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THE CASE OF NORTH AMERICA

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TAX PROGRESSIVITY: THE CASE OF NORTH AMERICA*

By

John P. Formby, Terry G. Seaks and W. James Smith**

I. INTRODUCTION

The tax systems of Canada, Mexico and the United States differ considerably. It would not be surprising, therefore, to find significant variations in the degree of progressivity among these tax systems. This paper investigates the comparative progressivity of the federal income tax systems in each of the nations of North America. Estimates of the degree of tax progressivity income are presented and limitations of the measures are discussed.

The usual definition of tax progressivity is in terms of tax rates and tax bases. For example, one widely-used approach classifies a tax schedule as locally progressive if the average tax rate increases as pre-tax income rises. Defined in these terms, progressivity is measured by the derivative of average tax rates with respect to income.¹ The difficulty with this measure of progressivity is that it refers to a single point. Measured in these terms, progressivity can and usually does vary at different points on the income scale. Point measures, thus, are local and cannot be used to assess the overall or global progressivity of an entire tax system. Several writers (Kakwani [1977b] and Suits [1977]) have suggested that what is needed is a valid summary statistic for an entire tax system.

Any summary measure of tax progressivity must be related to the distribution of income. This point has been emphasized by Daniel Suits [1977b, p. 752], who points out that there is nothing inherently regressive about a poll tax or a sales tax. The reason these taxes are regressive is because income is unequally distributed. The greater the income inequality, the more regressive are sales and poll taxes. For this reason the distribution of income must be central to any measure of overall tax progressivity.

Daniel Suits [1977b] and N. C. Kakwani [1976], working independently, proposed related but distinct summary measures and used them to compare the degrees of progressivity among different taxes and across nations. The summary indexes developed by Suits and Kakwani are in essence average measures of tax progressivity and, as we will argue, are not without serious limitations.

This paper uses income distributions, tax distributions and summary measures of progressivity for Canada, Mexico, and the United States to identify the conditions under which the summary measures yield valid comparisons and the conditions under which the new measures are invalid. Section II briefly reviews the Suits and Kakwani measures while Section III discusses the boundaries and relations between the measures. Section IV reports empirical estimates of the summary measures of progressivity, and Section V identifies the deficiencies and dangers of using the Suits and Kakwani measures. Section VI provides brief concluding remarks.

II. THE SUITS AND KAKWANI MEASURES

Suits' index of progressivity was developed to measure differences in the degree of progression and regression in various federal taxes in the United States. It has been extended by Guthrie [1979] and Kienzle [1980]. A number of writers have used the Suits and Kakwani measures to compare the progressivity of different taxes, to investigate changes in progressivity over time and to make cross-sectional comparisons among different governmental units.² Other writers have identified some of the problems associated with making such comparisons.³ No doubt due to the scholarly journals in which they first appeared, Suits' measure has attracted more attention in the United States, while Kakwani's has dominated discussion in Britain. Because the superiority of one of the new indexes over the other has not been demonstrated, we use both measures in this paper.

The Suits and Kakwani tax progressivity indexes are founded in the Lorenz and Gini methodology of measuring income inequality. Both measures are closely related to the Gini coefficient (G) of income inequality. We denote Kakwani's measure as K and Suits' as S . To explain K and S and their relation to G , we make use of the Canadian federal income tax data shown in Table 1. The cumulative distributions of tax returns and income in columns 2 and 3 of Table 1 are used to construct the Lorenz curve, $I(R)$, shown in Fig. 1. The deviation of $I(R)$ from the diagonal line of equality, $E(R)$, reflects Lorenzian income inequality, which is measured by area γ . The Gini coefficient, G , of the Lorenz income distribution is given by:

FIGURE 1

Kakwani's Approach

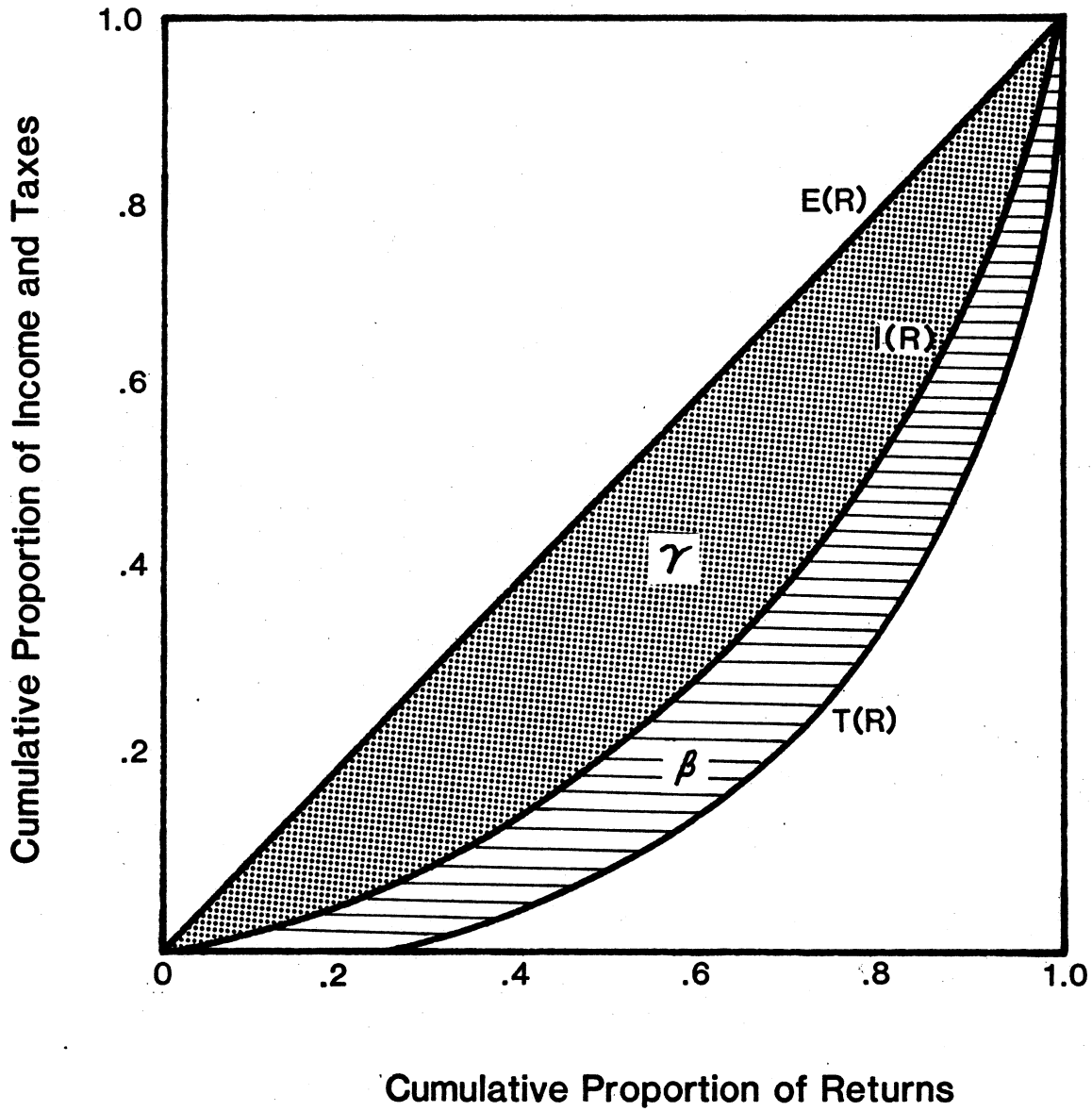


TABLE 1

ACCUMULATED PROPORTIONS OF CANADIAN TAX RETURNS,
ASSESSED INCOME, AND FEDERAL INCOME TAXES - 1975

(1)	(2)	(3)	(4)
INCOME		PROPORTIONS	
BELOW	RETURNS	INCOME	TAXES
\$3,000	0.0157	0.0032	0.0001
5,000	0.1008	0.0333	0.0049
6,000	0.1757	0.0678	0.0170
7,000	0.2591	0.1131	0.0384
8,000	0.3417	0.1648	0.0680
9,000	0.4201	0.2205	0.1043
10,000	0.4925	0.2779	0.1464
11,000	0.5598	0.3369	0.1933
12,000	0.6234	0.3980	0.2456
13,000	0.6813	0.4584	0.3008
14,000	0.7330	0.5167	0.3570
15,000	0.7756	0.5682	0.4088
16,000	0.8122	0.6155	0.4586
17,000	0.8427	0.6575	0.5040
18,000	0.8676	0.6938	0.5448
19,000	0.8884	0.7260	0.5817
20,000	0.9058	0.7542	0.6150
25,000	0.9532	0.8416	0.7235
50,000	0.9920	0.9459	0.8793
100,000	0.9986	0.9821	0.9532
MAX	1.0000	1.0000	1.0000

Source: Derived from The National Finances - 1977-78, The Canadian Tax Foundation 1978, Table 4-13, p. 56.

$$(1) \quad G = \frac{\gamma}{0.5} = 2\gamma = 2 \int_0^1 [R - I(R)] dR,$$

where γ is the area of Lorenzian income inequality and R denotes cumulative proportion of returns shown in column 2 of Table 1.

Kakwani's K is derived by using the data from columns 2 and 4 of Table 1 to construct the tax-curve, $T(R)$, also shown in Fig. 1. This curve shows the cumulative percent of taxes paid relative to the cumulative percent of tax returns. The deviation of $T(R)$ from $E(R)$ indicates Lorenzian inequality of tax payments (tax concentration) which is measured by the area $\gamma + \beta$. The fact that $T(R)$ lies everywhere below $I(R)$ reveals that there is greater tax inequality than income inequality thereby indicating a progressive tax system. Kakwani's K is directly related to the area β , which is simply the difference between $I(R)$ and $T(R)$. Analytically, K is:

$$(2) \quad K = 2\beta = 2 \int_0^1 I(R) dR - 2 \int_0^1 T(R) dR.$$

It is clear from (2) that β will be positive when $T(R)$ of Fig. 1 lies everywhere below $I(R)$ and negative when the reverse is true. A negative net area evidences greater income inequality than tax inequality and, therefore, indicates a regressive tax. Summarizing, the larger the value of a positive K , the more progressive the tax. The greater the absolute value of a negative K , the more regressive the tax.

The Suits progressivity measure is shown graphically by plotting the cumulative percent of taxes (Table 1, column 4) and the cumulative

proportion of income (Table 1, column 3). This is shown in Fig. 2. It is important to note that the Suits tax curve, $U(I)$, relates taxes to income rather than to returns. This means that the Suits index eliminates the tax return variable from direct consideration. If the tax curve, $U(I)$, coincides with the diagonal line, $F(I)$, a proportional tax is indicated. A progressive tax exists when $U(I)$ is everywhere below $F(I)$ and, conversely, a regressive tax occurs when $U(I)$ is everywhere above $F(I)$. The Suits measure of progressivity is twice the shaded area σ in Fig. 2. This area is simply the difference between the areas under $F(I)$ and $U(I)$. Analytically, S is:

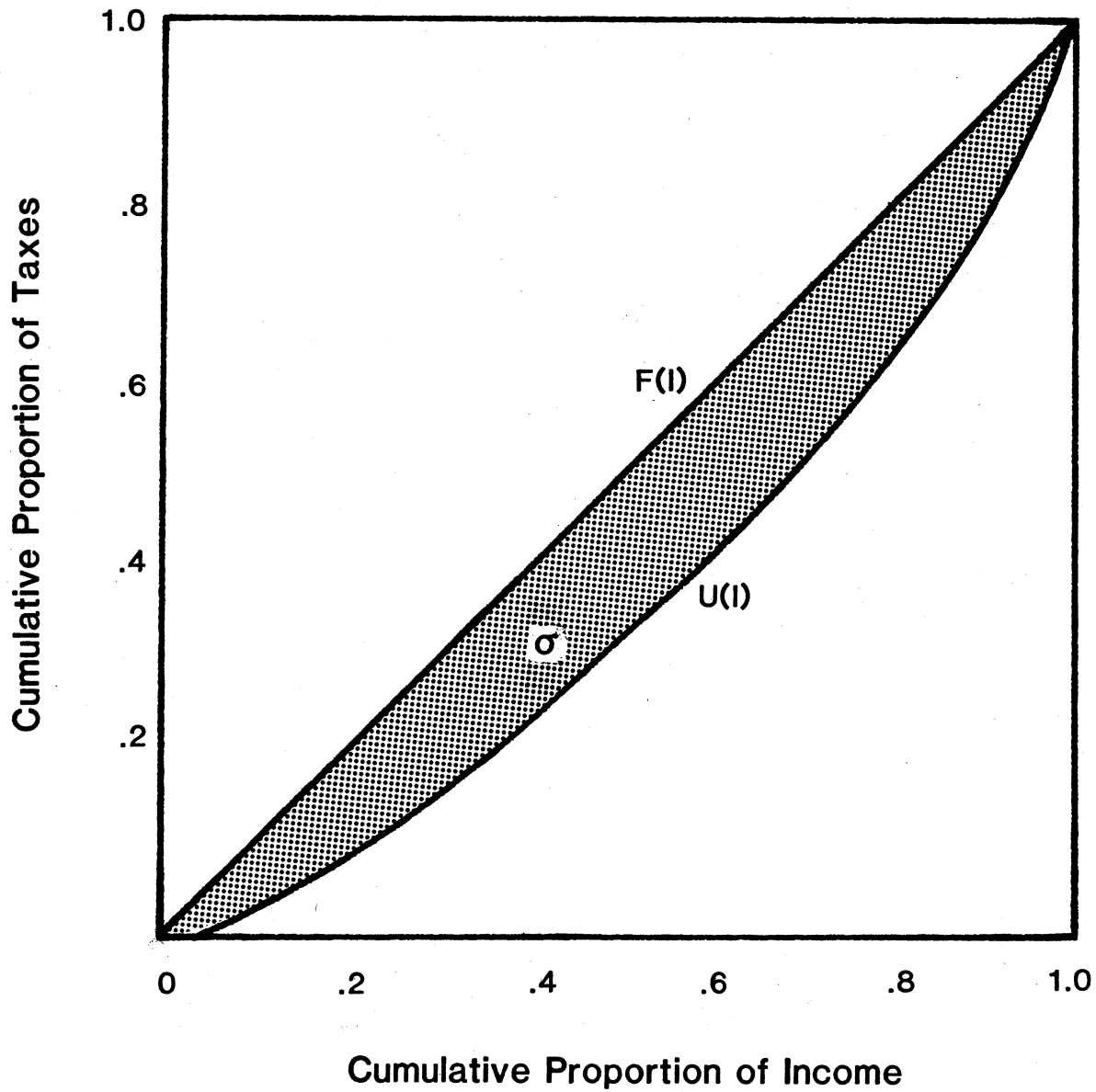
$$(3) \quad S = 2\sigma = 2 \int_0^1 F(I)dI - 2 \int_0^1 U(I)dI = .5 - 2 \int_0^1 U(I)dI.$$

As with the Kakwani measure, positive S values indicate progressive taxes and negative values reflect regressive taxes.

It is important for an understanding of the empirical results presented in Section IV below to recognize that the K and S measures given by equations (2) and (3) yield Kakwani and Suits' net summary indicators of overall progressivity. As Suits emphasizes, it is certainly possible for a tax system to be progressive over one range of the income distribution and regressive over another. If, for example, an income tax system were effectively progressive for relatively low income recipients, this result would materialize. When this happens, the tax concentration curve of Fig. 1 cuts the Lorenz curve from below. To the left of the intersection, progressivity occurs, and to the right regressivity occurs. The net effect is given

FIGURE 2

Suits' Approach



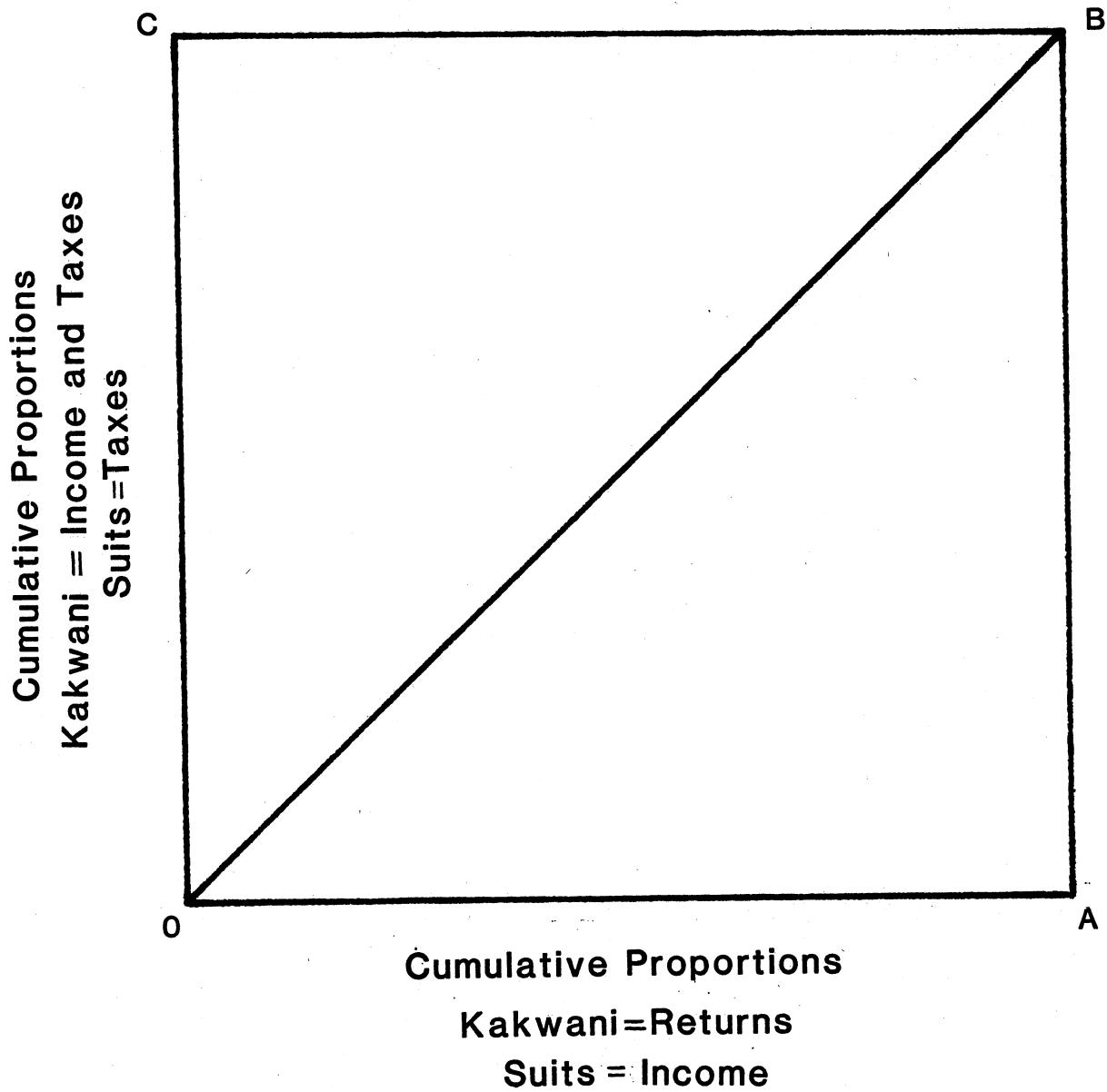
by equation (2), which treats regressivity as negative and progressivity as positive. When a crossing of $T(R)$ and $I(R)$ in Fig. 1 occurs, a positive value of K is taken to indicate that, on balance, the tax system is progressive. A negative value is taken to indicate that, on balance, there is net regressivity. In the case of the Suits measure, similar reasoning applies. In Fig. 2, the tax curve $U(I)$ would cut the diagonal line from below; progressivity would exist to the left of the crossing point and regressivity to the right. The value of S given by equation (3) shows net progressivity ($S > 0$) or net regressivity ($S < 0$). Although this discussion appears straightforward, difficulties in interpreting the progressivity measure arise when the $U(I)$ curve in Fig. 2 cuts the diagonal line.⁴ These difficulties and others are discussed in detail in Section V below.

III. THE DIFFERENCE IN K AND S

The progressivity measures K and S are clearly similar in design, but there are important differences between them. We identify and discuss two differences here. First, K and S are bounded on quite different intervals. This is most easily demonstrated by reference to Fig. 3. We first interpret Fig. 3 as a Kakwani-type diagram similar to Fig. 1. As is well known, the Gini coefficient G is bounded on the 0 to 1 interval. The coefficient is zero if income is distributed equally. In this case, the Lorenz curve overlaps the diagonal line OB in Fig. 3, the distribution is perfectly equal, and $G = 0$. The Gini coefficient takes on its theoretically conceivable maximum value of

FIGURE 3

**Limiting Values of the
Progressivity Measures**



1.0 when a single individual has all of the income. The Lorenz curve in Fig. 3 is then OAB and by equation (1), $G = 1.0$.

The Kakwani measure is bounded on the -2.0 to $+1.0$ interval. Recall that K is always twice the area β , which is simply the area between the Lorenz curve and the tax concentration curve. The maximum value of K occurs when income is perfectly equally distributed and taxes are perfectly unequally distributed. In Fig. 3, a Lorenz curve overlapping the diagonal OB and a tax concentration curve of OAB results in $\beta = .5$ and $K = 1.0$. Alternatively, the theoretically conceivable minimum value of -2.0 occurs when there is perfect income inequality and the entire tax burden is placed on persons with no income. In this situation, the Lorenz curve of Fig. 3 would be OAB and the tax concentration curve would be OCB. Thus at the limit, the minimum value of β is 1.0 and by equation (2), $K = -2.0$.

The Suits measure is bounded on the -1 to $+1$ interval [1977b, p. 749]. To understand this we now interpret Fig. 3 as a Suits type diagram like Fig. 2. The nature of the construction of the Suits tax curve $U(I)$ is such that if all taxes are paid by the highest income recipient (extreme progressivity), then $U(I)$ is OAB in Fig. 3. In this situation $\sigma = .5$ and S reaches its maximum possible value of 1.0. On the other hand, if all taxes are paid by those with zero income (extreme regressivity), the tax curve, $U(I)$, becomes OCB in Fig. 3. In this situation, $\sigma = .5$ and, by equation (3), S reaches its theoretically minimum possible value of -1.0 .

The limiting values of K and S clearly differ and are of interest. However, a second and more fundamental difference in the

indexes arises from the fact that the Suits measure is based upon an integration that is performed with respect to income, while the Kakwani measure depends upon an integration with respect to tax returns. This difference in the measures has been recently investigated by Formby, Seaks, and Smith [1981], who find that K and S differ by a weighting factor equal to the slope of the Lorenz curve. Their results show that, after substitution and manipulation, the measures are:

$$(4) \quad K = 2 \int_0^1 [I(R) - T(R)] dR$$

$$(5) \quad S = 2 \int_0^1 [I(R) - T(R)] I'(R) dR.$$

Comparison of (4) and (5) reveals that the only difference in the two progressivity measures is the term $I'(R)$, the slope of the Lorenz curve. This implicit weighting factor leads to different numerical magnitudes of K and S and may result in conflicting implications when time series or cross-section comparisons are made. Formby, Seaks, and Smith [1981] show that such a conflict does occur in a time series analysis of the U.S. personal income tax system.⁵ There is no apparent conceptual reason to prefer one of the measures over the other. For this reason, both K and S warrant consideration when progressivity is measured, and both are used below to estimate income tax progressivity in North America, a subject to which we now turn.

IV. EMPIRICAL ESTIMATES

Tables 2 and 3 show the accumulated proportions of taxpayers, incomes, and personal income taxes paid to the federal governments of the United States and Mexico in 1975. Like Table 1 for Canada, Tables 2 and 3 contain all of the necessary information for computing the K and S progressivity measures. Before presenting such estimates, however, it is useful to discuss briefly some data problems affecting international comparisons that are not apparent from Tables 1, 2, and 3.

Several difficulties arise from the fact that the source of the Mexican data is of a different sort than that for the U.S. and Canada. Until quite recently, tax distribution data by income class simply were not available for Mexico. However, the Centro Nacional de Información y Estadísticas del Trabajo (CENIET) carried out a detailed family income and expenditure survey in 1975. After publication of the survey results in 1977, CENIET made a number of file modifications that made possible cross-tabulations of tax and income distribution data. CENIET recently made the necessary computations and the resulting tax and income distributions have been published by Mann [1982]. Three points concerning the Mexican data deserve emphasis. First, it is survey data. Second, it is for a single month. Third, it is for families. In contrast, the Canadian and U.S. data are compiled from official tax statistics. They represent a census of tax returns filed during all of 1975. The Mexican survey data are for a single month and, thus, are not strictly comparable. In the U.S. and Canadian data, the number of returns filed does not have a one-to-one

TABLE 2

ACCUMULATED PROPORTIONS OF U. S. TAX RETURNS, ADJUSTED GROSS INCOME,
AND FEDERAL INCOME TAXES - 1975

(1) INCOME BELOW	(2) RETURNS	(3) PROPORTIONS INCOME	(4) TAXES
1,000	0.0576	0.003	0.000
2,000	0.1234	0.011	0.000
3,000	0.1842	0.024	0.000
4,000	0.2398	0.041	0.003
5,000	0.2950	0.063	0.010
6,000	0.3526	0.090	0.020
7,000	0.4033	0.118	0.034
8,000	0.4501	0.148	0.051
9,000	0.4954	0.182	0.072
10,000	0.5377	0.216	0.096
11,000	0.5776	0.252	0.122
12,000	0.6155	0.290	0.151
13,000	0.6514	0.329	0.182
14,000	0.6870	0.370	0.216
15,000	0.7196	0.411	0.250
20,000	0.8455	0.598	0.420
25,000	0.9136	0.729	0.557
30,000	0.9470	0.807	0.648
50,000	0.9804	0.912	0.794
100,000	0.9899	0.966	0.902
200,000	0.9918	0.987	0.957
500,000	0.9921	0.995	0.983
1,000,000	0.9922	0.998	0.991
MAX	1.000	1.000	1.000

Source: Statistics of Income 1975 - Individual Income Tax Returns, Department of the Treasury, Internal Revenue Service, Table 1.1, pp. 506.

TABLE 3

ACCUMULATED PROPORTIONS OF MEXICAN POPULATION, BROAD FAMILY INCOME AND
PERSONAL INCOME TAXES - 1975

(1)	(2)	(3)	(4)
INCOME BELOW	FAMILIES	PROPORTIONS	PERSONAL
		BROAD FAMILY INCOME	INCOME TAXES
8,401	0.208	0.023	0.001
11,401	0.287	0.042	0.001
15,001	0.375	0.071	0.004
20,401	0.464	0.106	0.040
26,401	0.568	0.162	0.103
36,001	0.690	0.249	0.202
48,001	0.775	0.328	0.291
62,401	0.843	0.410	0.389
84,001	0.904	0.511	0.528
110,401	0.938	0.588	0.629
147,001	0.966	0.674	0.730
MAX	1.000	1.000	1.000

Source: Mann, Arthur J., "The Mexican Tax Burden by Family Income Class,"
Public Finance Quarterly, July 1982, Table A-1, p. 323, and Table A-3,
p. 325.

correspondence with families. Some families do not file and in others more than one return is filed. Another and closely related problem is that the income concepts used in Tables 1, 2, and 3 differ. The Mexican definition of income reported in Table 2 is "broad family income," which corresponds closely to personal income in the national income accounts sense. For the United States, the income concept is "Adjusted Gross Income," and in Canada it is assessed income which differs in some ways from Adjusted Gross Income and personal income.⁶

A final data problem affecting comparisons relates to tax evasion. The tax compliance and enforcement procedures of the three nations differ and variations in the effects of evasion and avoidance are likely. This is almost certain to affect comparisons with Mexico. Low income earners (below 15,000 pesos) are exempt from the federal personal income tax. There are widespread and apparently well founded suspicions (see Mann [1982] and Evans [1982]) that upper income Mexicans engage in extensive and quite successful income tax evasion. Thus, very low income recipients pay no income tax and very high income recipients avoid most income taxes. If this avoidance is accomplished by underreporting income in the CENIET survey, then progressivity comparisons would be affected.

Given appropriate caveats applicable to the comparability of the underlying data, Table 4 shows the estimated values of K and S for the federal personal income tax systems in the three nations of North America in 1975. The necessary integrals were computed using a cubic spline technique, which Paglin [1975, pp. 608-9] has shown to be more accurate than the conventional straight-line method. Several

TABLE 4

SUMMARY MEASURES OF THE PROGRESSIVITY OF PERSONAL INCOME TAXATION
IN NORTH AMERICA - 1975

	(1) <u>K</u>	(2) <u>S</u>
Canada	.2133	.2360
Mexico	.0608	-.0002
United States	.1954	.2663

Source: Computed from Tables 1, 2, and 3 above.

implications of Table 4 are worth discussing. The K and S values in Table 4 suggest that both the U.S. and Canada have more progressive income tax systems than does Mexico. Given the central role that the distribution of income plays in the measurement of progressivity, this result, perhaps, might not seem surprising. However, as clearly shown in equation (2) and Fig. 1 and as implicit in equation (3) and Fig. 2, the measures of progressivity clearly depend on the distribution of taxes relative to the distribution of income. It is certainly conceivable that a poor nation like Mexico with significant income inequality could have even greater inequality in tax payments. Stated differently, a nation having great income inequality does not necessarily have less income tax progressivity than other nations.

A second implication of Table 4 is that the Kakwani and Suits measures yield inconsistent ranking of the comparative progressivity of the income tax systems of Canada and the U.S. The Kakwani measure suggests slightly greater progressivity in Canada and the Suits index shows U.S. income taxes to be slightly more progressive. The explanation of this is to be found in equations (4) and (5). They show that the slope of the Lorenz curve enters as a weighting factor that may result in K and S ranking tax progressivities differently. Table 4 reveals that this theoretical possibility was realized in 1975 for the U.S. and Canada. An even more interesting result, however, occurs in the case of Mexico.

Table 4 indicates that the Kakwani measure for Mexico suggests mild net progressivity, while the Suits index is negative, implying slight net regressivity. In this instance, the measures not only have

different values but opposite signs, one suggesting net regressivity and the other net progressivity. A plausible explanation of this result is that the Mexican personal income tax system is progressive over one range of the income distribution and regressive over another. This, in combination with equations (4) and (5), could result in inconsistent signs for the coefficients. Careful inspection of Table 3 reveals that this, in fact, occurs. To show this clearly, the Kakwani and Suits diagrams for Mexico are shown in Figs. 4 and 5. Fig. 4 shows the Kakwani diagram with the Lorenz curve $I(R)$ and the tax curve $T(R)$ crossing at point C. As indicated, the crossing point occurs at values of 0.877 and 0.466. Fig. 5 shows the Suits tax curve $U(I)$ crossing the diagonal at point D, with the crossing point occurring at a value of 0.466.

The conflicting signs on the K and S measures for the Mexican income tax system can be better understood by decomposing the K and S measures into their progressive and regressive components. For the Kakwani index:

$$(6) \quad K = K_p + K_r,$$

where K_p and K_r are the progressivity and regressivity measures associated with the area β_p and β_r in Fig. 4. Analytically,

$$(7) \quad K_p = 2\beta_p = 2 \int_0^{0.877} I(R)dR - 2 \int_0^{0.877} T(R)dR,$$

and

$$(8) \quad K_r = 2\beta_r = 2 \int_{0.877}^{1.0} I(R)dR - 2 \int_0^{0.877} T(R)dR.$$

FIGURE 4

Kakwani Diagram For Mexico-1975

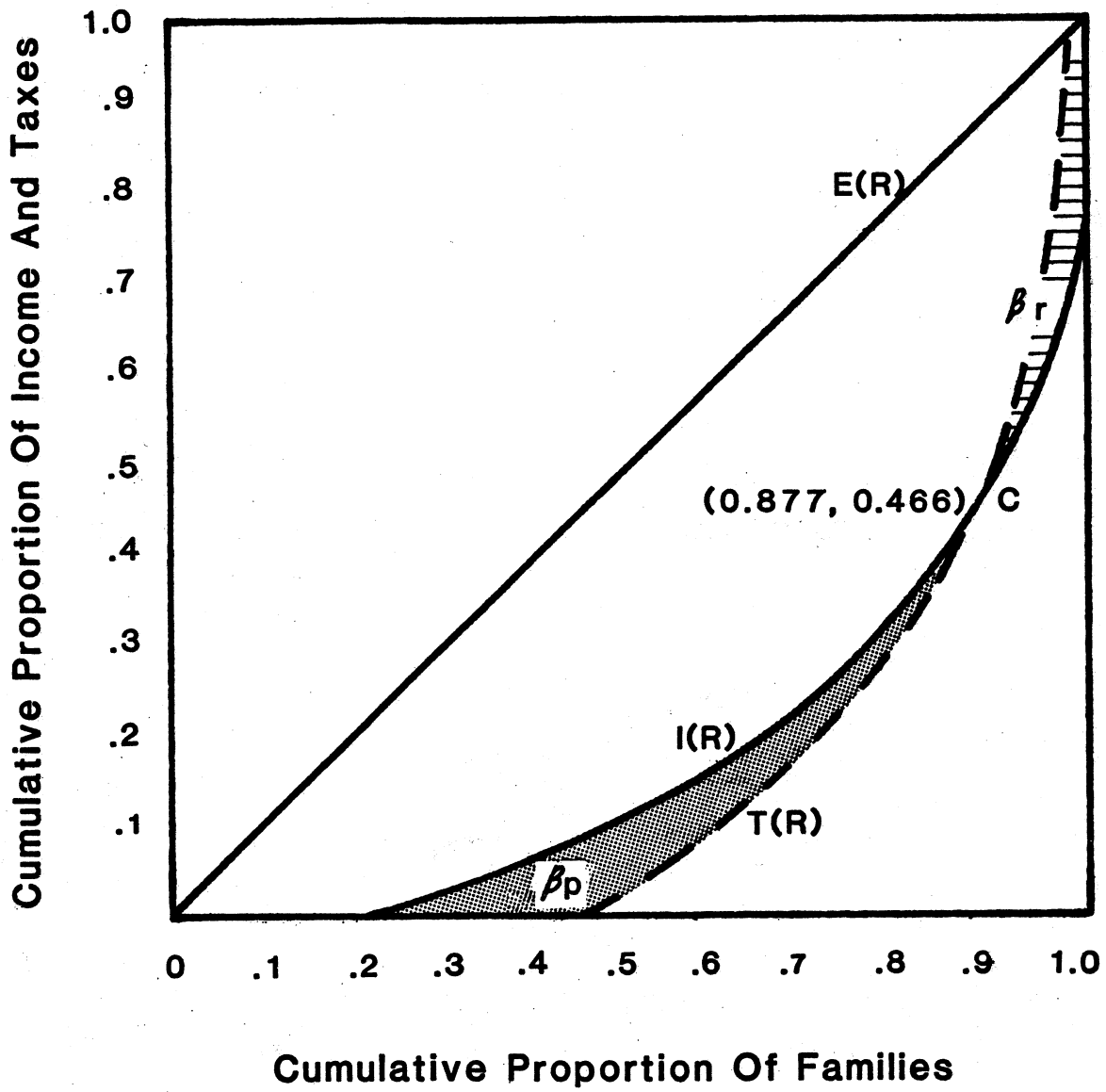
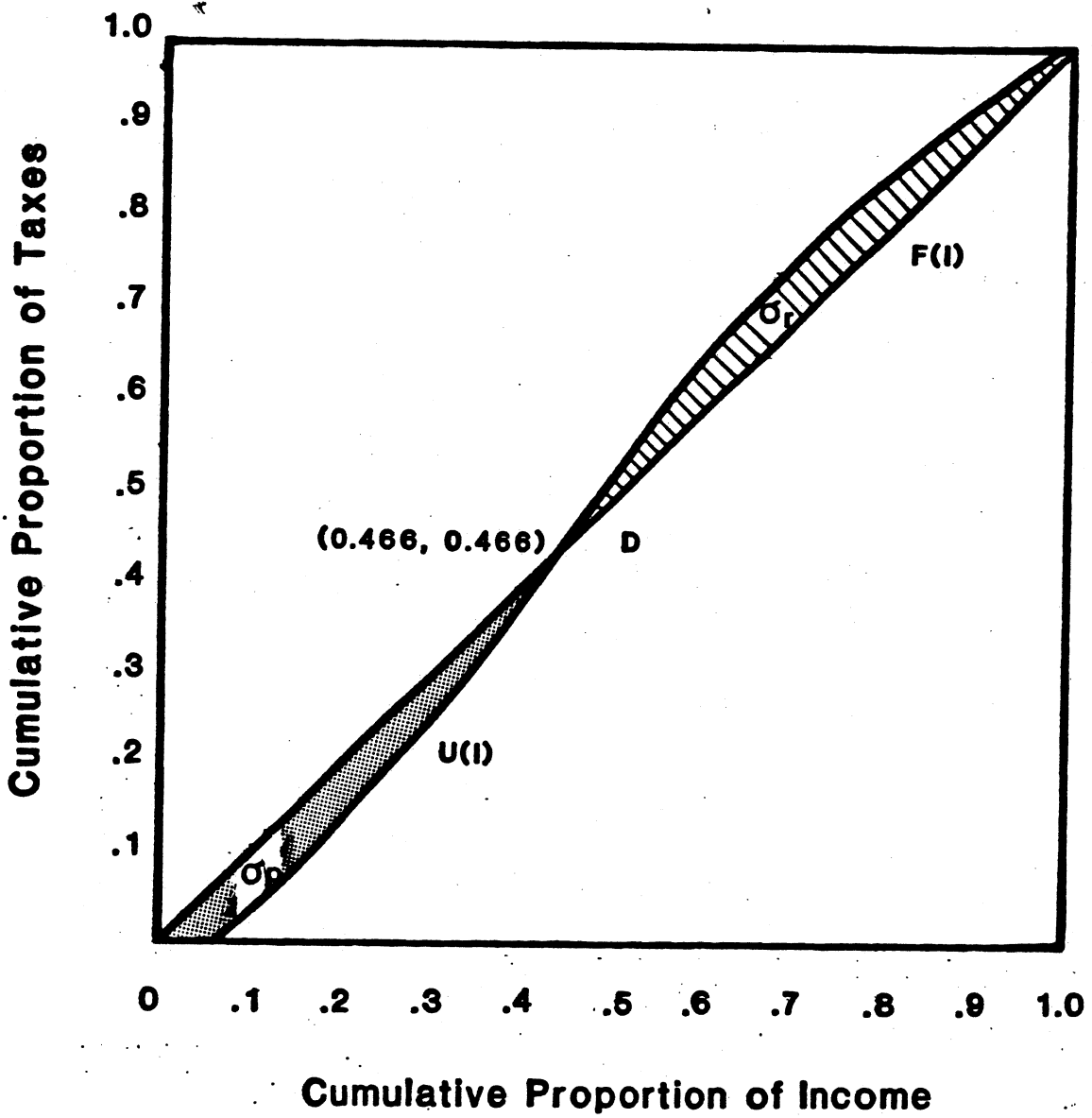


FIGURE 5

Suits Diagram for Mexico-1975



In the case of the Suits measure, the decomposition is:

$$(9) \quad S = S_p + S_r,$$

when,

$$(10) \quad S_p = 2\sigma_p = .5 - 2 \int_0^{.466} U(I)dI$$

and,

$$(11) \quad S_r = 2\sigma_r = .5 - .2 \int_{.466}^{1.0} U(I)dI.$$

The estimated values of the decomposed Kakwani measures are:

$K_p = .0686$, $K_r = -.0078$, and $K = .0608$. In the case of the Suits index, the decomposed values are $S_p = .0388$, $S_r = -.0390$, and $S = -.0002$.

V. CONCEPTUAL PROBLEMS IN MEASURING PROGRESSIVITY

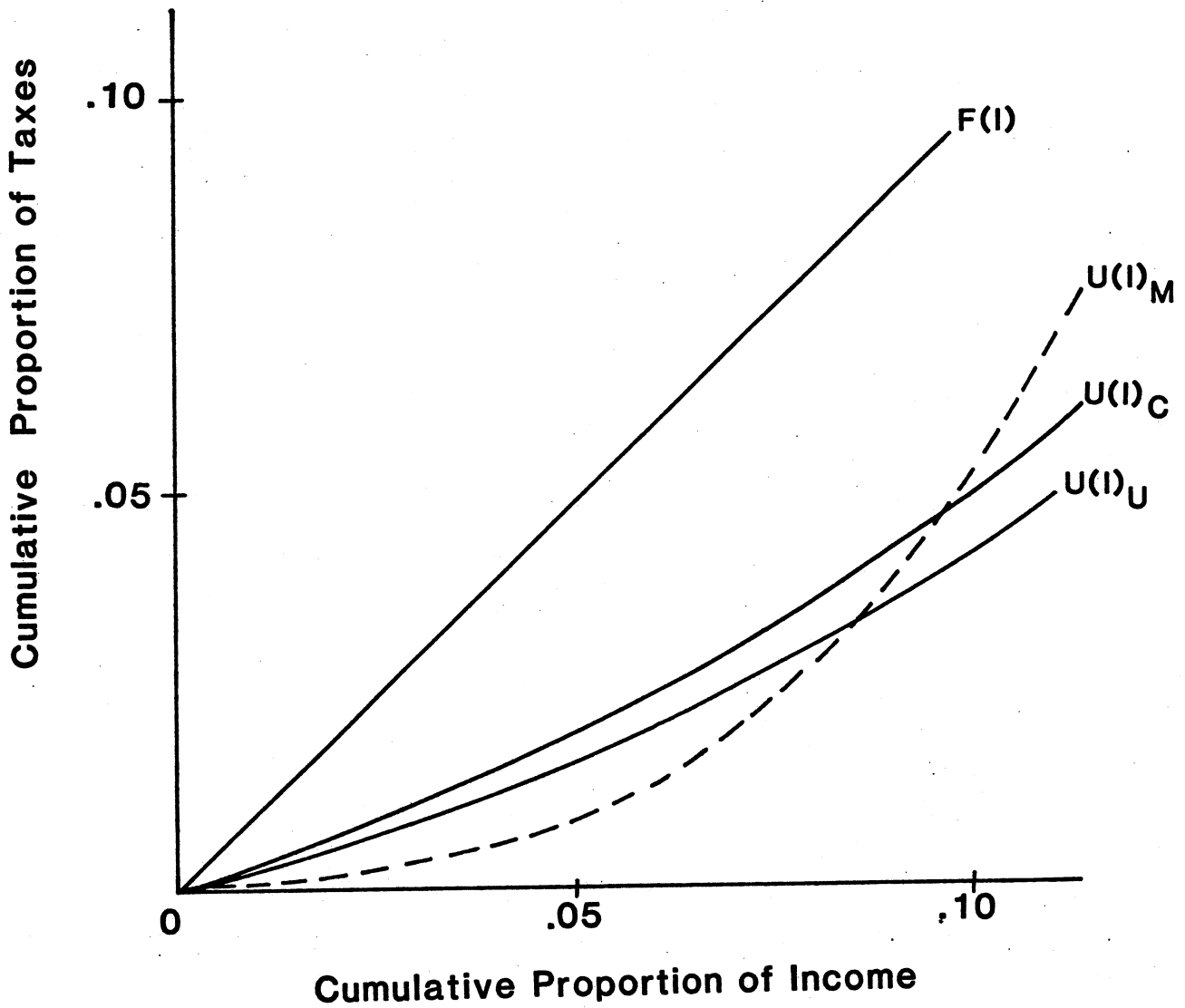
The facts that the Suits and Kakwani summary measures (1) fail to rank tax progressivity in a consistent manner with one another and (2) fail to agree on whether Mexico's tax system is progressive or regressive are particularly disturbing. Each measure appears internally consistent but is inconsistent with the other, although both measures derive from the same Gini-Lorenz methodology. The fact that there does not appear to be any reason to prefer one measure over the other raises the question of whether it is valid to devise a single number to encapsulate what must be viewed as a series.⁷ This point is most easily seen in the case of crossing points.

Two types of crossing points are possible. The first type was discussed in the previous section and is present whenever a tax system is progressive over one range of income and regressive over another as depicted in Figs. 4 and 5. This type of crossing point occurs for the case of a single nation or tax. The second type of crossing arises because the tax concentration and income concentration curves of different taxes and countries can intersect. In discussing these points, we focus on Suits' tax concentration curve $U(I)$, but the argument is equally damaging to Kakwani's measure. Fig. 6 is constructed from data in Tables 1, 2, and 3 and shows segments of Suits' tax concentration curves for Canada ($U(I)_C$), the U.S. ($U(I)_U$), and Mexico ($U(I)_M$). Fig. 6 shows that Mexico's curve crosses both the Canadian and U. S. curves while the Canadian and U. S. curves do not intersect. Careful inspection of the data in Tables 1, 2, and 3 reveals that no further crossing points occur. It is important to note that the summary indexes of Table 4 give no indication of these crossings.

The difficulty which crossing points pose for summary indexes such as the Gini coefficient is a problem in welfare economics and was first pointed out in a seminal contribution by Atkinson [1970]. Atkinson demonstrates that if Lorenz curves intersect, valid judgments about relative degrees of inequality cannot be made without detailed knowledge of the social welfare function.⁸ The distribution of taxes directly affects the distribution of income and, therefore, what applies to intersections of income concentration curves also applies equally to tax concentration curves. Atkinson's theorem is directly

FIGURE 6

**Partial Suits Diagram for Canada
Mexico and the U.S.-1975**



relevant to the intersections depicted in Figs. 4, 5, and 6.⁹ The theorem tells us that, given crossings, it is always possible to find a social welfare function which ranks tax distributions in reverse order to the Suits and Kakwani indexes. This means that, despite the implications suggested by Table 4, the summary measures are subject to serious limitations. Specifically, Atkinson's work has two important implications for comparing North American income tax progressivity.

First, simply subtracting the area of regressivity from the area of progressivity as in equations (6), (7) and (8) does not yield valid measures of progressivity and regressivity. It is not clear that when crossing points of the first type occur that "overall progressivity" and "overall regressivity" have any clear meaning. The fact that a summary index possesses a positive value does not imply that every reasonable observer would consider the tax system in Fig. 5 progressive. The judgement depends upon the weights assigned to individual incomes over the various income ranges. A social welfare function can always be constructed to contradict the summary index when a crossing point occurs.

Second, contrary to the implication of Table 4, no meaningful comparison of Mexico to either Canada or to the U. S. can be made. The fact that both the Suits and Kakwani measures for Canada, for example, are greater than those for Mexico does not necessarily mean that every rational individual would agree that Canada possesses a more progressive tax system. By Atkinson's theorem this follows from the fact that the two countries' curves cross.

The tax concentration curves of the United States and Canada do not cross and, consequently, the Suits and Kakwani summary measures can be used to make comparisons. However, this fact provides little comfort for advocates of the use of the summary progressivity indexes. As discussed above, the K index ranks Canada as more progressive and the S index ranks the U.S. as more progressive. Since there is no reason to prefer one measure over the other, the question of which is more progressive cannot be answered. Thus, in the case of North America the summary measures convey very little valid information about comparative progressivity.

VI. CONCLUSIONS

Using summary Kakwani and Suits indexes to compare federal income tax progressivity in North America is subject to severe limitation. Crossings of tax concentration and income concentration curves substantially diminish the value of the summary measures of tax progressivity. In fact, use of the Suits and Kakwani indexes without checking for and reporting crossings can be seriously misleading. The clear warning which emerges is that summary measures of tax progressivity must be used with extreme care and should never be used or interpreted apart from the underlying data and/or Lorenz curves with which they are associated. A defensible procedure for using the summary measures would seem to require that a check for crossing be performed and that either the distributions or corresponding concentration curves should be reported so that policymakers and other users are aware of the underlying distributions.

NOTES

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¹Average tax rate progressivity is only one of several possible point measures of progressivity. Musgrave and Thin [1948] propose three others, marginal tax progressivity (derivative of marginal tax rates with respect to income), liability progressivity (elasticity of tax liabilities with respect to pre-tax income), and residual progressivity (elasticity of post-tax income with respect to pre-tax income).

²There have been a number of applied public finance studies using the Suits and Kakwani measures. See, for example, Suits [1977a], Kakwani [1976], Clotfelter [1977], Calmus [1981], and Formby and Sykes [1984].

³Limitations of the measures have been discussed by Bracewell-Milnes [1979], Kakwani [1979], Davies [1980], Kienzle [1980], Suits [1980], and Formby, Seaks, and Smith [1981].

⁴Davies [1980] emphasizes this point.

⁵Their results show that K and S moved in opposite directions in three out of fourteen years between 1962 and 1976.

⁶For a discussion of the meaning and inclusiveness of these income concepts, see Mann [1982, p. 328], The National Finances [1978, pp. 55-56], and IRS Statistics of Income [1978, pp. 1-3].

⁷We are indebted to an anonymous Advisory Editor for this point.

⁸Atkinson only assumes that social welfare is additively separable and is the sum of identical individual utility functions which are concave. Dasgupta, Sen and Starrett [1973] show Atkinson's result under less restrictive assumptions.

⁹Calmus [1981] makes this point.

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Summary: Difficulties in the Measurement and Comparison of Tax Progressivity: The Case of North America--This paper investigates the comparative degree of personal income tax progressivity in Canada, Mexico, and the United States. Suits and Kakwani summary measures of progressivity are presented and the conditions under which the indexes yield valid comparative measures are identified. It is shown that using Suits and Kakwani indexes to compare income tax progressivity in North America is subject to severe limitations. Crossings of tax concentration and income concentration curves substantially diminish the value of the summary measures of tax progressivity. The use of the Suits and Kakwani indexes without checking for and reporting crossings can be seriously misleading. The paper concludes that the summary measures of tax progressivity must be used with extreme care and should never be used or interpreted apart from the underlying data and/or Lorenz curves with which they are associated.