we concentrated on the value-added tax (VAT), equivalent to about 60 percent of total tax revenues.³ While the complete results are presented in the Annex, the results obtained by using this methodology are illustrated in Table 1 for the stabilization periods June 1985-September 1986 (Plan Austral) and March 1991-December 1992 (Convertibility Plan). VAT receipts increased significantly during both episodes, but the monthly tax effort was 80 percent higher during the Convertibility Plan than during the Austral Plan. In contrast, if the decline in the inflation rate through the reversal of the Olivera-Tanzi effect accounted for an important part of the transitory success of the Austral Plan (explaining 30 percent of the total tax revenue increase), this effect was almost negligible during the Convertibility Plan. It has to be recognized, however, that about 12 percent of the increase in VAT receipts observed during the Convertibility program was due to the increase in the general VAT rate from 16 percent to 18 percent in March 1992.

The evolution of the tax effort index (1983=100; see technical appendix) over the 1983-92 period is illustrated in Figure 2. During 1987-89, the deterioration in tax effort by about 75 percent was a major reason for lower tax revenues in Argentina. The capacity to administer

3 Note, however, that the impact of the tax structure reform (e.g. elimination of distortionary taxes such as import taxes or stamp tax) on the efficiency of the tax system is excluded from this analysis.

efficient taxes was eroded by inattention to management and systems development, frequent legislative changes and the imposition of new levies greatly complicated the work of the General Tax Board (DGI), resulting in the accumulation of inconsistent bureaucratic procedures. The change of Government in July 1989 produced an unprecedented improvement in tax effort --716 percent between the second quarter of 1989 and the fourth quarter of 1992. Tax effort increased particularly at the beginning of 1990 and during the first two quarters of 1992, in spite of a temporary decline during the first quarter of 1991. As discussed in greater detail in Section 2.4, these improvements occurred in stages, beginning with the broadening of the tax base in February and November 1990.

Losses in tax receipts owing to the Olivera-Tanzi effect also contributed to the fluctuations in tax revenues (Figure 3). As expected, the negative impact on tax revenues was significant during periods of high inflation, reaching its highest point during the two hyperinflations of 1989-90. The negative impact of inflation was also quite important during the months preceding the Austral Plan (June 1985). Not only was the domestic inflation rate extremely high, but the collection delay was estimated above 35 days (see Duran 1987). The fiscal reform package of mid-February 1990 required VAT and income-tax payments to be made within 10 days, thus reducing the collection lag.

2.2 The Causal Relationship Between Tax Effort and Tax Revenues

The administrative dimension of the tax reform explains to a large extent revenue increase since March 1991. In absence of such effort, the increase in tax revenues observed during the Convertibility Plan would have been limited to 34 percent --much lower than the observed increase of 108 percent or even the increase in VAT collection registered during the Austral Plan. The purpose of this section was to determine whether tax administration reforms preceded or followed variations in tax revenues. The generally accepted opinion is that an increase in tax revenues generated by a good tax policy proposal improves the efficiency of tax administration.

To determine the causal relationship between tax effort and tax revenues, we used the well-known Granger test with an optimal distribution lag including 9 lagged variables.⁴ The results are summarized in Table 2. The hypothesis of Granger causality from tax effort toward

4 Corresponding to a white-noise error distribution.

tax revenues cannot be rejected because the parameters of lagged tax effort appear jointly-significant at a 10 percent level (as shown by the F-statistics in Table 2). On the other hand, we did not find Granger causality from tax revenues to tax effort. Regardless if this test defines properly the concept of causality, it is important for at least two reasons. First, it indicates some prediction capacity of changes in tax effort in forecasting future variations in tax revenues. Second, the absence of Granger causality from tax revenues to tax effort allows us to reject the hypothesis that variations in tax revenues precede changes in tax effort.

2.3 Determinants of Tax Effort

Since changes in tax effort are likely to precede rather than follow the variations in tax revenues, it is important to determine the economic and political variables which can affect changes in tax effort. Bird (1992) and Richuptan (1987) argue that macroeconomic variables are important in explaining taxpayers compliance and the efficiency of tax administration. However, the influence of macroeconomic variables on tax effort (or tax evasion) has been relatively little explored in the economic literature. The behavior of taxpayers can be viewed as an attempt to adjust their satisfaction or lack of satisfaction with government services and the macroeconomic environment, but the existing literature has only focused its attention on the explanation of the behavior of taxpayers in terms of microeconomic factors (see Richuptan (1987) for a review of this literature). Assuming that risk-averse taxpayers want to maximize their expected utility (Allingham and Sandmo (1972)) or their expected income (Srinivasan (1973)), the effect of microeconomic factors --including tax rates, tax base, the probability of being detected and penalized, and the size of the penalty-- on tax evasion is discussed.⁵ However, this approach is difficult to test empirically because most of the explanatory variables are not directly observable.

Tax effort is also influenced by the fiscal authorities's decisions (as well as by the bargaining process between these authorities and taxpayers). One popular approach to understand the fiscal behavior of the public sector is to assume that it reflects the actions of a

5 Other factors such as the characteristic of the population --age, sex, educational background-- have also been explored.

set of public decision makers (e.g. Heller (1975)).⁶ Within this framework, tax effort would positively respond to an increase in public expenditures because the Governments would have to adjust its budget constraint. Alternatively, additional sources of financing will reduce incentives to increase tax revenues. Finally, the efficiency of tax administration and the taxpayers compliance levels are closely related to the stability of the political system.

Following the above arguments, the empirical analysis of the responsiveness of tax effort has been limited to three classes of explanatory variables.⁷ First, we tested fiscal variables: real public expenditures, the variation in real net external public financing ($\Delta \ln F$), the variation in M1 ($\Delta \ln M$) as a proxy of public monetary financing, and a dummy variable (DUM1) used to test the assumption that the prohibition of monetary financing during the Convertibility Plan exerted a positive impact on tax effort. Second, we introduced macrovariables: GDP growth (GROWTH) and inflation (INFL); and, finally, indicators of political stability: the number of months between each change in the office of the Minister (POL) and a dummy variable (DUM2) capturing the change of Administration in the third quarter of 1989.

OLS regressions were carried out over the 1983:I-92:IV period, the most significant results are reported in Table 3. Additional comments can be found in the text.⁸ We expressed the variables in percentage variation rather than in levels to eliminate the trend, and used lagged explanatory variables because these variables and tax effort are likely to be jointly determined. Although it is difficult to obtain stable relationships in a country like Argentina, the overall estimated results appear quite satisfactory as summarized by the explanatory power of the

6 Basically, public decision makers are assumed to maximize their utility taking into account uses of public resources and alternative sources of financing such as effort in taxation and borrowing. The maximization of this utility function with respect to current policy variables subject to the public sector budget constraint predicts that tax effort is related positively to public expenditures and negatively to other sources of financing.

7 The analysis remains of course partial since changes in tax effort partially reflect the reality of political power and multiple aspects of the society such as the degree of corruption and the degree of civic conscience.

8 The procedure used in this paper differs from other studies in that the dependent variable is tax effort rather than total tax revenues. Using tax effort, the influence of macroeconomic variables through the Tanzi effect and changes in the potential VAT base is controlled for, implying more reliable tests of the impact of external factors.

regressions ($\text{adj}R^2$) and the white noise behaviour of the residuals tested for autocorrelation (Lagrange multiplier test), heteroskedasticity (due to squares of the regressors) and normality (Jarque-Bera test).⁹

Tax effort appears significantly influenced by the political and economic environment, but little by other fiscal variables. The response of tax effort to past inflation appears to be positive and significant. This result is somewhat surprising because, from the taxpayers' point of view, an increase in the inflation rate is perceived as a policy failure that would encourage future tax evasion. However, it may indicate that the destabilizing impact of inflation on the public sector's budget during the 1980s¹⁰ forced the authorities to improve tax administration or to increase the tax base. Higher lagged GDP growth influenced positively tax effort through an increase in economic welfare and lower liquidity constraints as well as higher confidence in the fiscal sector performance. It is worth underscoring that the relative high elasticity of tax effort to GDP growth accentuates the effect of changes in economic activity on tax revenues: a decline in GDP growth, say from 6 percent to 2 percent, would, other things equal, reduce total VAT revenues by about 8 percent through its direct impact on the potential VAT base and its indirect effect on tax effort.

The stability of the political environment also affected positively tax effort as captured by the variable (POL); this suggests that, other things equal, an additional year of political stability would increase tax effort by 6 percent. The positive impact associated with the change from President Alfonsín to President Menem (DUM2) partly reflects the sharp decline in tax effort registered during the last few months of the Alfonsín Administration when the morale of the tax administration staff was extremely low. External and monetary financing appear to have influenced negatively but not very significantly tax effort during the observed period, suggesting that access to alternative sources of financing may reduce incentives to increase tax effort. Along the same lines, we found a strong positive relationship between the Convertibility Plan and tax effort (DUM1).¹¹

9 The results of these tests are available upon request from the authors.

10 See Beckerman (1989) or Rodriguez (1991)

11 Although the estimated impact of a variation in public expenditures is not reported in Table 3, the insignificant coefficient may be the result of opposite forces. On the one hand, it may reflect the negative influence of

(continued...)

2.4 The Administrative Aspect

We were interested in the specific means and the sequencing used by the Menem Administration to deal with the shortfall of the tax system since 1989. To provide insights on the strategy followed by the Menem Administration, tax effort was separated between the measures aimed at reducing tax exemptions and tax evasion. This was done by slightly modifying the framework presented in Section 1 (see Appendix for further details)¹². Figure 4 illustrates the strategy followed by the Menem Administration. First, the authorities accentuated their efforts on the coverage of the VAT base through legal actions as the potential VAT base increased by more than 40 percent, while tax evasion effort only increased by 15 percent from the third quarter of 1989 to the first quarter of 1991. Then, from March 1991 onwards, they focused their attention on tax evasion by increasing their effort by 129 percent rather than on the VAT base that increased only by 4 percent.

Tax Exemptions

It is well recognized that the high level of (legal) tax exemption in developing countries is one of the major factors explaining the low level of collection (see Bird, (1992)). At the end

11(...continued)

higher public expenditures on the taxpayer willingness to pay, an expansive fiscal policy is generally viewed as a bad policy, raising the marginal utility derived from an extra-dollar of tax evasion. On the other hand, an increase in public expenditures might lead to higher tax effort because the authorities might be compelled to respect their budget constraint.

12 Accordingly, the potential tax base (B^*) can be rewritten as:

$$B^*_i = (\alpha_i Y_i) X_i$$

where α_i is the percentage of GDP covered by the VAT, Y_i is GDP and X_i an index representing the remaining effort in tax administration (i.e the tax evasion reduction effort). Rewriting this equation in log difference and substituting into equation (4) presented in Section 1, the variation in tax effort (ΔE_i) can be expressed as:

$$\Delta \ln E_i = \Delta \ln \alpha_i + \Delta \ln X_i$$

where $\Delta \ln \alpha_i$ represents the changes in exemption reduction effort and $\Delta \ln X_i$ the changes in tax evasion reduction effort.

of the 1980s, Argentina was no exception to this rule as the potential VAT base¹³ was estimated at 52.2 percent of GDP, much lower than the potential VAT base in Europe averaging 60 percent during the 1980s. Over the last two years, the legal coverage of the VAT was increased dramatically by a series of legal actions including the elimination of exemptions for combustibles and foodstuffs in February 1990, improved controls of the industrial promotion regime in April 90 (and a further tightening in December 92), and the inclusion in the VAT base of most services in November 1990. Previously, the VAT had been applicable only to those services specifically listed in the law; the new law contains the few exemptions. Finally, the potential VAT base was extended to water supply services in March 1991 and to insurance services in February 1992. Overall, VAT coverage is estimated to have increased from 52.2 percent in 1989 to almost 80 percent of GDP in 1992.

Tax Evasion

The Menem Administration fought with strong sanctions and a larger tax administration capacity tax evasion. Tax penalties were increased through the reactivation of existing and newly created legal capacities to enforce compliance. A new penal law (February 1990) strengthened the hand of the authorities in prosecuting tax evasion and fraud, mainly by reducing the burden of evidence required before the Government can proceed with penalties. The General Tax Board (DGI) has been granted the authority to close temporarily the premises of enterprises that fail to register for the VAT or to issue invoices. As a result, business closures, which had never been used in Argentina in a systematic way until two years ago, rose from 751 in 1990 to 5,021 in the first 9 months of 1991.

To increase the capacity of the tax administration, the strategy was to enhance simultaneously computerization and human resources development. The administration reactivated its managerial capacities through actions in the areas of **collection management, audits and internal control, and personnel policy**. The effort of increasing the number of audits, closures and detentions are summarized in Table 4.

The primary functions of tax administration--facilitating and monitoring taxpayer compliance and preventing taxpayer non-compliance--have until recently operated very

13 Source: World Bank (1990) and defined as the share in GDP of the economic sectors not exempted from payment of VAT.

inefficiently. The tax roster was allowed to deteriorate during most of the 1980s; additionally, data were collected manually with a high percentage of error. In order to increase the efficiency of tax collection, a new computer software was developed in an increasingly large number of agencies. The tax authorities also attempted to compensate for the absence of automated systems for collection and taxpayer auditing through several local initiatives, some of which had notable success such as the lottery based on VAT receipts that increased registration of transactions. Legal modifications have allowed more flexibility in the application of fiscal secrecy, permitting DGI to publish in newspapers lists of defaulting taxpayers, which has also curtailed fraud. Finally, taxpayer compliance increased significantly when a considerable simplification of tax forms was introduced in January 1992.

The low yield and high cost of taxpayer inspections and audits have been a prominent feature of Argentina's tax administration during the 1980s.¹⁴ DGI management proved unable to generate from within the necessary changes to improve productivity. Since 1989, however, many of the problems that plagued the institutional infrastructure of tax administration have been identified. First, an extensive audit of industrial promotion beneficiaries was launched as well as a census of VAT taxpayers. This operation provided an impressive amount of information about potential taxpayers; moreover, the presence of DGI officials all over the country had a deterrent impact on VAT noncompliance. Second, the strategy also focused on the improvement of DGI's audit capacity. This included the development of a computer program and the use of new tax audit procedures for selected economic firms in different sectors. The administration has been able to detect interruptions in the VAT chain and to develop indicators of critical inputs to estimate taxable bases.

For a long time, DGI management was unable to plan or carry out reforms to improve productivity. Past union contracts demanded a flat compensation curve, as well as ensuring job security, which made it difficult for management to improve the quality of the work force. Qualified staff were difficult to attract and retain, morale was low, and staff usually held more than one job to compensate for low wages. This was aggravated by high turnover in the position of Director General of DGI. As part of the Government's strategy, a new general organizational structure in line with modern managerial concepts was approved in January 1992. At the same

14 Between 1986 and 1989, collected revenue per audit fell from US\$126 to US\$34, while the average cost per audit increased from US\$278 to US\$838.

time, the remuneration, career path, and other human resource issues of the proposed structure were reviewed and embodied in a Collective Work Agreement. This agreement eliminated existing job security and modified the excessively generous leave policy, but established incentive policies including promotion procedures to increase productivity. Finally, training recently has become an area of concern for DGI.

3. CONCLUSION

Although the importance of tax administration reforms is widely acknowledged by those concerned with structural adjustment in developing countries, the relationship between tax administrative changes and tax revenue fluctuations has received little attention in the economic literature. In this paper, we have proposed a simple approach to measure this relationship. Tax effort has been defined as the variation in tax revenues that cannot be explained by the changes in the Olivera-Tanzi effect, in the potential tax base owing to the fluctuations in the economic environment, and in tax rates. The approach has been applied to Argentina, but can be readily applied to other countries as well.

The major results from the analysis can be summarized as follows:

- The administrative dimension of tax reform is at the center of the recent fiscal adjustment in Argentina. Since 1991, tax effort is on average 80 percent higher than during the precedent (temporary) successful adjustment episode in Argentina (the Austral Plan).
- An efficient tax administration and an improvement in taxpayers compliance levels appear to precede rather than to follow tax revenues increases.
- Tax effort is influenced significantly by macrovariables such as GDP growth and inflation as well as by the stability of the political environment, but little by other fiscal variables such as alternative sources of financing.
- The increase in tax effort is generally the result of reductions in legal tax exemptions and in tax evasion. The sequencing in Argentina was, first, to broaden the potential VAT base, and, then, to reduce tax evasion through higher

**tax penalties and improvements of the basic functions of tax administration:
inspection and audits, tax management, and personnel policy.**

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Table 1 - Increases in VAT Collection: Comparison between the Austral and Convertibility Plans

Variation in a/:	Austral Plan (May 1985 - Sep 1986)		Convertibility Plan (Mar 1991 - Dec 1992)	
	Total	Monthly Average	Total	Monthly Average
VAT Collection (T)	52.73	3.10	108.04	4.91
Tax Effort (E)	31.85	1.87	74.04	3.37
Real GDP (Y)	4.70	0.28	15.32	0.70
Olivera-Tanzi Effect b/	16.18	0.95	6.90	0.31
Tax Rate (t)	0.00	0.00	11.78	0.54

a/ Calculated as variations of natural logarithms, in percent.

b/ Measured as the log variation of gross corrected GDP growth and gross corrected inflation.

Table 2 - Granger Causality Test (Jan 1983 - Dec 1992)

Variable	E	E	VAT	VAT
constant	4.377 (0.32)	-2.736 (-.37)	-52.546 (-1.39)	-11.182 (-0.67)
E(-1)	0.424 (2.22)	0.411 (4.19)	0.416 (0.80)	
E(-2)	0.311 (1.59)	0.373 (3.52)	0.623 (1.16)	
E(-3)	-0.060 (-0.31)	0.071 (0.63)	-0.166 (-.31)	
E(-4)	0.176 (0.89)	0.135 (1.20)	0.907 (1.69)	
E(-5)	-0.119 (-0.62)	-0.168 (-1.50)	-1.118 (-2.11)	
E(-6)	-0.0314 (-0.16)	0.0785 (0.70)	-0.480 (-0.88)	
E(-7)	-0.0539 (-0.27)	-0.045 (-0.406)	-0.637 (-1.19)	
E(-8)	0.0472 (0.24)	0.109 (0.10)	0.788 (1.47)	
E(-9)	0.2175 (1.15)	0.190 (1.83)	0.719 (1.39)	
VAT(-1)	-0.007 (-0.10)		0.466 (2.49)	0.623 (6.31)
VAT(-2)	0.030 (0.41)		0.258 (1.28)	0.403 (3.49)
VAT(-3)	0.049 (0.66)		0.143 (0.71)	-0.527 (-0.43)
VAT(-4)	-0.036 (-0.50)		-0.270 (-1.37)	-0.305 (-0.25)
VAT(-5)	-0.028 (-0.40)		0.146 (0.75)	-0.142 (-1.20)
VAT(-6)	0.0461 (0.66)		0.333 (1.75)	0.298 (2.50)
VAT(-7)	0.002 (0.03)		0.081 (0.42)	-0.065 (-0.53)
VAT(-8)	-0.016 (-0.24)		-0.351 (-1.87)	-0.161 (-1.38)
VAT(-9)	-0.017 (-0.26)		0.060 (1.39)	0.197 (1.81)
	R ² = 0.79 DW = 2.00 RSS = 53571.7 N = 111 F(9,93) = 0.16	R ² = 0.79 DW = 2.00 RSS = 54396.5 N = 111	R ² = 0.93 DW = 1.93 RSS = 401350.5 N = 111 F(9,93) = 2.25	R ² = 0.92 DW = 1.92 RSS = 488537.4 N = 111

Note: E is the monthly tax effort index and VAT real value added tax revenues. T statistics are shown in parenthesis. R² is the explanatory power of the regression; DW is the Durbin-Watson Statistic; RSS is the residual sum of squares of the regressions; N is the number of observations. F is a Fisher test of joint-significance of the lagged terms of the independent variable.

Table 3: The Determinants of Tax Effort, 1983-92

	$\Delta \ln E$	$\Delta \ln E$	$\Delta \ln E$	$\Delta \ln E$
constant	-0.508 (-2.75)	-0.338 (-3.00)	-0.296 (-2.66)	-0.152 (-2.10)
infl(-1)	1.965 (5.50)	0.815 (3.12)	0.687 (2.74)	1.465 (4.93)
Growth(-1)	1.378 (1.75)	0.867 (1.82)		1.436 (1.67)
$\Delta \ln F(-1)$			-0.002 (-1.24)	
$\Delta \ln M(-1)$				-0.264 (-1.34)
POL	0.006 (1.55)	0.005 (2.37)	0.005 (2.17)	
DUM1	0.357 (2.55)	0.251 (2.96)	0.237 (2.74)	
DUM2		1.856 (7.65)	1.887 (7.61)	
adjR ²	0.518	0.833	0.824	0.439
DW	2.67	2.31	2.47	2.40

where $\Delta \ln E$ is the percentage change in total tax effort, *infl(-1)* lagged domestic inflation, *Growth(-1)* lagged GDP growth, $\Delta F(-1)$ is changes in external financing, $\Delta \ln M(-1)$ is changes in M1, POL the number of months between changes in Minister of Economy, DUM1 a dummy variable for the period of the Convertibility, and DUM2 a dummy variable for the third quarter of 1989 capturing the change of Administration.

Table 4: Tax Administration, Indicators of Collection Effort (1987-92)

	1987	1988	1989	1990	1991	1992 ^{a/}
Collection Orders	9,668	15,137	15,841	13,089	69,548	48,708
Control						
Closures	0	0	0	751	8,157	32,000
Effective Closures	0	0	0	n.a.	5,466	17,184
Fines	n.a.	n.a.	n.a.	n.a.	40,933	n.a.
Audits and Indictments						
Indictments Initiated	20,903	33,770	25,286	39,138	179,452	n.a.
Indictments Pending	n.a.	n.a.	n.a.	n.a.	116,084	197,332
Internal and External Audits	25,955	21,310	13,864	20,845	41,313	n.a.
Preventive Audits	n.a.	40,475	38,483	119,969	228,821	n.a.

^{a/} Estimates based on first quarter of 1992 only.
Source: DGI and World Bank staff estimates.

Figure 1

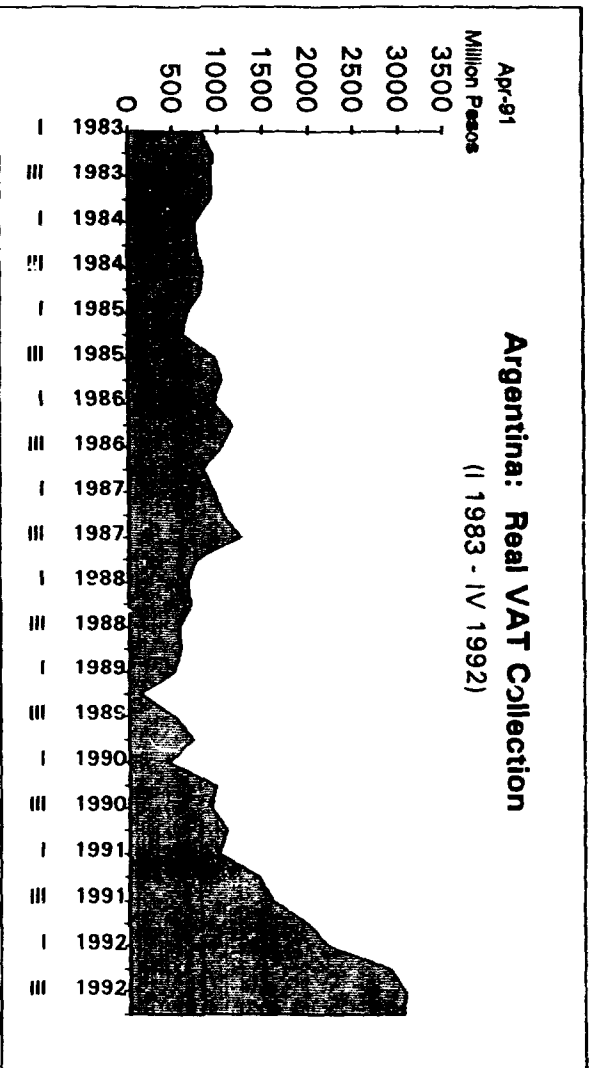


Figure 2

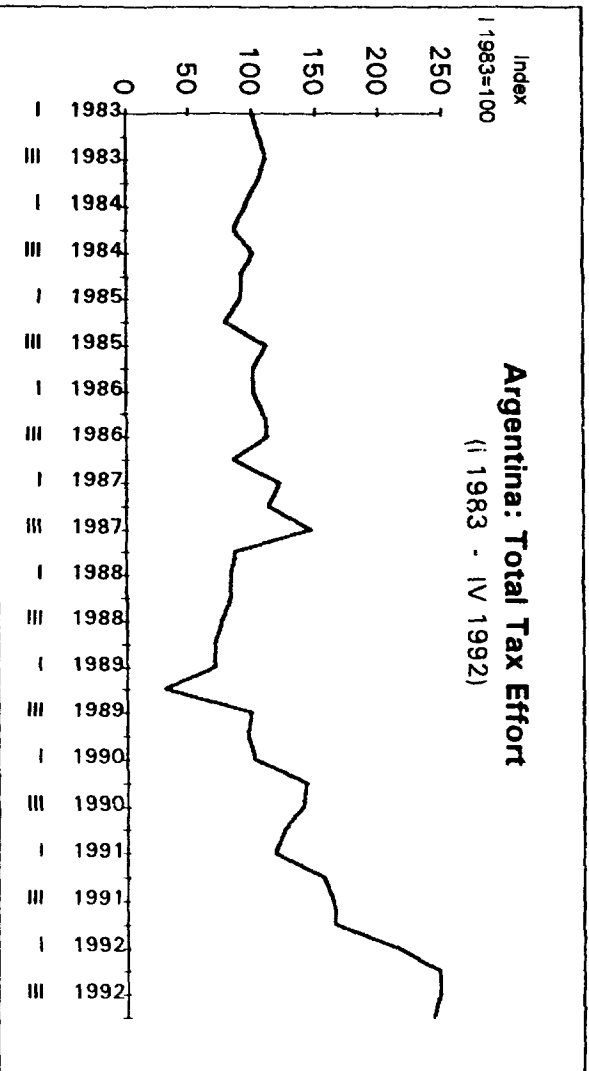


Figure 3

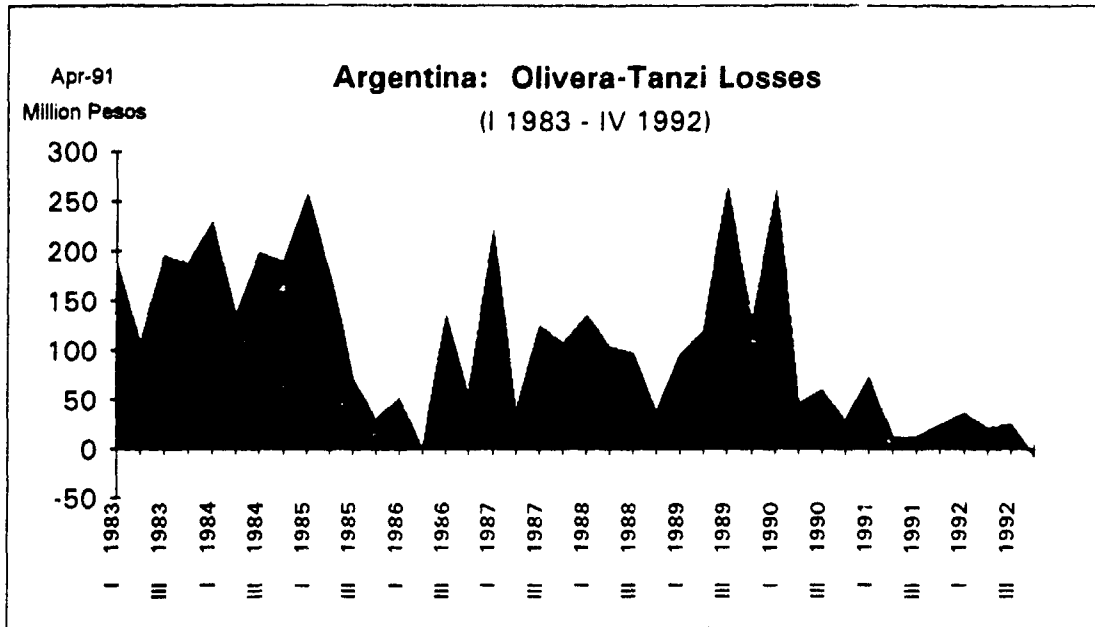
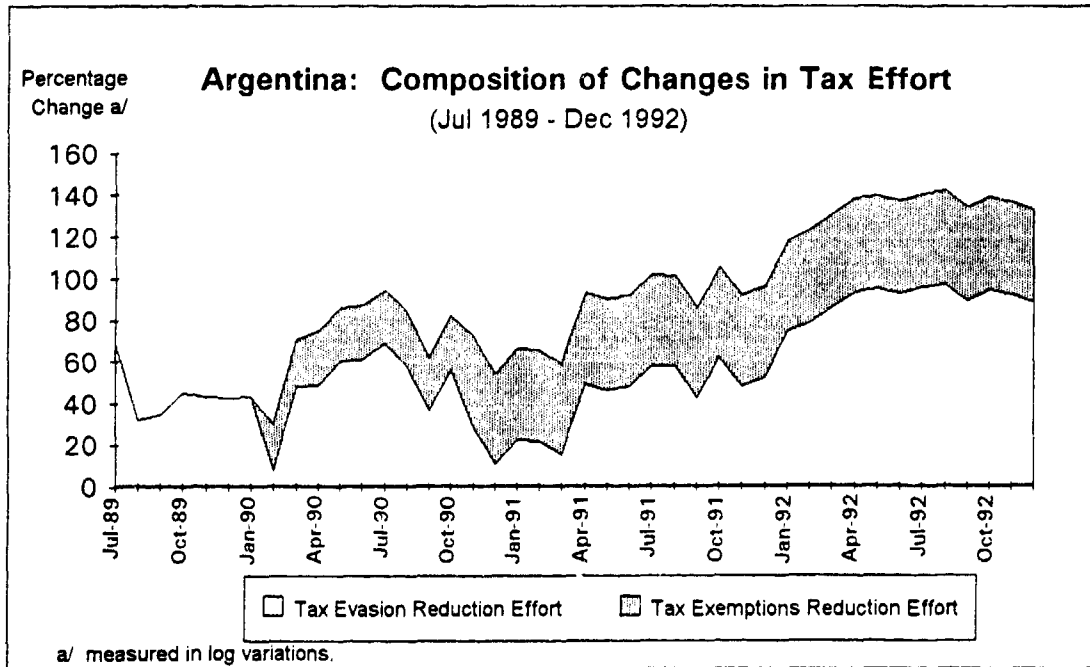


Figure 4



TECHNICAL APPENDIX

The monthly series involved in the estimation of tax effort are:

- a) Real VAT revenue (T), defined as nominal VAT collection net of withdrawals, deflated by the average combined price index.
- b) VAT rate (t), applied to general goods and services^{1/}.
- c) Collection delay (Θ) which is the legal delay, defined as the ratio "days of legal delay/days of period".
- d) The inflation rate (π), measured by the variation of the combined price index^{2/}.
- e) Real GDP (Y). Note that GDP data was only available on a quarterly basis. It was converted into a monthly series, using a monthly industrial production index as a proxy of economic activity.

The above information was obtained from the Tax Administration Agency (DGI), the Central Bank (BCRA) and the Institute of Statistics (INDEC).

In the main text (see Figure 2), we decided to present tax effort as an index, which was constructed in two steps. The monthly percentage change in tax effort^{3/} was estimated following equation (5); the detailed results are shown in Table 1 of this appendix. We then calculated the tax effort index (with base January of 1983=100) as follows:

$$E_{t+1} = \text{EXP} [\text{LN}(E_t) + \Delta \text{LN}(E_{t+1})]$$

The resulting monthly index is presented in the last column of Table 1 of this appendix. The quarterly index in Figure 2 is the simple average of the monthly index.

The decomposition of total tax effort into exemptions reduction effort and tax evasion reduction effort has been calculated by using the procedure described in the main text (see section 2.4 and Figure 4). The results are summarized in Table 2 of this appendix. Again, we chose to present them as indices, following the methodology described above.

^{1/} It is acknowledged that other rates apply to some goods and services, though these were not available on a detailed basis throughout the period.

^{2/} This measure of inflation is commonly used in Argentina; the combined price index is the simple average of the consumer and wholesale price indices.

^{3/} Measured as the variation of natural logarithms.

Table 1 - Argentina: Estimation of Total Tax Effort Index (January 1983 - December 1992)

	Log Change in Real VAT Collection	Log Change in Tax Rate	Log Change in Corrected Gross GDP Growth	Log Change in Corrected Gross Inflation	Log Change in Real GDP	Log Change in Tax Effort	Log of Tax Effort	Tax Effort Index Jan 83 = 100
Jan-83	-0.0089	0.0000	0.1071	0.0487	0.0401	0.1068	4.6052	100.00
Feb-83	-0.1813	0.0000	-0.953	-0.0198	-0.2908	-0.3056	4.2995	73.66
Mar-83	-0.0481	0.0000	0.7282	-0.0225	0.3334	0.3262	4.8258	102.08
Apr-83	0.1159	0.0000	-0.5142	-0.0303	-0.1394	-0.3192	4.3066	74.19
May-83	0.2482	0.0000	0.2096	0.0184	0.0361	0.4371	4.7437	114.86
Jun-83	-0.1264	0.0000	-0.0084	0.0526	0.0288	-0.1110	4.6327	102.79
Jul-83	0.0385	0.0000	-0.0929	-0.0315	-0.0507	-0.0353	4.5974	99.23
Aug-83	-0.0671	0.0000	0.1081	0.0582	0.0419	0.0573	4.6548	105.08
Sep-83	-0.0461	0.0000	-0.0246	0.0531	0.0208	-0.0384	4.6164	101.13
Oct-83	0.1366	0.0000	-0.0020	-0.0604	0.0191	0.0552	4.6715	106.86
Nov-83	-0.0295	0.0000	0.0670	0.0028	0.0769	-0.0365	4.6350	103.03
Dec-83	-0.2056	0.0000	-0.2503	0.0105	-0.1365	-0.3090	4.3260	75.64
Jan-84	-0.0221	0.0000	0.2171	0.0644	0.0481	0.0825	4.4085	82.14
Feb-84	-0.1403	0.0000	-0.3126	0.0448	-0.2157	-0.1924	4.2161	67.77
Mar-84	0.1719	0.0000	0.5986	0.0266	0.2996	0.4975	4.7135	111.44
Apr-84	-0.2540	0.0000	-0.4523	0.0019	-0.0939	-0.6106	4.1030	60.52
May-84	0.2778	0.0000	0.1232	-0.0406	0.0109	0.3495	4.4525	85.84
Jun-84	0.0082	0.0000	-0.0254	0.0500	-0.0109	0.0437	4.4962	89.67
Jul-84	0.0701	0.0000	-0.0139	-0.0356	-0.0227	0.0434	4.5395	93.65
Aug-84	0.0146	0.0000	0.0775	0.0544	0.0439	0.1027	4.6423	103.78
Sep-84	-0.2294	0.0000	-0.1217	0.0321	-0.0603	-0.2586	4.3836	80.13
Oct-84	0.2301	0.0000	0.2654	-0.0835	0.1691	0.2429	4.6266	102.16
Nov-84	-0.1355	0.0000	-0.2623	-0.0203	-0.0576	-0.3605	4.2661	71.24
Dec-84	-0.0274	0.0000	-0.0605	0.0678	-0.1088	0.0886	4.3547	77.84
Jan-85	-0.0716	0.0000	0.2447	0.0135	0.0981	0.0885	4.4432	85.05
Feb-85	-0.1453	0.0000	-0.4905	-0.0358	-0.3011	-0.3705	4.0727	58.71
Mar-85	0.0882	0.0000	0.6936	0.0781	0.2730	0.5868	4.6595	105.58
Apr-85	-0.1870	0.0000	-0.3354	0.0309	-0.0131	-0.4783	4.1811	65.44
May-85	0.1624	0.0000	-0.0274	-0.0163	-0.0358	0.1545	4.3357	76.38
Jun-85	-0.1046	0.0000	-0.1214	0.0773	-0.1351	-0.0135	4.3222	75.35
Jul-85	0.5324	0.0000	0.1306	-0.3559	-0.0282	0.3353	4.6574	105.37
Aug-85	-0.1561	0.0000	0.1115	0.0061	0.0650	-0.1036	4.5538	95.00
Sep-85	0.1902	0.0000	0.0280	-0.0116	0.0888	0.1179	4.6717	106.88
Oct-85	0.0311	0.0000	-0.0136	0.0009	0.0773	-0.0588	4.6129	100.78
Nov-85	0.0291	0.0000	-0.1212	0.0019	-0.0243	-0.0659	4.5471	94.35
Dec-85	-0.1537	0.0000	-0.0092	0.0054	-0.0319	-0.1256	4.4214	83.21
Jan-86	-0.1637	0.0000	0.0922	-0.0677	0.0450	-0.1242	4.2972	73.50
Feb-86	0.3377	0.0000	-0.3654	-0.0902	-0.2525	0.2246	4.5218	92.00
Mar-86	-0.1836	0.0000	0.6248	0.0183	0.2673	0.1922	4.7140	111.49
Apr-86	0.2640	0.0000	-0.3137	0.0115	-0.0005	-0.0378	4.6762	107.36
May-86	-0.1175	0.0000	0.0014	-0.0049	0.0007	-0.1217	4.5545	95.06
Jun-86	0.0560	0.0000	-0.1476	0.0148	-0.1207	0.0439	4.5984	99.33
Jul-86	-0.1252	0.0000	0.1997	0.0139	0.0443	0.0441	4.6425	103.80
Aug-86	-0.0199	0.0000	-0.0029	0.0368	0.0418	-0.0279	4.6146	100.94
Sep-86	0.1117	0.0000	-0.0379	-0.0236	0.0101	0.0396	4.6542	105.02
Oct-86	-0.0845	0.0000	0.1004	-0.0154	0.0946	-0.0940	4.5601	95.59
Nov-86	-0.2514	-0.1178	-0.1884	-0.0056	-0.0629	-0.2648	4.2953	73.36
Dec-86	-0.1635	0.0000	-0.0922	-0.0155	-0.0647	-0.1164	4.1789	65.29
Jan-87	0.4334	0.0000	0.1276	0.0169	0.0494	0.5285	4.7074	110.76
Feb-87	-0.6470	0.0000	-0.2954	0.0044	-0.2460	-0.6921	4.0153	55.44
Mar-87	0.8675	0.0000	0.5639	0.0119	0.3179	1.1254	5.1407	170.83
Apr-87	-0.2713	0.0000	-0.3927	-0.0519	-0.0749	-0.6411	4.4936	89.98
May-87	0.0743	0.0000	0.0613	0.0196	-0.0135	0.1688	4.6684	106.53
Jun-87	0.0432	0.0000	0.0470	0.0254	0.0334	0.0821	4.7505	115.65
Jul-87	0.5363	0.0000	-0.0671	0.0227	-0.0337	0.5255	5.2761	195.60
Aug-87	-0.8336	0.0000	0.0070	0.0402	-0.0267	-0.7597	4.5163	91.50
Sep-87	0.1997	0.0000	0.0426	0.0023	0.0159	0.2288	4.7451	115.02
Oct-87	-0.2855	0.0000	0.0917	0.0947	0.1076	-0.2067	4.5384	93.54
Nov-87	0.0267	0.0000	-0.1663	-0.1651	-0.0588	-0.2459	4.2925	73.15
Dec-87	-0.0233	0.0000	0.0408	-0.0378	-0.0179	-0.0024	4.2901	72.97

continued..

Tabl. 1 - Argentina: Estimation of Total Tax Effort Index (January 1983 - December 1992)

	Log Change in Real VAT Collection	Log Change in Tax Rate	Log Change in Corrected Gross GDP Growth	Log Change in Corrected Gross Inflation	Log Change in Real GDP	Log Change in Tax Effort	Log of Tax Effort	Tax Effort Index Jan 83 = 100
Jan-88	-0.1753	0.0000	-0.0015	0.0757	-0.0194	-0.0817	4.2084	67.25
Feb-88	0.0188	0.0000	-0.1408	0.0121	-0.1601	0.0503	4.2587	70.72
Mar-88	0.0616	0.0000	0.4468	0.0304	0.2866	0.2521	4.5108	91.00
Apr-88	0.0546	0.0000	-0.4389	0.0116	-0.1523	-0.2205	4.2904	72.99
May-88	-0.1732	0.0000	0.2222	0.0274	0.0699	0.0065	4.2968	73.47
Jun-88	0.1641	0.0000	-0.1079	0.0120	-0.0380	0.1063	4.4032	81.71
Jul-88	-0.1796	0.0000	-0.0132	0.0288	-0.0512	-0.1128	4.2904	73.00
Aug-88	-0.0733	0.0000	0.0411	0.0396	-0.0102	0.0175	4.3079	74.29
Sep-88	-0.0721	-0.0645	-0.0503	-0.1845	-0.0604	-0.1819	4.1260	61.93
Oct-88	-0.1398	0.0000	0.1816	-0.0196	0.1712	-0.0990	4.0269	56.09
Nov-88	0.3508	0.0000	-0.1119	-0.0158	0.0093	0.2138	4.2408	69.46
Dec-88	-0.0372	0.0000	-0.1002	0.0146	-0.0909	-0.0319	4.2089	67.28
Jan-89	-0.1795	0.0000	0.0691	0.0150	-0.0218	-0.0737	4.1352	62.50
Feb-89	-0.0374	0.0000	-0.0137	0.0107	-0.0355	-0.0049	4.1303	62.20
Mar-89	-0.0190	0.0000	0.2512	0.0816	0.2157	0.0981	4.2284	68.61
Apr-89	-1.5388	0.0000	-0.2916	0.2265	-0.0759	-1.5280	2.7004	14.89
May-89	-0.4622	0.0000	-0.0760	0.2753	-0.1519	-0.1110	2.5893	13.32
Jun-89	1.1492	0.0000	0.1624	0.1524	0.0104	1.4535	4.0429	56.99
Jul-89	0.4047	0.0000	-0.0443	0.2951	-0.0339	0.6893	4.7322	113.54
Aug-89	0.5549	0.0000	0.0831	-0.9562	0.0492	-0.3675	4.3647	78.63
Sep-89	0.1823	0.0000	-0.0350	-0.1114	0.0142	0.0216	4.3863	80.35
Oct-89	0.1400	0.0000	0.1009	-0.0184	0.1151	0.1074	4.4937	89.45
Nov-89	0.0904	0.0000	-0.1209	0.0060	-0.0058	-0.0187	4.4750	87.80
Dec-89	-0.3475	0.0000	-0.0309	0.3370	-0.0366	-0.0047	4.4703	87.38
Jan-90	-0.3263	-0.1431	0.0486	0.1477	0.0120	0.0011	4.4714	87.48
Feb-90	-0.1641	0.0000	-0.2137	0.0519	-0.2018	-0.1242	4.3472	77.26
Mar-90	0.5162	0.0000	0.2909	-0.2355	0.1709	0.4007	4.7478	115.34
Apr-90	0.3774	0.0000	-0.1347	-0.2930	-0.0934	0.0430	4.7909	120.40
May-90	0.1103	0.0000	0.0972	0.0059	0.1007	0.1127	4.9035	134.76
Jun-90	0.0357	0.0000	-0.0725	0.0020	-0.0423	0.0075	4.9110	135.78
Jul-90	0.0261	0.0000	-0.0261	-0.0120	-0.0965	0.0785	4.9895	146.86
Aug-90	-0.1270	0.0000	0.1242	0.0450	0.1487	-0.1065	4.8830	132.03
Sep-90	-0.1362	0.0000	-0.0921	-0.0205	-0.0302	-0.2186	4.6644	106.10
Oct-90	0.2759	0.0000	0.0747	-0.0346	0.1161	0.1999	4.8644	129.59
Nov-90	0.1417	0.1823	-0.0663	-0.0059	-0.0133	-0.0996	4.7648	117.31
Dec-90	-0.2118	0.0000	-0.0234	-0.0069	-0.0610	-0.1812	4.5836	97.87
Jan-91	0.1058	0.0000	0.0805	0.0328	0.0985	0.1206	4.7042	110.41
Feb-91	-0.1775	0.0000	-0.1531	0.1073	-0.2171	-0.0062	4.6980	109.73
Mar-91	0.0745	0.0253	0.1474	-0.1332	0.1287	-0.0653	4.6328	102.80
Apr-91	0.3471	0.0000	-0.0677	-0.0065	-0.0705	0.3434	4.9761	144.91
May-91	0.0364	0.0000	0.0680	-0.0049	0.1296	-0.0301	4.9460	140.61
Jun-91	0.0059	0.0000	-0.0707	0.0006	-0.0789	0.0147	4.9607	142.69
Jul-91	0.0826	0.0000	0.0283	-0.0020	0.0080	0.1009	5.0615	157.83
Aug-91	0.0215	0.0000	0.0076	-0.0034	0.0305	-0.0048	5.0567	157.08
Sep-91	-0.0306	0.1178	-0.0121	0.0021	-0.0055	-0.1529	4.9038	134.81
Oct-91	0.2856	0.0000	0.0512	-0.0002	0.1413	0.1963	5.1001	164.04
Nov-91	-0.0386	0.0000	-0.0519	-0.0042	-0.0075	-0.1371	4.9630	143.02
Dec-91	0.0027	0.0000	-0.0163	0.0003	-0.0574	0.0442	5.0071	149.47
Jan-92	0.1324	0.0000	-0.0086	0.0064	-0.0845	0.2147	5.2218	185.27
Feb-92	-0.0865	0.0000	-0.0248	-0.0015	-0.1656	0.0528	5.2746	195.32
Mar-92	0.1826	0.0000	0.1436	0.0015	0.2523	0.0754	5.3500	210.62
Apr-92	0.1889	0.0000	-0.0910	-0.0036	0.0009	0.0734	5.4235	226.66
May-92	0.0172	0.0000	-0.0007	-0.0012	-0.0012	0.0165	5.4399	230.42
Jun-92	0.0024	0.0000	0.0157	0.0014	0.0453	-0.0257	5.4142	224.57
Jul-92	0.0543	0.0000	-0.0101	0.0019	0.0156	0.0305	5.4447	231.52
Aug-92	0.0251	0.0000	-0.0043	-0.0009	0.0027	0.0172	5.4619	235.54
Sep-92	-0.0645	0.0000	0.0063	-0.0007	0.0215	-0.0805	5.3814	217.33
Oct-92	0.0660	0.0000	-0.0037	-0.0004	0.0106	0.0512	5.4326	228.75
Nov-92	-0.0257	0.0000	-0.0088	-0.0044	-0.0159	-0.0229	5.4097	223.56
Dec-92	-0.0552	0.0000	-0.0007	0.0014	-0.0180	-0.0365	5.3732	215.54

Table 2 - Argentina: Composition of Total Tax Effort (July 1989 - December 1992)

	Total Tax Effort Index (July 1989 = 100)	Tax Evasion Effort Index (July 1989 = 100)	Exemptions Reduction Effort Index (July 1989 = 100)
Jul-89	100.00	100.00	100.00
Aug-89	69.25	69.25	100.00
Sep-89	70.76	70.76	100.00
Oct-89	78.78	78.78	100.00
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