Discussion Paper 65-2

ESTIMATION AND FORECASTING OF TAX REVENUE IN THE PHILIPPINES

by

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ESTIMATION AND FORECASTING OF TAX REVENUE

Part I. Statement of the Problem, Outline of Methods, Summary of Results, and Some Recommendations

1.0 Introduction

In the field of public finance in the Philippines, estimation of public revenue is one area of research which calls for the immediate attention of economists and statisticians. The practical need for good estimates of public revenue cannot be overemphasized. For instance, the budgetary process under existing laws calls for a good estimate of prospective income for at least the next fiscal year because proposed expenditure has to be covered by prospective income.[1/] In addition good planning and programming require a fairly good idea of public revenue for a longer period say for the next five fiscal years.

At another level, estimates of the impact on public revenue of certain tax modifications (or other economic policies) are needed by congressmen, senators and other government officials who have to make decisions for the country. "What is the potential gain (or loss) in terms of public revenue?" is one obvious question that they ask whenever they are called upon to consider tax legislations or other economic policies.

Today's topic for discussion: Estimation and Forecasting of Revenue (in the Philippines) is based partly on a report of one such attempt to set up a framework for estimating the answers to the above question. Dr. Mijares and I (1) shall describe briefly what has been done along these lines by our group[2/] at I.E.D.R.; (2) we shall

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[1/] R.A. 992 The Revised Budget Act, Section 13.

[2/] In addition to Dr. Mijares and myself the group was composed of Mr. Roberto Mariano, Mr. Mahar Mangahas and Mr. Johnny Ferraren who submitted ad interim reports with Miss Remedios Beltran and Miss Salvacion Uy as research assistants.

enumerate some of the problems we encountered (not always statistical) - some of which we have not resolved to our satisfaction; (3) we shall present to you for discussion and criticism some of our methods and tentative results in the hope that you would suggest possible improvements; and finally, (4) we shall point out directions for further research in this field.

1.1 Other Problems

The original objective of the pilot study which was proposed to the U.P. Economics Project for possible financing was:[1/]

> "To construct a model for estimating public revenue changes resulting from given tax modifications."

However, it was very soon evident that the need for a model to estimate public revenue under existing tax structure was just as pressing if not more so. For instance, the Program Implementation Agency which acts as the economics staff to the President wanted independent estimates of public revenue divided into broad categories such as B.I.R. collections and Custom's collections for its own work in budgeting, planning and programming.

There were evidences that estimates of collections by these agencies were purposely overstated. Moreover, it emerged that the official estimates were arrived at more by "feel" rather than by statistical methods; therefore, it was not possible to replicate their methods. Usually, estimates (up to the last centavo) were made without indication of the confidence level, giving an impression of specious accuracy.

Upon further examination, it turned out that oftentimes, data which were needed for making the simplest statistical estimates were not available and were not systematically gathered, such that each attempt to make an estimate based on

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[1/] The U.P. Economics Project administers the funds for faculty research granted by the Rockefeller Foundation to the Department of Economics.

existing tax structure required an ad hoc compilation of whatever data seemed to be pertinent and available at that time.

The situation was even worse in the case of the estimation of revenue impact of tax modifications. Data pertinent to this type of estimates were not readily available, (if not totally absent), such that some quantitative evaluations of revenue impact of tax bills, or other economic policies were often done haphazardly (given the time constraints) and were almost useless as a basis for rationale decision-making.

There were several government offices which did not realize nor appreciate the need for this type of research. There were even offices that alluded that the University of the Philippines is "lucky because it has all the statistics" when the fact is that all the data have to come from that office. This certainly is a ludicruous example of the fact that certain offices do not realize the wealth of information that is available from their own records. Failing to formulate the problem more specifically, many government officials (even in statistical units of their agencies) did not realize what can be done with the minimum of re-classification and statistical analysis with data already available to their own agencies.[1/]

The problem existing then and now is certainly a challenge to economists and statisticians to try their hand in the organization of data, and the setting up of a framework for forecasting revenue (under existing tax structure) and estimating the impact on public revenue of certain types of modifications in the tax structure. The statistical forecasts and estimates are to serve only as first approximations (or benchmarks) from which to base refinements as dictated by economic analysis

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1/ Let it be said, however, that there were two offices in connection with their own functions, which showed some interest in the compilation of this type of data and research in this area, namely: the Joint Legislative-Executive Tax Commission and the Program Implementation Agency.

considering the prospects of the economy from other economic indicators and some knowledge about the probable reaction of taxpayers to given changes in the tax structure.

1.2 Outline of Methods

To meet different problems and uses several frameworks for estimation were set up:

(1) For budgeting purposes it was necessary to project separately collections of the BIR and the Bureau of Customs for the current and the next fiscal year on an annual basis with high and low estimates with stated confidence levels.

(2) For planning purposes these projections had to be extended up to five fiscal periods (which is risky business to say the least.) However, the five-year projection would be revised with every budget cycle when additional data on the preceding fiscal year would then be available. So long as only the estimates for the next fiscal year were considered of a relatively firm forecasts the hazards were not considered too great. At any rate budgetary procedures require a five-year fiscal program to be included in the budget proposal every year.

(3) For programming purposes, however, it was necessary to devise a method that would take into account the fluctuations of tax collection over the fiscal period; therefore projections on a quarterly basis had to be attempted (for the first time in the Philippines to my knowledge) for both the Bureau of Internal Revenue and the Bureau of Customs collections. In order to maintain at least a minimum level of cash in the National Treasury it was necessary to program releases of funds by the Budget Commission to parallel more closely the fluctuation of tax revenue collection. In addition, the objective of price stabilization and the constraint on net domestic assets imposed by the IMF required that availment of overdraft line from the Central

Bank of the Philippines be timed more closely to the fluctuation. Similarly, the timing of the issue of treasury bills and the flotation of government bonds has to be geared to the quarterly (if possible monthly) fluctuation of collectionsby the BIR and Customs if the paramount objective of stabilization were to be achieved and the IMF constraint were to be respected.

All these information including estimates of fiscal operation are being coordinated in Project Eagle involving the Central Bank, the Department of Finance, the Budget Commission and the Program Implementation Agency which then become the basis of top-level decision in monetary and fiscal policies in the Philippines;

(4) For estimating the revenue impact of certain typesof modificatio . in the tax structure several frameworks were devised, namely: for the corporation income tax, for the individual income tax, and for license and business taxes. Each of these categories of tax often required several estimating frameworks for different types of tax modifications.

A brief summary of the methodology is included as Parts II - IV which Dr. Mijares will discuss with you.

1.3 Summary of Results

Our research efforts in this area have yielded a mass of data on public revenue some of them available for the first time in the Philippines. We have set up several frameworks for estimating revenue under existing tax structure and for estimating revenue impact of certain types of tax modifications. More specifically some of the more significant results are summarized below:

On Aggregate Revenues:

(1) Projections of Annual Collections of the BIR and the Bureau of Customs, 1965-1970

(1)a Projections of Annual Collections, All Funds Combined, 1963-1969

(2) Projections of Quarterly Collections of the BIR and the Bureau of Customs, 1965-1970

On Corporation Income Tax:

(3) Distribution of Income Tax Returns of Corporations by Net Income Tax Brackets, 1960 and 1962

(4) Mean Net Income of Corporations by Net Income Tax Brackets, 1962

(5) Estimates of Tax Assessments from the Corporate Income Tax by Net Income Tax Brackets,1965-1970

(6) A Fortran program for the IBM 1620 electronic computer to process IBM cards punched from corporate income tax returns.

Pertinent information needed to forecast revenue collection from the corporate income tax can now be obtained much faster through the use of this program. The program has been debugged but has not been used with actual cards.[1/]

On Individual Income Tax:

(7) Estimates of the Distribution of Individual Income Tax Returns and Net Income by Tax Brackets, 1960

(8) Percentage Distribution of Number of Taxable Returns by Current and Smaller Tax Brackets and by Civil Status, 1960

(9) Percentage Distribution of Net Taxable Income by Current Smaller Tax Brackets and by Civil Status, 1960

(10) Estimates of Mean Net Income by Tax Bracket for Present Bracket Sizes and for Proposed Bracket sizes

(11) Estimated Individual Income Tax Assessments based on Current Tax Rate

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1/ Unfortunately the BIR would not allow the duplication of the cards nor allow them to be taken out of the Department of Finance Building for processing across the street at the Bureau of Lands' IBM 1620 electronic computer without the written permission from the President of the Republic.

Structure and based on Proposed Tax Rate Structure, 1963-1970

(12) Estimated Percentages of Taxable Returns of Married Persons Remaining if Exemption per Child is raised to ₱1,000

(13) Estimated Individual Income Tax Assessment if the Exemption per Child is Raised to ₱1,000, Calendar Years 1964-1965

(14) Framework for Estimating Revenue from:

(a) Advance Sales Tax

(b) Compensating Tax

(c) Tobacco and Liquor Taxes, and

(d) Some Minor Taxes

Others

(15) Estimates of Potential Revenue from the Proposed Export Tax

(16) Estimates of the Additional Revenue from the proposed Increases in Taxes on Gasoline and other Motor Fuels

In almost all cases standard errors were computed and high, middle and low estimates were made with stated levels of confidence (usually 95%). From the statistical viewpoint, therefore, our estimates are "better" than the usual estimates of government agencies. It is too soon to evaluate our efforts in this area; however.

In the brief period that our group has been in the forecasting game, our estimates of BIR collections and Customs collection for FY 1964 were the closest to the recorded actual collections among all estimates made by different government agencies. In fact our estimate of BIR collection for that year was so close (only ₱2 million off) that we are almost sure to do worse this year.

However, our framework for estimating quarterly collections of the BIR has been giving good results so far. The same cannot be said of our framework for estimating

customs collections. The reported collections for the 4th quarter of last FY 1964 and the 1st quarter of this FY 1965 have been declining contrary to previous years' pattern. It is only the collection of the 2nd quarter of this FY year which has at least returned to the pattern.

New exemption laws and rampant smuggling would partly explain the discrepancy between collections and other indicators of the volume of importation. A few comparisons of actual collection with our own projection give us some reassurance that our statistical methods and economic analysis work even in the short run. Statisticians and Economists know they will work in the long run.

Unfortunately (or fortunately) Congress did not pass during the last session the proposed tax modifications such as the changes in the rates of the corporation and individual income taxes, change in the rate of motor fuel taxes, the imposition of export taxes, so the performance of our estimating procedures for these types of changes have not been tested.

Some Recommendations

After a year of research in this field, several areas for further study and research have emerged:

(1) A more systematic and sustained effort by the tax collecting agencies to compile tax revenue data - along the lines of Income Tax Statistics in the United States of America.

The compilation of statistics should be geared not only to tax revenue forecast but also to make possible, estimates of revenue impact of probable tax modification.

(2) The sampling of exempt Individual Income Tax Returns. At the present time there is hardly any information on the characteristic of exempt returns except for the approximate number (800, 000 in 1963) since these are not punched into cards. The

punching operation generally entails quite a tremendous amount of work and expense. However, it might be sufficient to sample the exempt returns every 3 to 5 years so pertinent data can be obtained.

(3) A Study of Corporations by Industry Group and by Region. At present industry code and region code are punched in the IBM cards. Analysis of these information will yield meaningful characteristics of corporation in terms of gross income, business deduction, size of net income, tax assessments by industry and by region.

(4) The eventual use of electronic computers for faster processing of tax data. The BIR will soon install an IBM 1401 to process tax records and income tax returns. If computer programs are developed and written along the lines suggested by this pilot study, estimate of revenue from major tax sources can be made much quicker with less computational errors.

(5) The continuation of this study on tax revenue estimation and forecasting by the Bureau of Internal Revenue and the Bureau of Custom. Since these Agencies are the ones directly responsible, a section specifically charged with the making of revenue estimates should be established in the BIR and the Bureau of Customs.[1/]

There are many inhibitions imposed by law regarding access to tax records.[2/] These inhibitions do not apply to employees of these bureaus; therefore, they will have access to information which otherwise would not be available to academic researchers inspite of the willingness of the latter to accept aggregated data, or otherwise cleansed information.

1/ It might be helpful to include in the staff trained statisticians and economists.

2/ Infact this problem stares researchers in this field right in the face. Non-statistical problems of this type and outright non-cooperation of officials or lack of appreciation of the problem are the more pernicious barriers to research in tax estimation and forecasting.

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ESTIMATING PUBLIC REVENUE

Part II. Estimating Corporation Tax Assessment

1. Introductory remarks

The purpose of this phase of work is to estimate total assessment, by brackets, from corporation income tax (i) under existing structural tax rates and brackets, and (ii) under changes in both structures.

Net taxable incomes of corporations for the year 1960 were available at all the three BIR offices in Cubao, Canonigo and the Central Office. For the year 1962, however, only the Cubao and Canonigo data could be utilized at the time the study was being made. The choice of these two years stemmed from the belief that the imposition of decontrol in 1961 had caused changes in some way on certain characteristics of corporations like the percent distribution of the corporations' taxable returns by brackets and their mean taxable incomes for each of these brackets. Except for 1 or 2 brackets, statistical tests indicate some significant changes in these two structures have apparently occurred between the year preceding (1960) the institution of decontrol and the year after (1962).

Projections were made for the year 1965, by brackets, with confidence coefficients of 95% having been utilized to locate Low, Middle and High estimates of assessments.

A note on corporation income tax is in order . Under Philippine Law a corporation may actually choose either the calendar year or the fiscal year as its accounting period when it files its income tax return. The Bureau of Internal Revenue indicates that a big proportion of corporations reports on the calendar year basis.

However, the net taxable incomes of corporations which choose the fiscal year as their accounting period are also included in the BIR reports for the same year.

Thus, the set of data for one year, as obtained from the IBM accounting sheets of BIR is actually a combination of net taxable incomes for that calendar year, in the case of most reporting corporations, and of incomes for the same fiscal year in a few scattered cases. Therefore, this set-up actually presents no difficulty in our method of estimation since the net taxable income of a corporation for the year t obviously affects the tax collection for the fiscal year (t + 1), regardless of the accounting period chosen by the corporation.

2. The 1960 and 1962 Data

Table 1.1 shows the number, net taxable incomes and percent distributions of brackets 0-₱50,000, ₱50,001-₱100,000, ₱100,001-₱250,000, and above ₱250,000 for years 1960 and 1962.

Table 1.1 Number of Taxable Returns, Net Taxable Income and Per Cent Distributions of Corporations: 1960 and 1962[1/]

Brackets	1960 Number (Per Cent)	1960 Net Taxable Income (Per Cent)	1962 Number (Per Cent)	1962 Net Taxable Income (Per Cent)
0-₱ 50,000	2,519 (72)	26,051,767 (5)	2,023 (67)	23,115,554 (4)
₱ 50,001-₱100,000	292 (8)	21,249,590 (4)	325 (11)	23,638,998 (4)
₱100,001-₱250,000	311 (9)	48,589,901 (8)	303 (10)	47,015,603 (7)
Above ₱250,000	376 (11)	470,033,759 (83)	347 (12)	556,909,653 (85)

1/ 1962 figure does not include the data from BIR Central Office.

If the per cent distribution of the number of corporations for the entire country is reflected in the 1962 data above, the brackets above ₱100,000 appear to have the same per cent distribution as for 1960, whereas those below ₱100,000 appear to have shifted composition. The 0-₱50,000 bracket decreased by 5% from 72% in 1960 to 67% in 1962. The second bracket, however, experienced a gain of 3% during the two periods.

Except for possibly the largest bracket (Above ₱250,000) which had registered a further gain in the total cut of net taxable income in 1962 by about 2%, the other brackets remained somewhat stable in their total contribution to net taxable income for the period. Taxable income groups of ₱100,000 and below remained steady at about 4-5%. Whereas, the middle group (₱100,001-₱250,000) had net taxable income about 7-8% of the total.

The pattern of per cent distributions was clearly lopsided with 70% of the total taxable corporations contributing only about 4% of total net taxable income while the bracket above ₱250,000 which had about 12% of the total number of corporations contributed about 85% of the total net taxable income.

3. Were there indications of structural changes?

Was there evidence, in the statistical sense, that the difference in the percentage distribution of the number of taxable returns by net income brackets observed in Table 1.1 could have arisen by chance?

A Chi-Square test applied on the 4 x 2 contingency table (Table 1.1) shows $\chi^2_c = 18.74$. The probability of the occurrence of $\chi^2_c \geq 18.74$ with 4 degress of freedom is very much less than 1% if the null hypothesis of no difference is true. Since the probability of occurrence is quite small, there is strong evidence to suspect that the

null hypothesis could not be true. This conclusion, which is based on a statistical test, supports the observations given just below Table 1.1.

How about the mean net taxable income in the different brackets? The means for the two periods are given below (Table 1.2):

Table 1.2 Mean[1/] Net Taxable Income of Taxable Corporation Returns: 1960 and 1962

Taxable Bracket	1960	1962
0- ₱50,000	₱ 10,342	₱ 11,426
₱ 50,001-₱100,000	72,726	72,735
₱100,001-₱250,000	156,238	155,167
Above ₱250,000	1,250,000	1,604,927
Total	₱ 161,785	₱ 217,038

[1/] Derived from Table 1.1

The mean net taxable incomes for the first three brackets seem stable and the differences appear to be insignificant. However, in 1962 the largest bracket had a mean net taxable income which was approximately ₱355,000 larger than the 1960 mean. In this case no further statistical test was considered necessary to indicate the significance of this difference in the mean net taxable income of the fourth bracket.

Considering the results in the statistical analyses of the 1960 and 1962 data, it was thought best to use the percentage distribution of the number of corporation taxable returns of the latter period, i.e., 1962.