

Measuring the Performance of Chile's Tax Administration

Abstract - The purpose of this paper is to measure the effectiveness of Chile's Internal Revenue Service (SII). We assume that its goal is to achieve maximum compliance from taxpayers while minimizing compliance costs. Sample taxpayer surveys and statistical data both show that SII service standards—a proxy for compliance costs—improved during the 1990s. Compliance rates also increased significantly in the same period. Regression analysis, however, suggests that this is largely explained by the country's strong economic growth during the decade. Our preferred performance indicator—the degree to which observed compliance falls short of its maximum achievable level—displays no change.

INTRODUCTION

The aim of this paper is to measure the performance of Chile's Internal Revenue Service (SII) in the 1990s.¹ Although its director is a presidential appointee, the service itself is an autonomous decentralized public body. The government determines the tax structure and sets the SII budget, while the latter formulates and implements the tax enforcement strategy to be used.² The government therefore has to deal with two problems: (i) setting performance targets for the tax administration; and (ii) developing suitable performance indicators (PIs) for those goals. This note discusses the tax administration goals, develops corresponding PIs, and applies them to the Chilean case.

Three categories of performance indicator are distinguished in the literature. Economy indicators measure the ability to carry out tasks at minimum cost; an example would be the tax administration (TA) expenditure per taxpayer. Efficiency indicators measure the relationship between outputs and inputs—the number of audits carried out by each tax inspector, for example. Lastly, effectiveness indicators (EIs) assess the degree to which institutional objectives are being achieved; these usually include user- or citizen-satisfaction, but as this is hard to build into a common indicator, it is normally assessed separately.

Pablo Serra
*Centro de Economía
Aplicada, Universidad
de Chile, Santiago,
Chile*

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¹ A new democratically elected president took office in March 1990, and the top management of the SII was overhauled. Then the president that succeeded him in 1994 kept the incumbent SII director in his post.

² A two-tier decision-making procedure is common in this context (Cremer, Marchand, and Pestieau, 1990), and has been institutionalized in countries as different as Kenya and the USA.

Tax Administrations mostly use economy and efficiency indicators. Although these are quite useful as internal management tools, they can lead to flawed conclusions if mistaken for effectiveness indicators. For instance, TA expenditure per taxpayer would improve if tax revenue increased as a result of higher tax rates, without any change in the tax administration's efforts.³ The number of taxpayers penalized, or the amounts collected from fines, are often proposed as alternative performance indicators, but these can also be misleading.⁴ When the tax enforcement effort increases, taxpayers are likely to respond by reducing evasion. On the other hand, the proportion of evasion detected can also be expected to increase, so the net effect of greater TA efforts on revenue collected from fines is ambiguous.

Effectiveness indicators should be determined by the objective assigned to the TA. The public finance literature generally assumes that the aim of fiscal policy is to maximize social welfare, which is achieved when the marginal benefit of government expenditures is equal to the marginal cost of collecting taxes, plus the marginal utility of income for the representative taxpayer (Kaplow, 1990). Since the TA is responsible for collecting taxes, its goal should be to minimize collection costs for a given tax structure and tax administration budget.

The literature identifies six components of collection costs (Slemrod and Yitzhaki, 1996): (i) the deadweight loss—inefficiency caused by taxpayers switching from taxed to untaxed or less taxed activi-

ties; (ii) the administrative cost—i.e., the TA budget; (iii) the compliance cost—the costs borne by citizens in complying with the tax laws; (iv) the cost of noncompliance—the cost of concealing income from TA; (v) the risk borne by tax-evaders; and (vi) the costs of market distortions resulting from the unfair competition that non-evaders face from evaders (Tanzi and Shome, 1993).

In this note we argue that joint minimization of tax evasion and compliance costs can be used as a proxy for minimization of collection costs, which would be very hard to observe directly. Integrating the two objectives into a single indicator would be highly desirable, but this would require better theoretical and empirical understanding on how they trade off against each other. Accordingly, we develop a separate indicator for each objective, but this means we can only claim that TA performance has unambiguously increased when both performance indicators improve at the same time; otherwise the PIs provide useful information to tax administrators, at least.

The compliance rate itself could serve as EI for the compliance maximization objective. The International Monetary Fund has used VAT compliance as a TA performance measure in many countries, using a national accounts-based methodology to calculate it.⁵ But as tax evasion is affected by variables that are beyond TA control, such as changes in per-capita income, we use the percentage deviation of the observed compliance rate from maximum achievable compliance as an EI for the compliance maximization goal. As for

³ The Inter-American Tax Administrators Center estimates the quotient between revenue collection and the tax administration budget for countries in the region. Chile's SII also posts comparative data on its website, and the IRS in the USA publishes its own quotient.

⁴ Cremer, Marchand, and Pestieau, (1990) suggest maximization of the number or amount of fines for a given audit budget as the TA goal. Hunter and Nelson (1996) assume the output of TA to be tax enforcement, and that this can be adequately measured by the additional taxes and penalties assessed by the TA.

⁵ Silvani and Brondolo (1993) computed the 1991 compliance rates for 20 countries (Chile's compliance rate of 74 percent ranked eighth in the sample; the average was 69.2 percent). Since calculating the compliance rate requires information that might not be available for all countries, the IMF also uses the productivity rate as a rule of thumb, i.e., the ratio between VAT revenue collected as percentage of GDP, and the tax rate.

the second objective, minimizing compliance costs, the EI chosen in this note is taxpayer service standards, which, we claim, is a better effectiveness indicator than non-standardized compliance costs.⁶

During the 1990s the SII's stated objectives were as discussed above,⁷ so it is appropriate to evaluate its performance on that basis. We show that in the 1990s its performance improved significantly in terms of one of the two objectives: taxpayers' satisfaction with services. Opinion polls show that taxpayers' evaluation of the SII improved in this period and this has been backed up by factual data on service quality. The EI for the other objective—the extent to which actual compliance falls short of the maximum achievable—did not improve in the 1990s. Although compliance rates rose sharply in the early part of that decade, regression analysis suggests the increase is largely explained by the country's strong economic growth during the period.

The remainder of this note is organized as follows: the second section establishes the goals and develops TA effectiveness indicators; and the third and fourth sections use these to measure the SII's performance. The final section offers some conclusions.

TAX ADMINISTRATION PERFORMANCE INDICATORS

Minimizing collection costs should be a goal of the TA; but this does not provide a practical indicator, since collection costs are impossible to measure in the current state of the art. Below we argue that tax

collection costs generally fall when greater TA effort results in a higher compliance rate, and this provides a rationale for setting tax compliance maximization as a TA objective.

An improvement in the TA's performance resulting in higher rates of compliance enables the government to collect the same revenue with either lower tax rates, a reduced TA budget, or both. The optimal response is likely to consist of a combination of the two, thereby reducing the first two tax collection costs (deadweight and administrative costs). A higher compliance rate also reduces the risk borne by tax-evaders. Moreover, if the TA reduces evasion rates by targeting major evaders, the market distortion costs also diminish. Noncompliance costs could also fall with compliance as less income is concealed from the TA. Even when evasion is reduced by raising the unitary cost of non-compliance,⁸ since evasion diminishes the combined effect is ambiguous. Moreover, noncompliance costs are unlikely to have much weight in the social welfare function.

It remains to analyze the relation between compliance costs and compliance rates, for which the mechanism whereby higher compliance is achieved needs to be specified. The literature claims that tax compliance improves with both more intensive enforcement efforts and lower compliance costs. There is empirical evidence that the TA fosters compliance by being congenial towards taxpayers, providing timely information and simplifying tax procedures (Thurman, 1991). Thus improved taxpayer services not only re-

⁶ Computing the minimum compliance cost to construct a better EI seems an impossible task at the present time; even measuring actual compliance cost is hard.

⁷ The SII states that its mission is to administer the internal taxation system, monitor taxpayers to ensure they comply with the tax laws, and facilitate compliance. Its objectives are to improve the efficiency of the Service's permanent activity; promote professional and personal development among its staff; reduce levels of tax evasion and avoidance; facilitate tax compliance and improve taxpayer services; ensure equity and legal precision in the application of tax laws; strengthen and develop greater technological capacity to fulfill the mission. The United States Internal Revenue Service (IRS) states its objective as to maximize compliance while minimizing compliance costs.

⁸ For instance, computerized matching of third-party data could raise the cost of concealing income.

duce compliance costs but also foster compliance. On the other hand, stricter enforcement—making it more likely that evasion gets detected—could come as the result of a larger number of audits, more in-depth audits, or a shrewder selection of taxpayers for audit.⁹ In the first two cases some rise in compliance costs can be expected.

To summarize the discussion so far, collection costs are likely to be positively related to tax compliance. The precise relationship, however, depends on the way compliance maximization is achieved—i.e., on how the TA allocates its budget between tax enforcement activities and improving taxpayer services. If the only target set for the TA is to maximize tax compliance, it will allocate its budget such that the last dollar spent on enforcement activities yields the same tax revenue as the last dollar spent on improving taxpayer services. But the last dollar spent on improving services will have the additional benefit of also lowering compliance costs, which could be quite large.¹⁰

In short, unconditional compliance maximization is unlikely to minimize collection costs, so the additional goal of minimizing compliance costs needs to be established explicitly. We therefore propose setting a dual objective for the tax administration: maximizing tax compliance and minimizing compliance costs. Integrating both objectives into a single indicator would be highly desirable, but this would require better theoretical and empirical understanding of the relations between collection costs and both the compliance rate and compliance costs than we currently have.

Having set objectives for the tax administration, we now develop the corresponding EIs, focusing first on compliance maxi-

mization. The higher the compliance rate, holding all other variables constant, the greater effectiveness will be. The compliance rate does not permit inter-period comparisons, however, since tax compliance depends on other variables besides the performance of the TA. Traditional tax evasion theory makes an individual's compliance rate, s , a function of the probability, p , of evasion being detected, the size of the corresponding penalty, m , the individual's income, y , and the tax rate, t , as summarized in the following expression (Allingham and Sandmo, 1972):

$$[1] \quad s = f(y, t, m, p).$$

In what follows we omit the unit penalty, as theory and evidence are both ambiguous about its effect on revenue collected (see for instance, Besley and McLaren, 1993; and Pommerehne and Weck-Hannemann, 1996). Equation [1] can also represent economy-wide behavior, in which case s becomes the aggregate compliance rate and y the average per-capita income.

The perceived probability of detection is difficult to measure; so many empirical papers resort to the following alternative:

$$[2] \quad s = f(y, t, g, \alpha),$$

where α denotes efficiency of the TA, and g is some measure of the resources available to the TA in relation to the task it has to accomplish. For instance, g might be the quotient between the TA budget and the number of taxpayers. This formulation is more general than [1], since the (g, α) pair also includes positive encouragement for compliance by the TA.

⁹ The literature reports on how the use of data and statistical techniques to select taxpayers for audit improves compliance (Hunter and Nelson, 1996).

¹⁰ There are no estimates of compliance costs for Chile, but evidence from the United States suggests they may be substantial. Blumenthal and Slemrod (1992) estimate that compliance costs in the U.S. approach 7 percent of personal income tax revenues and over 3 percent of corporate tax revenues (Slemrod and Blumenthal, 1996).

Where a long time series is available, the aggregate compliance function can be estimated econometrically. Since α is not observable, we resort to the stochastic frontier method proposed by Aigner, Lovell, and Schmidt (1977). This involves specifying an error term consisting of two components—one normal, v , representing pure randomness, and the other taken from a one-sided distribution, u , representing technical inefficiency. The corresponding equation for estimation is:

$$[3] \quad \log s = \beta_0 + \beta_y \log y + \beta_t \log t + \beta_g \log g - u + v,$$

where the β s are the parameters to be estimated. The data are in log form, so u is a measure of the percentage deviation of each observation from the frontier, and $\alpha = 100 - v$ is a performance indicator for the tax compliance objective.

Next we focus on compliance cost minimization, for which we propose using the quality of TA taxpayer services as an EI. Although the most appropriate measure would be the deviation of the actual compliance cost from the minimum feasible compliance cost, measuring the latter is an impossible task at the present time.¹¹ Non-standardized compliance costs do not provide a good measure of TA performance because they are affected by aspects beyond the TA's control, such as the complexity of the tax structure and the quality of tax legislation. In contrast, the quality of taxpayer services does depend directly on the TA's efforts; and like any other good or service, the user's valuation of taxpayer services is highly relevant. Satisfaction with services provided by the TA expressed through sample taxpayer surveys is the most usual means of measuring service quality. However, the results obtained from such surveys need

to be complemented with more objective data, since people's perceptions are not necessarily based on their experience.

MINIMIZATION OF COMPLIANCE COSTS

This section analyzes the performance of the SII in minimizing compliance costs. Evidence suggests that efforts made by SII to improve the quality of taxpayer services reduced compliance costs in the 1990s. Sample surveys conducted in the early 1990s by independent opinion research firms contracted by SII showed that the worst rated aspects were the time needed to complete tax procedures, and perceived unequal treatment at SII offices. Accordingly, steps were taken to enhance transparency: taxpayers are now attended at SII offices in strict order of arrival, and procedures for dealing with the public have been streamlined.

Sample surveys among individuals summoned to the SII to clarify their income-tax returns were conducted in 1994 and in 1997. In 1994, 60.4 percent of the sample rated the service as either good or very good, and this figure rose to 64.1 percent in the 1997 survey. More importantly, the service attributes with the lowest rating in the initial surveys had dramatically improved. In 1994, only 36.8 percent of the sample were either satisfied or very satisfied with waiting time, and 34.0 percent of the sample felt the same about equality of treatment by SII employees. By 1997 these figures had risen to 63.9 percent and 74.9 percent, respectively.

In 1992 a new on-line control system for income tax returns was installed, which further streamlines the system for dealing with taxpayers called to explain and correct errors detected on their income-tax returns. Nowadays taxpayers

¹¹ Even measuring compliance costs is no trivial matter, and few studies attempt it. Pitt and Slemrod (1989) estimate compliance costs by observing those taxpayers who would save money by itemizing but who choose not to do so, and Seltzer (1997) undertakes a case study. Other studies rely on taxpayer surveys.

TABLE 1
TIME SPENT BY TAXPAYERS IN LIFE-CYCLE-RELATED PROCEDURES.

Time spent (minutes)	Document stamping			Initiation of activities and obtaining Taxpayer ID		
	1996	1997	1998	1996	1997	1998
Less than 16	28.9	45.7	74.5	32.4	49.3	66.4
20 to 30	13.4	15.2	22.1	17.3	15.0	25.9
30 to 60	37.1	32.7	3.3	36.6	27.4	7.2
Over 60	20.9	6.1	0.1	13.6	7.3	0.5

Source: SII

usually resolve such problems on a single visit, whereas before 1992 it was not uncommon to have to make a second or third appearance. The new control system also reduced the number of taxpayers that got called in but ended up not having to alter their declarations—from 65 percent in 1991 to just 28 percent in 1993.

The Taxpayer Life Cycle project, implemented in 1993, cuts the number of visits to SII offices required to start up a business, obtain a tax ID number and stamp invoices, from three to just one. Along with other changes, this has led to an improvement in user evaluations. Sample taxpayer surveys were undertaken in 1996 and 1997, and the results showed high and increasing satisfaction with procedures. For example, 74 percent of the respondents in 1997 rated equality of treatment as either very good or excellent, compared to 66.6 percent in 1996; while 65.2 percent claimed to be satisfied or very satisfied with the time taken by the procedure, as opposed to 50.9 percent in 1996.

In mid-1997 the SII established a 30-minute time limit for all “life-cycle” procedures. If this time limit is exceeded, the SII has to take the relevant documents to the taxpayer’s address. According to survey respondents, the average time per procedure was 27.8 minutes in 1997, down from 41 minutes in 1996. Most importantly, the number of people spending

over 30 minutes at the SII office declined substantially between 1996 and 1997, as shown in Table 1. The 1998 figures, which were electronically measured, are even more impressive. As can be seen in the table, 7.7 percent of taxpayers spent more than 30 minutes in their visits to SII offices.¹² This figure was reduced to 0.2 percent in 1999 and 2000.

Since the late 1990s the SII has made an effort to further reduce compliance costs through information technology. Publications and other information prepared by the SII can now be obtained from the institution’s website. The latter also allows individual taxpayers to obtain detailed information on the status of their income tax returns, and carry out most transactions, including lodging complaints. In 1999, 5.2 percent of taxpayers filed their income tax returns through the SII website, and this figure rose to 39.9 percent in 2001.

THE COMPLIANCE MAXIMIZATION GOAL

The VAT compliance rate for the period 1981–1998 is shown in the second column of Table 2. The SII estimates this by calculating potential revenue for each year based on the National Accounts, and then compares this with the revenue actually collected. Broadly speaking, the VAT base is calculated by adding together the dif-

¹² Since December 1997, on arrival at the SII office taxpayers take a ticket from an electronic dispenser, and a meter registers when they start and finish being attended to. Special software records on-line variables such as the number of staff attending the public, and the corresponding times. This information enables office heads to make on-the-spot decisions to speed up the service.

TABLE 2
CHILE, TAX COMPLIANCE RATES

Year	VAT	Corporate Income Tax
	%	%
1980	76.8	—
1981	76.6	—
1982	64.2	—
1983	71.6	—
1984	73.4	—
1985	73.0	46.0
1986	74.5	49.5
1987	71.2	52.2
1988	69.3	56.0
1989	71.0	46.0
1990	70.4	49.8
1991	73.2	51.6
1992	77.1	55.5
1993	81.7	58.2
1994	80.4	61.3
1995	79.7	63.5
1996	80.0	61.9
1997	80.3	61.5
1998	78.0	—
1999	81.7	—

Sources: SII and Jorrat and Serra (2000)

ferent transactions that are subject to the tax. The main component is final consumption, both public and private, of taxed goods and services. Apart from this, there is the purchase of inputs and investment goods subject to VAT, which are then used in the production of tax-exempt goods and services. Jorrat and Serra (2000) estimated the business tax rate for the period 1985–1997 (third column in Table 2). They calculate the tax base by adjusting the “*Excedente de Explotación*” profits figure in the National Accounts.

Compliance rates display a similar trend for both taxes, improving significantly since 1990. The VAT compliance rate jumped from an average of 72.2 percent in the 1980s to 78.3 percent in the 1990s, and the average business income tax compliance rate increased from 49.9 percent in the period 1985–1989 period to 57.7 percent during 1990–1997. Though part of this dramatic change in compliance can be attrib-

uted to an improvement in the performance of the SII, other factors helped as well. Between 1990 and 1998 the economy grew at an unprecedented average annual rate of 7.8 percent. Theoretically, this should have had a positive impact on tax compliance.

Next we attempt to explain how the different factors affected tax compliance. We analyze the VAT compliance rate because there is a longer series for this variable. This can be further justified by the fact that VAT accounts for about 45 percent of all tax revenue collected and that the compliance rate for VAT is highly correlated with that of corporate income tax, the second largest revenue-earner.¹³ The reason is that VAT evasion also reduces the income tax base, with about 75 percent of company income tax evasion being explained by VAT evasion (Jorrat and Serra, 2000); given that personal and company income taxes are integrated, VAT evasion also leads to evasion of personal income tax.¹⁴

The stochastic-frontier approach was used to estimate the deviation from maximum compliance, as shown in equation [4] below. Income, y , corresponds to per-capita GDP, while g is the quotient between the number of SII employees and the estimated tax base. The tax rate was omitted since it varied little during the period. The number of employees corresponds to the entire TA; hence we are implicitly assuming that internal resource allocation did not change much between 1981 and 1999. Table 3 shows the number of employees, along with the tax rate, per-capita GDP, the tax base, and tax revenue collected.

Variable y is likely to be integrated of order two, while variables g and s are likely to be integrated of order one. In fact the Augmented Dickey-Fuller Test using two lagged first-difference terms, and including constant and trend, failed to re-

¹³ The correlation is 78 percent in the 1985–1997 period.

¹⁴ VAT is charged at a flat rate of 18 percent, except on exports, which are zero-rated. Sales of certain goods and services (passenger transport, life insurance, healthcare (partially), education and financial interest) are VAT-exempt. Construction companies receive a credit equivalent to 65 percent of the amount payable on the sale of residential buildings, which in practice makes house building zero-rated.

TABLE 3
SII EMPLOYEES, VAT TAX BASE, AND VAT REVENUE COLLECTED

Year	Tax Rate	SII employees	GDP per capita	VAT Tax Base	Gross Collection	Performance Indicator
			Thousand pesos*	Billion pesos**	Billion pesos**	
1980	20		297.7	8 956	1 376	
1981	20	1 863	309.4	9 245	1 416	99.3
1982	20	1 828	261.8	8 164	1 049	98.5
1983	20	2 025	255.9	7 834	1 122	98.9
1984	20	1 936	267.9	8 000	1 174	99.2
1985	20	2 028	268.8	8 410	1 228	99.1
1986	20	2 050	279.2	8 603	1 282	99.2
1987	20	1 999	292.7	9 533	1 357	99.1
1988	18	1 979	308.8	10 686	1 332	99.0
1989	16	2 185	335.7	12 059	1 370	98.8
1990	17	2 198	342.3	12 119	1 450	98.8
1991	18	2 209	363.5	13 178	1 736	99.0
1992	18	2 437	401.3	14 795	2 053	99.0
1993	18	2 405	422.3	15 668	2 305	99.3
1994	18	2 624	439.3	16 399	2 375	99.0
1995	18	2 624	478.6	17 730	2 544	99.0
1996	18	2 632	506.7	18 713	2 695	99.0
1997	18	2 622	536.5	19 789	2 860	99.1
1998	18	2 679	550.1	20 352	2 858	98.9
1999	18	2 785	536.7	19 423	2 856	99.0

*Chilean pesos at 1986 prices.

**Chilean pesos at December 1999 prices.

Sources: SII, Central Bank of Chile, National Statistical Institute.

ject the hypothesis of a unit root at the 10 percent significance level for s , g and the first difference of y . Accordingly, we use the difference equation, which is most likely to capture short-run effects.¹⁵ The stochastic frontier was estimated using the maximum likelihood method. The distribution of the error term was assumed normal, and the term representing technical inefficiency was assumed to have a truncated normal distribution. The results of the regression were as follows:

$$[4] \ln(s/s_{-1}) = 1.044 \ln(y/y_{-1}) \quad (5.85)$$

$$+ 0.59 \ln(g/g_{-1}). \quad (4.11)$$

The log-likelihood estimator is 34.3 with t -statistics as shown in brackets. The variance of the normal error term, v , is 0.00114, and the variance of the non-negative error term, u , representing technical inefficiency, is 0.00044. The quotient, u/v , is 0.619, with a t -statistic of 1.395, which indicates that estimated inefficiency is not significant at the 5 percent significance level. This results in small fluctuations in the EI. The reason for this is that the same agency is being analyzed over several years, so wide swings in its effectiveness would not be expected. As efficiency is measured in terms of the best performance years in the series, this is not very significant for any observation. The stochastic frontier is a method best suited for

¹⁵ The OLS regression of equation [3] run for the years 1981–1999 gives the following results:

$$\ln s = 4.91 + 0.532 \ln y + 0.433 \ln g.$$

The student t -statistics are 7.5, 4.3, and 2.8 respectively; the adjusted R -squared is 0.71; the log-likelihood statistic is 38.2, and the Durbin-Watson statistic is 1.69. The OLS regression for the difference equation run for the same period gave:

$$\ln(s/s_{-1}) = 0.894 \ln(y/y_{-1}) + 0.548 \ln(g/g_{-1}).$$

In this case the student t -statistics are 4.2 and 3.0, respectively; the log-likelihood statistic is 32.9, and the Durbin-Watson statistic is 2.06.

cross-section comparisons, which is what it was actually developed for.

The effectiveness indicator, $1 - u$, is shown in the last column of Table 3. This suffered a setback in 1982, when the country went through a severe crisis in which GDP shrank by approximately 14 percent. In crisis periods one might expect voluntary taxpayer compliance to decrease even more than the drop in per capita income would predict.¹⁶ The indicator recovered in 1984, before declining to end the decade at a relatively low level in 1990. It then recovered in 1991 and 1992, before peaking the following year. The indicator then settled at a lower level in 1994–99.

Following the 1982 crisis, vigorous tax enforcement measures were taken to reduce the fiscal deficit, but qualitative evidence suggests that enforcement became more lax in the second half of the 1980s. The various programs to improve enforcement and taxpayer services, introduced by the SII director that held office between 1990 and 2001, would explain the rise in the EI in the early 1990s. What, therefore, explains the ensuing decline in performance? One possibility is the TA's strong focus on taxpayer satisfaction. The Auditors' Association has claimed that the changes introduced to improve taxpayer services have made less time available for approving taxpayers' requests, preventing a thorough examination of the relevant documents.

What difference does it make if the compliance rate is used as a measure of effectiveness instead of the indicator proposed? The correlation between our performance indicator and the compliance rate is a relatively low 0.55 (when the final three observations are excluded, the

correlation rises to 0.63). The compliance rate fluctuates more sharply than the EI over time, which is plausible considering that the regression in the stochastic frontier approach attempts to fit the model to the actual data.

Although the compliance rate rises sharply in the early 1990s, the EI shows no gains. In fact the average performance indicator for the 1990s is the same as for the 1980s. The reason for this is that the model attributes part of the improvement in taxpayer compliance to the rapid economic growth experienced by the country in the 1990s. Using the compliance rate as a performance indicator therefore seems to overestimate the gains in effectiveness achieved by the tax administration. On the other hand, the regression results probably underestimate SII performance gains.

FINAL REMARKS

Although the compliance rate is sometimes used as a tax administration effectiveness indicator, this is inappropriate for two reasons. Firstly, there are other variables apart from TA performance that affect the compliance rate. Regression analysis shows that the sharp rise in tax compliance experienced by Chile in the early part of the 1990s was partly due to the economy's high growth during this period. This result is consistent with traditional tax-evasion theory that sees compliance as positively related to per-capita income. The second reason is that unconditional tax enforcement efforts could raise compliance costs that are already far from negligible. Hence a second objective for the TA should be to minimize compliance costs.

¹⁶ We tried including the first difference of y in the level equation—a procedure for which there is considerable theoretical support (see Engel, Galetovic, and Raddatz, 2001, for instance). In this case the regression results were:

$$\ln s = 5.05 + 0.708 \ln y + 0.643 \ln g + 0.297 \ln (y/y_{-1}).$$

Here the student t -statistics are 7.4, 3.5, 2.7, and 2.1, respectively; the adjusted R -squared is 0.75; the log-likelihood statistic is 39.9, and the Durbin-Watson statistic is 1.67. This formulation seems to fit the data best; the stochastic frontier did not work well in this case, however.

In this note we argue that the appropriate performance indicator for the objective of compliance maximization is the percentage deviation of observed tax compliance from its maximum feasible level; while the EI for the compliance cost minimization objective should be taxpayer service standards. The SII has improved in terms of one indicator, but the EI for the second objective did not alter. The average percentage deviation of tax compliance from its maximum feasible level did not vary much in the 1990s, but opinion polls show that taxpayers' rating of the SII increased during the decade. Since SII performance improved with respect to at least one objective, we can safely conclude that its functioning improved during the 1990s.

A problem with the EI we propose for the compliance maximization objective, as with the compliance rate, is the availability of timely information to calculate it. In particular, there is a delay in publishing the national accounts figures used in computing the compliance rate. It takes over six months even to obtain provisional figures, and these are later revised and sometimes altered substantially. As information technology continues to progress, it should become easier to compute the EI on a timely basis, however. Another potential problem with the TA effectiveness indicators proposed here is that we do not know how to trade them off against each other. So in the event that one EI improves while the other deteriorates, no definitive conclusion on the performance of the TA can be reached. Future research should address this issue.

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