Developing Statistical Tools for Tax Policy and Tax Administration in Slovakia

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This paper discusses some of the issues associated with developing statistical tools for tax policy and tax administration in the Slovak Republic. It describes: a model for projecting tax receipts for the state budget, developed by the U.S. Treasury Tax Advisory Program; a microsimulation model for analyzing proposed changes to the tax and benefit system, developed under contract with EC PHARE; and an analysis, proposed by the Tax Advisory Program, of the cost-effectiveness of auditing 100 percent of tax returns. It describes some of the important features and limitations of the models and the analysis, as well as improvements that can be made to them in the future. It also describes some of the structural changes that can be made to improve the environment for developing statistical tools at the Slovak Ministry of Finance. It concludes with some observations about how to approach the development of statistical tools for tax policy and tax administration in the Slovak Republic.

■ Tax Receipts Estimation Model

The Tax Advisory Program has recently developed a simple model to project total receipts for each tax entering the state budget of the Slovak Republic during the current budget period. The estimate is the sum of: actual receipts in each of the subperiods of the current budget period for which tax receipts data are available; and projected receipts for each of the remaining subperiods of the current budget period. The general form of the model is as follows:

$$T\big|_y = \mathbf{A}^{\mathrm{T}} \cdot \mathbf{E}\big|_y + \mathbf{P}^{\mathrm{T}} \cdot \mathbf{F}\big|_y \qquad (1)$$

where $T\big|_y$ is the estimate of total receipts for a given tax in the current budget period y,

$\mathbf{A}$, $\mathbf{E}$, $\mathbf{P}$, and $\mathbf{F}$ are vectors of n rows, with

a_i = actual receipts in subperiod i,

$$e_i = \begin{cases} 1 \text{ if receipts data exist for subperiod } i \\ 0 \text{ otherwise,} \end{cases}$$

p_i = projected receipts in subperiod i,

$$f_i = \begin{cases} 1 \text{ if no receipts data exist for subperiod } i \\ 0 \text{ otherwise,} \end{cases}$$

and i indexes the n subperiods in the budget period for which tax receipts data are made available. Since the Slovak tax administration makes tax receipts data available every month, and projections are typically made for calendar-year budget periods in the Slovak Republic, i indexes the 12 months of the calendar year in the Slovak tax receipts estimation model.

Projected receipts for a given tax in subperiod i of budget period y are the product of: actual receipts for subperiod i of budget period y-1; the ratio of the applicable tax rate for subperiod i of budget period y to the applicable tax rate for subperiod i of budget period y-1; and a growth factor, as follows:

$$p_i\big|_y = a_i\big|_{y-1} \cdot \frac{\tau_i\big|_y}{\tau_i\big|_{y-1}} \cdot \delta \qquad (2)$$

where τ_i is the applicable tax rate [1] in subperiod i, and δ is a growth factor.

The growth factor, δ, is a weighted average of: the projected growth in gross domestic product (GDP) between budget periods y-1 and y; and the

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growth in actual receipts to date between budget periods y-1 and y, as follows:

$$\delta = \alpha \cdot \frac{PGDP|_y}{AGDP|_{y-1}} + (1-\alpha) \cdot \frac{\mathbf{A}^T \cdot \mathbf{E}|_y}{\mathbf{A}^T \cdot \mathbf{E}|_{y-1}} \qquad (3)$$

where $PGDP|_y$ is the projected gross domestic product for budget period y, and $AGDP|_{y-1}$ is the actual gross domestic product for budget period y-1 [2]. The weight, a, varies from zero, when receipts data are available for all subperiods in the current budget period, to one when no receipts data are available for any subperiod in the current budget period, as follows:

$$\alpha = \frac{n - \sum_{i=1}^{n} e_i|_y}{n} \qquad (4)$$

By rearranging equation (2), it becomes clear that the tax bases in budget periods y-1 and y differ only by the growth factor, d, regardless of whether the tax rates have changed, as follows:

$$\frac{p_i|_y}{\tau_i|_y} = \frac{a_i|_{y-1}}{\tau_i|_{y-1}} \cdot \delta \qquad (5)$$

This implies that the model does not account for any effect that a tax rate change may have on the propensity of taxpayers to engage in the taxed activity. For example, the model does not account for any change in the consumption of alcoholic beverages that may be associated with a change in the excise tax rate on those beverages. While it would probably be a good idea to account for the behavioral effects of tax rate changes, there does not appear to be any literature which would suggest what those effects might be in the Slovak Republic.

Equation (2) also implies that the pattern of projected receipts for budget period y is similar to the pattern of actual receipts for the same subperiods of budget period y-1. Indeed, projected receipts for subperiod i of budget period y are equal to actual receipts for subperiod i of budget period y-1 when the applicable tax rate and the growth factor remain constant. This feature represents one of the improvements of the current model over the model previously used in the Slovak Republic. The previous model simply grossed-up the year-to-date receipts by a factor of 12 over the number of months for which tax receipts data were available [3]. Since smaller taxpayers are only required to make estimated tax payments on a quarterly or annual basis, the monthly tax receipts data fluctuate widely from month to month. As a result, the previous model's estimate of total receipts also fluctuated widely as new receipts data were incorporated into the model each month. In contrast, by explicitly accounting for the variation in month to month receipts, the current model's estimate of total receipts should fluctuate less. It is interesting to note that it probably would not have been appropriate to incorporate this feature into the previous model for the purpose of estimating tax receipts for 1994. Indeed, the pattern of tax receipts in the early months of 1993 was probably not a good indicator of the pattern of tax receipts in the early months of 1994, because of the transitional effects associated with the introduction of a new tax system when the Czech and Slovak Republics became independent at the beginning of 1993.

■ EC PHARE Microsimulation Model

EC PHARE has entered into a contract with researchers at the University of Bath to develop a microsimulation model of taxes and benefits in the Slovak Republic [4]. While the scope of the model covers both the tax and benefit systems, this paper focuses on the tax system and the ability of the model to analyze the revenue and distributional effects of proposed tax law changes. The EC PHARE model is more limited than the tax receipts estimation model in terms of the taxes it models, but it is broader in terms of the analyses it is designed to perform. While the tax receipts estimation model includes all taxes whose revenues are included in the state budget, the EC PHARE model includes

only the value-added tax, the excise taxes, the individual income tax, and the social insurance taxes [5]. Moreover, while the tax receipts estimation model is designed solely for estimating tax receipts for the state budget, the EC PHARE model is designed for analyzing specific modifications to the tax system, such as changes in the tax brackets, exemption amounts, and filing thresholds.

The EC PHARE model uses data from a 1993 household expenditure survey to estimate the revenue and distributional effects of proposed tax law changes for 1995, but the quality of the income and expenditure data from the survey raises serious questions about the validity of the model. In particular, while the model allows one to adjust the 1993 income data by certain factors to ensure that total income in the model is consistent with the official projections of aggregate income for 1995, the underlying income distribution is likely to be suspect for three reasons. First, people are typically reluctant to provide accurate information on their incomes to government agencies. This is likely to be the case in the Slovak Republic, where there appears to be a high level of distrust on the part of the public toward the central government, as well as a large underground economy. Second, the Slovak Statistics Office, which is responsible for conducting the survey, does not have adequate resources to verify the income data provided by respondents. The Statistics Office employs only 60 people to administer the entire survey, which contains approximately 500 items and is completed by approximately 2,000 respondents each month. Finally, the survey undersamples households at the low and high ends of the income distribution, according to Ing. Helena Súkeníková, who oversees the design and implementation of the household expenditure survey at the Slovak Statistics Office.

The model also uses expenditure data from the 1993 household expenditure survey for modeling the tax system, and it implicitly assumes that consumption expenditures for 1993 are representative of consumption expenditures for 1995. This assumption is suspect, given the significant political and economic changes that have taken place in the Slovak Republic in the past few years. The Slovak Republic has made significant progress in the transition from a centrally-planned to a market economy since the late 1980s, and it became an independent country at the beginning of 1993. Therefore, it would be unreasonable to assume without verification that the prices, quantities, and quality of goods consumed will be the same in 1995 as they were in 1993. Indeed, in the absence of any information indicating that consumption expenditures for 1993 are representative of consumption expenditures for 1995, serious questions remain about the validity of the model.

In addition, since the excise taxes on alcohol, tobacco, and petroleum are imposed on a per unit basis, the model uses a measure of the average price of each good to estimate the number of units of each good subject to tax. To the extent that there is a correlation between the quality of goods consumed and the income of the respondent, however, any distributional analysis of an excise tax rate change using expenditures as a proxy for the tax burden will lead to a biased estimate of the distribution of the tax burden. For example, while low- and high-income individuals may have the same expenditures on alcohol, high-income individuals may consume fewer units of higher-quality alcohol. Since the excise tax on alcohol is imposed on a per unit, as opposed to an ad valorem basis, a distributional analysis using expenditures as a proxy for the tax burden would show that a proposed excise tax increase is less regressive than it actually is.

As the political and economic environments become more stable over time, the household expenditure survey will begin to provide a more accurate representation of consumption expenditures. It will then begin to provide a relatively good foundation for analyzing proposed changes to the value-added tax, because the value-added tax is imposed on the value of goods and services consumed. It does not now, nor will it ever, provide a good foundation for analyzing proposed changes to the ex-

cise taxes, the individual income tax, or the social insurance taxes, because better data are currently available from tax returns and the tax administration. Indeed, excise tax returns include information on the number of units of each good subject to tax, which must represent a more accurate measure of the excise tax base than information on expenditures from the household expenditure survey. In addition, the tax administration collects information from the income tax returns of self-employed individuals, and it has the authority to collect information from businesses on the wage and social insurance taxes they withhold and pay on behalf of their employees. This tax information must represent a more accurate measure of the individual income tax base than the information on income from the household expenditure survey. Finally, information from the tax returns and accounting statements of juridical persons would allow one to develop a comprehensive model of the income tax on juridical persons.

There is little doubt that the use of tax data would improve the accuracy of the revenue and distributional analyses of proposed excise, income, and social insurance tax changes [6]. The use of multiple independent data sources would probably lead, in turn, to the use of multiple models for analyzing proposed tax law changes. Indeed, given the data sources that are currently available, there would probably be separate models for: the value-added tax; the excise taxes; the individual income and payroll taxes; and the income tax on juridical persons. Indeed, it may be preferable to have multiple models rather than a single model, because the assumptions of multiple models are likely to be more transparent to the users. This is in part because different people at the Ministry of Finance have analytic responsibility for each of the different taxes. One concern about using multiple models is that one may lose the ability to account for interactions between different taxes. This does not have to be the case, however, if the interactions are modeled explicitly. For example, an excise tax rate increase will reduce both real and nominal income, holding GDP constant, and will thereby reduce revenue from the income tax. This effect can (and should) be incorporated into an excise tax model.

■ Analysis of Audit Results

The Tax Advisory Program has proposed a joint project with the Slovak tax administration to analyze the cost-effectiveness of the current practice of auditing 100 percent of tax returns. This practice stems from verifying the progress of firms in meeting annual production targets, and it is therefore common in the countries of Eastern Europe and the former Soviet Union [7]. There has been some reluctance to change the practice in the Slovak Republic, despite the widespread belief that it is ineffective, and despite the possibility that it may be counterproductive [8]. The proposed analysis would identify certain groups of the income tax returns of juridical persons and measure the cost-effectiveness of auditing each group. If the analysis were to identify groups that were not cost-effective to audit, it would provide a strong argument in favor of reducing the percentage of tax returns audited.

The Slovak tax administration has agreed to develop a dataset which will include: the additional amount of revenue obtained from auditing the income tax return of each juridical person; the amount of time auditors spent auditing each return; and detailed information on the characteristics of each return and accounting statement. The first step in the analysis would be to identify certain characteristics of tax returns (e.g., total assets) that may be indicative of the amount of revenue likely to be obtained from audit. The second step would be to identify groups of returns based on those characteristics (e.g., total assets greater than Sk 5 million) and to calculate the additional amount of revenue associated with auditing each group. The third and final step would be to estimate the cost of auditing each group and to compare it to the additional amount of revenue obtained from auditing each group. The cost of auditing each group presumably would depend on

the total amount of time auditors spent auditing each group and on the wage costs of the auditors. If the cost of auditing a given group were to exceed the additional amount of revenue obtained from the audit, it would clearly not be cost-effective to audit that group of returns. Moreover, it would suggest that the 100 percent audit rate requirement is not cost-effective. If the analysis were to identify certain groups of tax returns that are not cost-effective to audit, it would provide evidence that the resources devoted to auditing those returns could be put to more productive use elsewhere. The analysis would provide little information, however, on where to redirect those resources. One might think, for example, that the resources should be redirected toward auditing those groups of tax returns that generated the greatest amount of additional revenue per unit of audit resources. Given the nature of tax audits in the Slovak Republic, however, it may not be reasonable to assume that the marginal increase in revenue from increasing the resources devoted to auditing returns is proportional to the average increase. Since tax audits in the Slovak Republic simply attempt to verify that documentation exists to support every item reported on a tax return, it is not clear that increasing the resources devoted to auditing tax returns will yield a significant amount of additional revenue.

In addition to measuring the cost-effectiveness of the current practice of auditing 100 percent of tax returns, the analysis establishes a foundation for developing criteria for systematically selecting tax returns for audit in the future. Developing such criteria might involve: the selection of a sample of tax returns for extensive audit and an analysis of the relationship between the additional amount of revenue obtained from audit and the characteristics of the tax returns subject to audit. In theory, by providing information on the marginal revenue associated with increasing the audit resources devoted to different groups of tax returns, such an analysis would provide a basis for allocating audit resources in such a way as to maximize the amount of revenue obtained from a given amount of audit resources. In practice, however, the ability of such an analysis to provide such useful information depends critically on the ability of the tax administration to conduct an audit which is more than a cursory verification of the items that appear on a tax return. Indeed, the tax administration should begin to look more closely at the items reported on tax returns, as well as to try to uncover items that may not be reported on tax returns.

■ Structural Changes

The development of statistical tools for tax policy and tax administration depend critically on the existence of data collection and tax analysis functions in the Ministry of Finance. These functions, in turn, depend on the existence of an integrated computerized tax information system, centralized databases with internally-consistent data, and professional staffs with expertise in computer programming, statistics, and economics. While this infrastructure is taken for granted in the United States, it does not exist in the Slovak Republic. The Tax Advisory Program has recommended: the establishment of data-gathering and tax analysis functions under the auspices of the Ministry of Finance; the development of an integrated computerized tax information system, which reflects the organizational structure of the Ministry of Finance and which accommodates the sharing of information among its functions; and the development of centralized databases (with internally consistent data) for tax and customs administration. The Program is also committed to the development of human capital at the Ministry of Finance to support and enhance the development of this infrastructure.

The Tax Advisory Program has recommended the creation of a data-gathering function which would extract data from tax returns and put them in a form that would be useful to tax policy officials at the Ministry of Finance. The function would include a number of responsibilities similar to those of the Statistics of Income Division at the Internal Revenue Service. It would select

stratified random samples of tax returns for use by the Ministry of Finance in the development of microsimulation and other models for tax analysis purposes. It would provide periodic reports summarizing the characteristics of tax returns and how these characteristics have changed over time. Finally, it would prepare special reports in response to requests by the Ministry of Finance. The data-gathering function could be a part of the tax administration organization, as it is in the United States, or independent of the tax administration but still under the auspices of the Ministry of Finance. Regardless of its location, it is important that the function be insulated from any day-to-day demands that could interfere with its data-gathering responsibilities. Otherwise, the short-term demands of the Ministry of Finance could compromise the accuracy and timeliness of the data.

The Tax Advisory Program has also recommended the creation of a tax analysis function, which would provide analytic support to the Ministry of Finance in the legislative and budgetary processes. The function would include a number of responsibilities similar to those of the Office of Tax Analysis at the U.S. Treasury Department. It would develop microsimulation and other models using data supplied by the data-gathering function to analyze the revenue and distributional effects of proposed tax law changes. It would link tax return data with other data (e.g., household expenditure survey data or microcensus data) if model development were to require such linkages. It might also be responsible for forecasting tax receipts for the state budget. It is essential that the tax analysis function be under the auspices of the top tax policy official in the Ministry of Finance. Given the demands of the legislative and budgetary processes, this official needs to be able to analyze and respond to legislative and budgetary developments as quickly as possible.

The data-gathering and tax analysis functions, in turn, cannot exist without access to computers that allow them to process large amounts of data. The functions operate most efficiently when the computers are part of an integrated computerized tax information system. Indeed, the Tax Advisory Program has recommended the development of a computerized tax information system, which reflects the organizational structure of the Ministry of Finance and the functions of the offices involved in the enactment and administration of the tax laws, but which also accommodates the sharing of information among these offices. In particular, it has recommended the development of a computerized tax information system which is designed around the following four functional areas: tax administration, customs administration, data gathering, and tax analysis. While these would be relatively independent functional areas within the Ministry of Finance, their information needs would overlap. The tax and customs administrations clearly need to maintain databases to administer the tax and customs laws, but they also need to share information regarding excise and value-added tax payments and rebates for imported and exported goods. These databases should also be accessible by the data-gathering function for use in selecting samples of tax returns and developing summary statistics. In turn, these data should be accessible by the tax analysis function for developing microsimulation and other economic models for analyzing the revenue and distributional effects of proposed tax law changes.

The ability to share information among these four functional areas would be enhanced by the maintenance of centralized databases. In order for the tax administration to verify that goods have been exported before providing excise or value-added tax rebates, for example, it would be less cumbersome for the tax administration to search for the information it required in a centralized customs database than in separate databases maintained at each of the local customs offices. While a centralized database may make it easier to share data, it will not guarantee the internal consistency of the data. Indeed, because the data are currently gathered by each of the local tax and customs offices, it is likely that the data are not internally consistent. Even if an effort were made to impose

a strict and uniform structure on the data-gathering function in each of the local tax and customs offices, the data would likely remain inconsistent, reflecting the different information needs and time pressures of the different local tax and customs offices. As a result, it would clearly be preferable, insofar as the internal consistency of the data is concerned, to have a single organization devoted to the data-gathering function.

Finally, and perhaps most importantly, the development of statistical tools for tax policy and tax administration depend critically on cultivating a professional staff at the Ministry of Finance with the expertise to perform all aspects of the data-gathering and tax analysis functions. It is necessary to have computer programmers to input and work with tax return data, statisticians to develop representative samples and summary statistics, and economists to develop microsimulation and other economic models for analyzing the revenue and distributional effects of proposed tax law changes. The ability to cultivate such a staff at the Ministry of Finance is constrained by at least two factors: the limited experience in the Slovak Republic with a free-market economy, let alone the statistical and economic analysis of the tax system; and the limited resources of the Ministry of Finance for training staff in, and allocating staff to, data-gathering and tax analysis functions. Contributing to the development of expertise and the work effort in the data-gathering and tax analysis areas is perhaps where the foreign assistance programs, like the Tax Advisory Program and EC PHARE, can be most helpful.

■ Conclusion

The contribution that the statistical tools described in this paper can make to informed decision-making in the tax policy and tax administration areas will probably increase over time. This is, in part, because the reliability of using data from one time period to make projections with respect to future time periods will probably increase as the political and economic environments stabilize over time. This is also, in part, because the Slovak Republic became an independent country only a short time ago and many of the tax proposals that are currently under consideration by the Ministry of Finance involve major structural changes to the tax system. These proposals may be beyond the analytic scope of the models described in this paper, and/or the analyses of these proposals may be of secondary importance to the decision-making process. Indeed, major structural changes to the tax system may not only be inconsistent with certain assumptions embedded in the models (e.g., constant GDP), but they may simply be better analyzed with macroeconomic models. Moreover, the revenue and distributional effects of major structural changes to the tax system may be less important than more theoretical concerns about public finance and the structure of the tax system. For example, the Ministry of Finance is currently considering whether to provide a tax preference for intercorporate dividends. It would seem that the revenue and distributional effects of such a proposal, while relevant, would be less important than the question of whether the tax system should be neutral with respect to corporate organization.

The contribution that statistical tools can make to informed decision-making will also increase over time with the development of data-gathering and tax analysis functions at the Ministry of Finance. The contribution will depend, in turn, on the development of an integrated computerized tax information system, centralized databases with internally consistent data, and professional staffs with expertise in computer programming, statistics, and economics. Since all elements of this infrastructure are interdependent, their development must take place simultaneously. For example, the types of statistical tools that can be developed depend on what data are available, but what data are collected should depend on what statistical tools the Ministry of Finance would find useful. The types of statistical tools that are developed and the data that are collected should depend, in turn, on the expertise of the professional staff at the Ministry of Finance and the capabilities of the computerized tax information system. The contribu-

tion that statistical tools can make to informed decision-making ultimately depends, however, on the weakest element of the infrastructure. Indeed, sophisticated statistical tools are not very valuable without accurate data and a highly-skilled professional staff to use and maintain them.

The recognition of the interdependence of all elements of the infrastructure supporting the development of statistical tools is one important distinction between the modeling approaches of EC PHARE and the U.S. Treasury Tax Advisory Program. While the researchers who are developing the EC PHARE model appear to be attempting to develop a comprehensive tool for analyzing a wide variety of tax (and benefit) system changes, they have not paid much attention to the quality of the data on which the model is based or to the availability of better data. Moreover, they do not appear to have paid much attention to the fact that the ultimate users of the model at the Ministry of Finance have limited experience with the use of statistical and economic tools for analyzing the tax system. Any misunderstanding of the assumptions or limitations of the models resulting from this limited experience could, in turn, lead to bad policy decisions. This is a particular risk, given the scope and complexity of the EC PHARE model.

The statistical tools developed by the Tax Advisory Program are, by design, much more limited in scope, reflecting the limitations of the data, as well as the limited experience of Ministry officials with the use of statistical tools for analyzing the tax system. By focusing on specific issues faced by Ministry officials, the Tax Advisory Program can provide examples of how data can be brought to bear on current tax policy issues and, at the same time, minimize the risk that a misunderstanding of the assumptions or limitations of the models could lead to bad policy decisions. If these examples have the effect of convincing Ministry officials that data can help them solve (or better understand) current tax policy issues, then they might create an impetus for developing data-gathering and tax analysis functions at the Ministry of Finance, as well as the infrastructure necessary to suport them. This would, in turn, enable them to begin developing more sophisticated statistical tools for analyzing a broader variety of tax policy and tax administration issues in the future.

■ Acknowledgments

The authors are indebted to B.K. Atrostic, Christopher Heady, Daniela Kralova, Donna Pavetti, Fritz Scheuren, Theodore Smith, Jean Tesche, and James H. Wooster, for helpful comments. The views expressed in this paper, however, are those of the authors and do not necessarily reflect the views of the U.S. Treasury Department.

■ Footnotes

[1] If there is more than one tax rate associated with a given tax (e.g., in the case of a graduated income tax, the applicable tax rate is a weighted average of the tax rates, where the weight is proportional to the size of the tax base associated with each rate.

[2] The GDP component of the growth factor is generally the ratio of nominal GDP in year y to nominal GDP in year y-1, because the tax bases for most of the taxes are likely to change both with changes in the price level and with changes in real GDP. In the case of excise taxes, however, the GDP component of the growth factor is the ratio of real GDP in year y to real GDP in year y-1. Since the excise taxes are imposed on a per unit basis, the excise tax bases are likely to change only with changes in real GDP.

[3] The previous model also accounted for changes in tax rates and GDP.

[4] The model is based on a similar model developed by the same researchers for the Czech Republic. Because the Slovak model has only recently been completed and its documentation has not yet become available, the discus-

sion of the model in this paper relies on the documentation of the Czech model and conversations and correspondence with the model developers. See Coulter et al., Microsimulation Modelling of Personal Taxation and Social Security Benefits in the Czech Republic, unpublished manuscript, and Coulter et al., Modelling the Czechoslovak Personal Income Tax: Redistribution Under the Old and New Regimes, unpublished manuscript.

[5] The social insurance taxes are not included in the tax receipts estimation model, because the revenues from these taxes are not included in the state budget.

[6] The use of data from excise tax returns on the number of units subject to tax would not allow one to conduct a distributional analysis of proposed excise tax rate changes, unless additional information were available on the distribution of the units of the taxed good consumed by the income of individuals.

[7] See Milka Casanegra de Jantsscher et al., Modernizing Tax Administration, in *Fiscal Policies in Economies in Transition*, Vito Tanzi (Ed.), pp. 126-127.

[8] It may actually be possible to increase compliance by decreasing the percentage of tax returns subject to audit. Indeed, the current practice of auditing all returns may mean that the resources devoted to auditing returns are spread too thinly, and that the audits may, therefore, be inadequate. Audits that fail to detect unreported income or overstated expenses, for example, may cause taxpayers to underrreport income or overstate expenses on subsequent returns, because the inadequate audits teach taxpayers that such misreporting will go undetected.

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