Volume Title: Horizontal Equity, Uncertainty, and Economic Well-Being

Volume Author/Editor: Martin David and Timothy Smeeding, editors

Volume Publisher: University of Chicago Press

Volume ISBN: 0-226-13726-0

Volume URL: http://www.nber.org/books/davi85-1

Publication Date: 1985

Chapter Title: A Comparison of Measures of Horizontal Inequity

Chapter Author: Robert Plotnick

Chapter URL: http://www.nber.org/chapters/c6152

Chapter pages in book: (p. 239 - 268)

8 A Comparison of Measures of Horizontal Inequity

Robert Plotnick

8.1 Introduction

The principle of horizontal equity is usually stated as "equal treatment of equals." Policies that redistribute should levy identical taxes or provide identical transfers to all units with the same level of well-being. In recent years several researchers have argued that, if this classic definition is to be analytically useful and intuitively reasonable, it must be amended to include the more general condition that a redistribution of well-being must not alter the rank order of units (Atkinson 1980; Feldstein 1976; King 1983; Plotnick 1982).[1]

As attention to the concept of horizontal equity has grown, methods for appropriately measuring the extent of horizontal inequity have also received increased scrutiny (Atkinson 1980; Berliant and Strauss 1983; Cowell 1980, 1982; King 1983; Plotnick 1981, 1982; Rosen 1978). Empirical work on this issue, however, has been meager and unsystematic.[2] Pa-

Robert Plotnick is associate professor of public affairs and social work, Graduate School of Public Affairs and School of Social Work, University of Washington.

The author wishes to thank Stephan Chase and William Epstein for research assistance. This research was supported in part by a contract to the Institute for Research on Poverty from the U.S. Department of Health and Human Services. The views expressed in this paper are those of the author and do not necessarily reflect the views of either DHHS or the Institute for Research on Poverty.

1. While Berliant and Strauss 1982 have taken issue with this amendment, it is adopted in this study. See part 8.2 for further discussion.

2. Here is a quick but nearly complete review of the empirical literature: Plotnick and Skidmore 1975, (pp. 156, 234–36) offered tabular evidence for cash transfers but no summary measure. Atkinson 1980 used aggregate data on the U.S. income tax and one measure. Berliant and Strauss 1983 also examined this tax using a measure they developed. Rosen 1978 analyzed the U.S. income and payroll tax with two measures. King 1983 applied the index he derived to a simulated reform of housing subsidies in England and Wales. Plotnick 1981 adopted the same index as Atkinson, but used microdata and two measures of well-being to examine several redistributions involving taxes and cash and in-kind transfers. Still different

pers with empirical sections have simply illustrated a particular measure (or measures) using a convenient data set. Comparisons of different measures applied to the same data and measure of economic welfare, and differences resulting from using the same measure of horizontal inequity and same data but alternative definitions of economic well-being, have not been explored.

This chapter seeks to fill this gap in the literature. Such an exercise is needed to give analysts a better "feel" for the meaning of different values of an inequity index and for how various indexes differ in their sensitivity to changes in the definition of well-being.[3]

Aside from whatever intrinsic scholarly interest it may hold, advancing our understanding of the measurement of horizontal inequity may contribute to better informed policy analyses and decisions. It is evident that the horizontal inequity generated by public policies that explicitly or implicitly redistribute economic welfare concerns decision makers. Analyses of proposed tax and welfare reforms and changes in entitlement programs prepared by the Congressional Budget Office or the U.S. Treasury Department routinely include simple "gainers and losers" tables. Such information provides a crude assessment of the extent of reordering. Examples of situations in which a nonworking welfare mother's cash and in-kind transfer income exceeds the take-home pay of a working poor family have featured prominently in welfare reform debates since 1969. So, too, have examples of differences in public assistance provided to equally needy families caused by state-by-state variation in eligibility rules and benefit schedules. Waiting lists for subsidized public housing or other benefits with limited availability have been viewed as unfair since some equally deserving persons are denied access. Special provisions in the tax code are frequently defended or attacked by claiming they reduce or induce unequal treatment of equals.

There are sound reasons for this concern. Unequal treatment of equals and rank reversals are likely sources of social tension in a society that tends to view incomes (and, hence, ranking in the distribution) generated by market processes as deserved. Knowledge that some persons with lower market incomes than oneself attain greater disposable incomes by receiving some public benefit or avoiding their "fair share" of taxes may well breed resentment.

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indexes are implemented in the specialized studies by Chernick and Reschovsky 1982 and Menchik and David 1982. See Plotnick 1982 for citations to earlier studies and criticisms of many of the horizontal inequity indexes used in them.

3. In contrast, analysts appear to have a better intuitive sense of, for example, what a Gini coefficient of .3 means relative to one of .6. In addition, substantial work has been done on the sensitivity of measures of inequality to changes in the reporting unit or measure of well-being (Beach, Card, and Flatters 1981; Benus and Morgan 1975; Danziger and Taussig 1979; Taussig 1973).

Because public policies may create horizontal inequity in accomplishing their primary objectives, decision makers should be aware of the extent of this negative effect. They may also be interested in possible trade-offs between it and the likely efficiency and conventional distributional impacts (i.e., effects on poverty or inequality independent of any reordering) of policy options. But to do so, they require useful indicators of the magnitude of horizontal inequity. This chapter, then, takes a necessary step towards enabling us to sensibly evaluate the implications for horizontal inequity of specific policy proposals.

The balance of this chapter has four parts. Part 8.2 more carefully examines the concept of horizontal inequity and develops the implications for properly measuring it. The third section describes the measures of horizontal inequity and well-being used and the data set. Part 8.4 contains the empirical findings. The final section is a summary and conclusion. A word of warning: The conclusion will not identify the best index on the basis of the empirical results. Such a judgment, as argued in part 8.3, is normative to an important degree and cannot be reached solely from the evidence provided here.

8.2 The Concept of Horizontal Inequity

While the classic notion of horizontal equity as equal treatment of equals expresses an important principle of policy design, it is conceptually incomplete. King (1983, p. 101) observes:

> In practice, of course, no two individuals are ever identical, and the principle of equal treatment of equals has little empirical significance unless it can be usefully extended to include "and unequals treated accordingly." To do this we are led naturally to a comparison of the ordering of utility levels before and after a tax change.

Following this logic, a horizontally equitable redistribution is one that preserves the initial rank order of the units. This conception encompasses the classic definition but is more general.

The requirement of rank preservation has raised objections from some quarters (Berliant and Strauss 1982). I believe it is essential for two reasons. First, though one is always free to require that the term *horizontal inequity* only concern unequal treatment of equals, the concept will then have little practical application, as King noted. Arbitrarily grouping "similar" units together and examining whether their treatments were equal appears to be an artificial way to salvage empirical applicability. Broadening the definition to cover rank reversals makes empirical analysis more feasible.[4]

4. If one wants to label rank-order requirements something other than horizontal inequity, so be it. Semantics aside, my interest in this study is in understanding and quantifying the extent of such reversals.

The second is more fundamental and is rooted in the view that, ceteris paribus, horizontal inequity diminishes social welfare. Consider an economy characterized by competitive markets and equal opportunity.[5] As many have observed, the distribution of marginal revenue products and rents generated in such an economy is not necessarily just. Consequently, transforming the distribution of market income into one that better conforms to society's preferred distribution will raise social welfare. The degree to which differences in initial well-being should be narrowed is debatable, but once this is resolved, what social purpose would be promoted by reversing ranks during the transformation? None—if the economic game is regarded as a fair process. (And such an economy, I believe, would likely be a U.S. choice by consensus for a fair system.) Unless the socially optimal distribution is one of full equality, those earning more initial well-being should surely have greater final well-being than those earning less. What logic could justify otherwise? Thus, any reversals incidental to the redistributive process would seem to lower social welfare.[6]

A reranking causes a unit's actual level of final well-being to diverge from its rank-preserving final level. It is this divergence, rather than the rank reversal per se, that is the real source of the problem and that lowers social welfare. A useful measure of horizontal inequity, therefore, must be a function of such differences in economic well-being.[7]

In the dense portions of the income distribution, a modest cardinal difference in well-being would translate into a large difference between the actual ordinal rank and the rank-preserving one. The same difference in well-being for a unit in the upper tail would lead to a much smaller difference in ranks. A measure that examines differences in well-being, therefore, is probably superior to one based on rank differences.

If this perspective on horizontal inequity is accepted, the implications for the narrower equal-treatment-of-equals approach are serious. Suppose that distinct groups of equals could somehow be identified. And assume that all members within any specific group received identical treatment. Then according to the equal treatment view, no horizontal inequity exists. Yet the final levels of well-being of two groups could well be in reverse order of their initial levels. The unfairness of such a situation would never be recognized by focusing on equal treatment.[8]

5. I.e., no discrimination in any market or social institution based on ascriptive characteristics such as race or sex. See Rae et al. 1981 for extended discussion of the concept of equal opportunity.

6. I am using *social welfare* in a broader sense than usual. Typically, overall social welfare is a function only of individual utility levels. Here, though, I am suggesting that reordering has an effect on social welfare independent of the utility levels at each rank. The social welfare function, then, incorporates nonutility information and rejects "welfarism" (Sen 1979).

7. Useful measures will *not* be concerned with comparisons between initial and actual final levels of well-being, nor between initial and final rank-preserving levels. These comparisons may also be of interest, but they are not appropriate for assessing horizontal inequity.

8. See the remarks in footnote 4 also.

The view that rank reversals reduce social welfare rests, ultimately, on an intuitive appeal to notions of fairness and deservingness in the distribution and redistribution of economic resources. This judgment cannot be derived from either the principle of welfare maximization nor that of Pareto optimality (Atkinson 1980; Stiglitz 1982). It appears to be an independent principle of tax and transfer policy. (Hence, complete criteria for evaluating alternative redistributive policies must allow for trade-offs among their horizontal inequities, vertical inequities, inefficiencies, administrative costs, and other attributes.)

As should now be clear, I interpret the principle of horizontal equity as one concerned with fairness in the *process* of redistribution. The principle offers no guidance on whether the initial or final distribution is optimal or just, nor on whether the redistributive instruments made the distribution more or less just. Instead, given the initial and final distributions, it poses a criterion to judge the fairness of the means used to alter the distribution. Conceivably, one could argue that a particular final distribution was not just, but agree that it was obtained by a horizontally equitable process.

The emphasis on process brings out an important implicit assumption in the interpretation of horizontal inequity—the initial ranking is accepted as fair. Yet in real economies, unlike the ideal one posited above, there are many reasons to reject this assumption. For example, the influence of racial discrimination, monopoly rents, or bribes on setting the initial ranking would lead one to question its fairness. Nonetheless, on pragmatic grounds this assumption may not be too bad. If, despite the contrary arguments that can be offered, most persons tacitly accept the initial ranking as reasonably fair when making judgments on redistributive equity, a useful measure of horizontal inequity (useful in the sense that it measures a phenomenon of public concern, even if the concern is partly based on "faulty" perception of what constitutes the fair ranking) must also accept this ranking.

If no normative value attaches to the initial ranking, a reranking need not, of course, be inequitable. In the empirical section of the paper, I necessarily assume that the initial ranking deserves to be preserved.[9]

8.2.1 Horizontal versus Vertical Equity

The rank condition may appear to be a principle of vertical equity. Carefully distinguishing between the concepts of vertical and horizontal equity shows that this interpretation does not follow, however. Vertical equity is perhaps best interpreted, in Nozick's (1974) terms, as an "end state principle." One compares an observed distribution of economic

9. If the fairness of the initial ranking is questionable, the analyst may, in principle, specify what the fair initial ranking should be. This can be compared to the actual final ranking to assess horizontal inequity.

well-being to an optimal one. (How the optimum is derived is immaterial for this discussion.) If they differ, vertical inequity exists—the relative incomes of some or all of the units are too large or too small. A redistribution reduces the extent of vertical inequity if it moves the actual distribution "closer" to the optimum.[10]

This notion of vertical equity does not include a rank-order condition. Measures of inequality that satisfy the widely accepted anonymity principle are independent of which unit occupies each position in the distribution.

Conflict and confusion have arisen over terminology among researchers who analyze changes in the income distribution. This semantic problem leads to disagreement about how to properly measure various effects of redistributive activity. One can ask if a redistributive policy (1) alters the level of inequality, (2) reranks units, and (3) requires those with greater ability to pay, in fact, to pay more taxes or receive lower benefits. I view these as questions of vertical equity, horizontal equity, and progressivity, respectively. Others may choose different terms to label these three issues or use these three terms to refer to different issues. It would be useful to reach consensus on terminology.

8.3 Empirical Procedures

8.3.1 Five Measures of Horizontal Inequity

Economists have proposed a large variety of indexes for measuring horizontal inequity. Many are unsatisfactory, however, because they mistakenly fold norms of vertical equity into the index formula or do not adequately deal with reranking (Plotnick 1982, pp. 386–90).

This study provides empirical results only for the five "good" measures that I have found in the literature. "Good" measures satisfy three properties (Plotnick 1982, p. 384). First, their values are independent of the mean of the final distribution of well-being. Second, they satisfy a simple anonymity condition. Last, if one redistribution differs from a second solely because some units' actual final levels of welfare are closer to what their rank-preserving (i.e., their horizontally equitable) final levels are, the index must show less horizontal inequity for the first redistribution. This third property is crucial, for it forces measures to embody the loss-of-social-welfare interpretation of horizontal inequity offered in part 8.2.

Denote unit i's actual observed level of welfare in the final distribution by oy_i. Unit i's final level of welfare, if its rank in the initial and final distribution were identical, is denoted fy_i. That is, fy_i is the level of well-being

10. The term *vertical equity* as used here is not equivalent to *progressivity*. Kakwani 1982 establishes the conceptual distinction between progressivity and changes in inequality (i.e., changes in vertical inequity) due to taxes and transfers.

that would have been attained in a rank-preserving, completely horizontally equitable redistribution. The observed rank in the final distribution and the rank in the initial distribution are, respectively, or_i and fr_i. Assume N units with mean final welfare of Y. The first of the five measures is

$$(1) \qquad A - P = \frac{\sum_i fr_i (fy_i - oy_i)}{N^2 YG},$$

where G = Gini coefficient of final well-being.

This index has a familiar geometric interpretation (Atkinson 1980; Plotnick 1981). Construct a concentration curve by ordering units according to their initial rank and plotting cumulative shares of *final* well-being. The curve will always lie above and to the left of the conventional Lorenz curve for final well-being. The area between these two curves, divided by the maximum possible area between them (which has the same value as G), equals $A - P$.

The second measure is

$$(2) \qquad K_{h,t} = 1 - \left[\frac{\sum_i [oy_i \exp(-h|oy_i - fy_i|/Y)]^t}{\sum (oy_i)^t} \right]^{1/t}, \quad t \neq 0;$$

$$= 1 - \exp\left(\frac{-h}{N} \sum_i |oy_i - fy_i|/Y \right), \quad t = 0.$$

In this index h is a nonnegative number chosen by the analyst and indicates the degree of aversion to horizontal inequity (King 1983). King notes that the social value of the level of economic well-being, oy_i, of a unit that is reranked equals the social value of a level of well being, $oy_i e^{-hs}$, where $s = |oy_i - fy_i|/Y$. If $h = 1.0\,(5.0)$, $s = 0.05$ is equivalent in terms of social evaluation to a reduction in well- being of about 5 (22) percent. Parameter $t = 1 - e$, where e is the coefficient of inequality aversion (Atkinson 1970). Since e may be any nonnegative number, t may have any value less than or equal to one. I obtained results for twenty combinations of h and t: $h = 0.5, 1, 2,$ or 5; $t = -1, -0.5, 0, 0.5,$ or 1.

Indexes (3) and (4) are special cases of a family of one-parameter measures (Cowell 1980) with the parameter equal to zero or -1:[11]

$$(3) \qquad C_0 = \frac{\sum_i oy_i \ln(oy_i/fy_i)}{NY}.$$

11. While Cowell developed measures of distributional change, they are readily adapted as measures of horizontal inequity, which are less general. To do so, interpret his distributions of "old" x_i and "new" y_i as the distributions of fy_i and oy_i, respectively. See Cowell 1980, p. 151. Since the means of fy and oy are identical, expressions 5 and 7 in his paper simplify to what I have presented.

$$C_{-1} = \frac{-\sum_i fy_i \ln(oy_i/fy_i)}{NY} \tag{4}$$

Of the infinite set of possible indexes, only these two yield useful decompositions of total horizontal inequity into within and between subgroup components.

Measure (5) is defined as

$$P_h = \left[\frac{\sum_i |oy_i - fy_i|^h}{\max} \right]^{1/h}, \quad h \geq 1, \tag{5}$$

where max = the maximum value possible for the expression in the numerator and $h \geq 1$. Ph is a slight modification of the index suggested by Plotnick (1982, p. 385). As in King's index, Ph is an increasing function of h. The calculations set $h = 1, 1.5, 2, 2.5, 3$, and 4.

Last,

$$S = \frac{3 \sum_i (or_i - fr_i)^2}{N^3 - N} \tag{6}$$

This measure is half of one minus the Spearman rank correlation coefficient. (The subtraction is a needed formality if S is to satisfy the third property listed earlier.)

$A - P$, $K_{h,t}$,P_h, and S range between zero and one. C_0 and C_{-1} have a lower bound of zero, but indeterminate upper bound.

These measures vary along two general dimensions. First, different functional forms are used to cardinalize the "amount of horizontal inequity" produced by a gap between oy_i and fy_i. For example, $K_{h,t}$ exponentiates the product of h and the absolute value of the difference between oy_i and fy_i, while C_0 and C_{-1} use the logarithm of the income ratio. For all measures except $K_{h,t}$ with a nonzero t, if $oy_i = fy_i$ (which implies $or_i = fr_i$), the functions give the value zero for unit i, as one would expect.[12] Second, different weights are assigned to each unit in the income distribution when summing the amount of horizontal inequity. For example, $A - P$ uses the rank of the unit in the initial distribution. P_h assigns equal weights. Thus, like inequality indexes, measures of horizontal inequity necessarily contain implicit judgments or require explicit ones, and are not objective.[13]

8.3.2 Measures of Well-Being

To compute indexes of horizontal inequity, one must define the initial and final measures of economic well-being. The precise characteristics of

12. If t is nonzero and $oy_i = fy_i$, $\exp\{-h(oy_i - fy_i\}$ attains its largest value and, thus, lowers the index as much as possible. If $oy_i = fy_i$ for all i, $K_{h,t} = 0$.

13. Note that S uses rank differences instead of differences in well-being. For this reason it is probably the least satisfactory index. See also Plotnick 1982, pp. 383, 388.

the distribution of initial well-being (such as its level of inequality) are not important. Rather, it is important for establishing the fair ranking of units that a horizontally equitable redistribution would preserve.[14] The vector of actual final levels of well-being, in which element j is the level of final well-being of the unit with rank j in the initial distribution, is then compared to what the rank-preserving vector of levels of final well-being would have been, and the differences summarized by an index.

The concept of horizontal inequity itself offers no guidance on how equals are to be identified and the appropriate ranking established. Instead, the choice of initial and final concepts of well-being necessarily varies with the interests of the analyst. For example, if the horizontal inequity of the cash transfer system were at issue, initial well-being might be pretax, pretransfer income. Final well-being would then be pretax, post-cash transfer income. (Or one might use a posttax variant.) If the inequity of only cash public assistance were under scrutiny, initial and final well-being might be pretax, post-social insurance income (since social insurance income helps define eligibility) and pretax, post-all-cash-transfer income, respectively. And if one wanted to know whether food stamps reduce horizontal inequities created by interstate variation in cash public assistance, one would compare the index resulting from the preceding definition of initial and final well-being to one based upon the same initial income, but final well-being equal to income after taxes, all cash transfers, *and* food stamps.[15] Adjustments for needs, cost-of-living differences, leisure, net assets, etc. may also be incorporated if the analyst regards them as important "admissible distinctions" (Stiglitz 1982, pp. 25–28) for determining the initial ranking that serves as the benchmark.

This exploratory exercise examines a variety of redistributions. Table 8.1 lists the measures of initial and final income that define each redis-

14. For example, the two redistributions A and B below are equally inequitable because the pattern of reranking is identical:

	Initial Well-Being		Final Well-Being	
	A	B	A	B
Unit x	12	9	6	6
Unit y	5	7	9	9
Unit z	3	4	5	5

The differences between initial and final levels of well-being at each position in the distribution vary in A and B. However, attention to this distinction between A and B reflects *vertical* equity judgments on the appropriate pattern for altering relative levels of welfare via redistribution.

15. Similarly, to see if a program reform affects horizontal inequity, one would compare the horizontal inequity of the current situation to that with the reformed program in place, using the pre-current program distribution as the initial measure of well-being in both cases. Note that whatever the initial measure selected by the analyst, he or she is implicitly assuming that the initial ranking is fair.

Table 8.1 **Concepts of Initial and Final Income Used in the Analysis**

	Initial Income Concept	Final Income Concept	Assesses Horizontal Inequity Of
	A. Comprehensive Redistributions		
1. *CASHT*	pretax, pretransfer[a]	pretax, post–cash transfers	all cash transfers[b]
2. *ALLT*	pretax, pretransfer	pretax, post–all transfers	all cash transfers, food stamps, Medicare, Medicaid
3. *CASHT + FS*	pretax, pretransfer	pretax, post–cash transfers and –food stamps	all cash transfers, food stamps
4. *CASHT + TAX*	pretax, pretransfer	posttax, post–cash transfers	as in row 1, plus federal income and payroll tax
5. *ALLT + TAX*	pretax, pretransfer	posttax, post–all transfers	as in row 2, plus federal income and payroll tax
6. *CASHT + FS + TAX*	pretax, pretransfer	posttax, post–cash transfers and –food stamps	as in row 3, plus federal income and payroll tax
	B. Redistribution by Income-Tested Programs		
7. *WELF*	pretax, post–cash social insurance	pretax, post–cash transfers	public assistance
8. *WELF + FS*	pretax, post–cash social insurance	pretax, post–cash transfers and –food stamps	public assistance, food stamps
9. *WELF + FS + MCAID*	pretax, post–cash social insurance	pretax, post–all transfers	public assistance, food stamps, Medicaid
	C. Redistribution by Explicitly Redistributive Instruments		
10. *INCTX + INCTEST*	post–payroll tax, –social insurance, and – Medicare	post–all taxes and – transfers	income tax, public assistance, food stamps, Medicaid
	D. Redistribution by Taxes		
11. *TAX*	pretax, pretransfer	posttax, pretransfer	federal income and payroll tax

[a]Includes labor, property, and miscellaneous market income and private transfers.
[b]OASDI, unemployment insurance, workers' compensation, veterans' compensation and pensions, government pensions, and all forms of cash public assistance.

tribution. In some, the horizontal inequity of a wide set of tax and transfer instruments is assessed. *CASHT* considers all cash transfers. *ALLT* examines cash transfers plus the major in-kind programs—food stamps, Medicare, and Medicaid. Since the appropriate method for assigning benefits from medical care transfers is uncertain (Smeeding and Moon, 1980), *CASHT*+*FS* includes only cash and food stamp benefits. The next three redistributions cover the same sets of transfers but also include federal income and payroll taxes. With others, the difference between the concepts of well-being involves three or fewer transfer programs or taxes. *WELF* looks at cash public assistance; *WELF*+*FS* adds food stamps, and *WELF*+*FS*+*MCAID* examines Medicaid as well. Redistribution 10 assesses these three income-tested transfers and the federal income tax, all of which have explicit redistributive purposes. Finally, *TAX* isolates just the federal income and payroll taxes for analysis. I also computed all index values for each redistribution using welfare ratios based on the federal poverty lines and income per family member to check the indexes' sensitivity to alternative needs adjustments.

Redistributions 1 through 6 and 10 have substantial impacts on income inequality. The Gini coefficient is reduced by between 15 and 26 percent. The other four redistributions exert much smaller equalizing effects since they are less comprehensive. The Gini coefficient falls by 3 to 6 percent. (Table 8.A.1 contains initial and final Gini coefficients for all rows in table 8.1.)

8.3.3 Data

The data set is a modified March 1975 Current Population Survey. Income information is for 1974 and has been adjusted for underreporting of all types of money income. Estimated federal income and payroll taxes and imputed benefits from food stamps, Medicare, and Medicaid have been added to the data. Both medical transfers are imputed on an insurance value basis. In-kind benefits are counted at taxpayer cost, not cash equivalent values.[16] Expressions (1) through (6) are suitably modified to account for the data's population weights. To reduce computational burdens, one-quarter of the observations (N = 11,495) were used in the calculations.

8.4 Empirical Results

Table 8.2 presents a representative set of ten index values for the eleven redistributions listed in table 8.1, using income as the indicator of well-

16. I thank Tim Smeeding for sharing the data. Procedures for correcting and augmenting the CPS data are in Smeeding 1975. Using Smeeding's cash equivalent values gave similar results.

Table 8.2 **Values of Selected Indexes of Horizontal Inequity**

Redistribution	Index of Horizontal Inequity									
	$A-P$ (1)	$K_{1,.5}$ (2)	$K_{1,0}$ (3)	$K_{5,0}$ (4)	$K_{2,-.5}$ (5)	P_1 (6)	P_4 (7)	C_{-1} (8)	C_0 (9)	S (10)
1. *CASHT*	.0194	.110	.112	.448	.215	.106	.181	.0336	.0426	.0238
2. *ALLT*	.0245	.119	.122	.481	.244	.122	.182	.0329	.0386	.0310
3. *CASHT + FS*	.0195	.109	.111	.455	.220	.106	.181	.0293	.0354	.0239
4. *CASHT + TAX*	.0333	.146	.144	.542	.264	.150	.293	.0442	.0557	.0354
5. *ALLT + TAX*	.0423	.157	.156	.573	.297	.173	.298	.0435	.0511	.0471
6. *CASHT + FS + TAX*	.0337	.145	.143	.538	.272	.151	.295	.0390	.0468	.0361
7. *WELF*	.0018	.013	.019	.093	.065	.017	.054	.0078	.0164	.0026
8. *WELF + FS*	.0022	.014	.022	.104	.081	.020	.056	.0075	.0129	.0032
9. *WELF + FS + MCAID*	.0045	.025	.034	.159	.096	.032	.075	.0097	.0158	.0067
10. *INCTX + INCTEST*	.0095	.073	.072	.310	.142	.075	.197	.0140	.0210	.0110
11. *TAX*	.0009	.044	.030	.141	.005	.024	.084	.0012	.0006	.0004

Note: Computed using income as the measure of well-being.

Table 8.3 **Ordinal Rankings of Redistributions in Terms of Horizontal Inequity**

Redistribution	Index of Horizontal Inequity					
	$A-P$ (1)	$K_{1,.5}$ (2)	$K_{2,-.5}$ (3)	P_1 (4)	C_0 (5)	S (6)
1. *CASHT*	7	7	6	6.5	8	6
2. *ALLT*	8	8	8	8	7	8
3. *CASHT+FS*	6	6	7	6.5	6	7
4. *CASHT+TAX*	9	10	9	9	11	9
5. *ALLT+TAX*	11	11	11	11	10	11
6. *CASHT+FS+TAX*	10	9	10	10	9	10
7. *WELF*	2	1	2	1	4	2
8. *WELF+FS*	3	2	3	2	2	3
9. *WELF+FS+MCAID*	4	3	4	4	3	4
10. *INCTX+INCTEST*	5	5	5	5	5	5
11. *TAX*	1	4	1	3	1	1

Note: This table based on table 8.2.

being.[17] All indexes clearly are sensitive to the choice of initial and final income since, as a glance down the columns shows, their values vary by factors of 5 or more. Columns (3) and (4) show that increasing the degree of aversion to horizontal inequity (holding t constant) can significantly raise that index's value. Columns (6) and (7) suggest somewhat less sensitivity of P_h to the size of h. Differences across a row cannot be meaningfully compared (just as one would not cardinally compare the Gini coefficient, coefficient of variation, and Atkinson's index for the same distribution).

More interesting is a comparison of how the indexes order the extent of horizontal inequity of the various redistributions. Table 8.3 shows the ordinal ranking according to six of the indexes presented in table 8.2. For the same six indexes, table 8.4 normalizes the figures in table 8.2 by setting the top value in each column at 100. (For completeness, parallel computations for the other four are in tables 8.A.2 and 8.A.3.) The columns, then, display the relative changes in the cardinal values of each index as the redistribution varies. Every index (except P_4, as seen in tables 8.A.2 and 8.A.3) separates the redistributions into three strata. Redistributions 7 through 11 create the least horizontal inequity. The top three fall in a middle range. Rows 4 through 6 show the most inequity.

The rankings and normalized values are surprisingly similar among the A-P, $K_{h,t}$, P_h, and S measures. Each shows its largest value for *ALLT+TAX*. In table 8.4, each records very small differences between rows 4 and 6, though $K_{1,.5}$ ordinally ranks 4 higher than 6 and the others

17. For $K_{h,t}$ and P_h, results for other choices of h and t were similar to one of the four columns shown here and in later tables.

Table 8.4 **Normalized Index Values as the Redistribution Varies**

Redistribution	Index of Horizontal Inequity					
	$A-P$ (1)	$K_{1,.5}$ (2)	$K_{2,-.5}$ (3)	P_1 (4)	C_0 (5)	S (6)
1. *CASHT*	100	100	100	100	100	100
2. *ALLT*	126	109	113	115	91	130
3. *CASHT+FS*	101	99	102	100	83	101
4. *CASHT+TAX*	172	133	122	142	131	149
5. *ALLT+TAX*	218	143	138	164	120	198
6. *CASHT+FS+TAX*	173	132	126	142	110	152
7. *WELF*	9	12	30	16	39	11
8. *WELF+FS*	11	13	38	19	30	13
9. *WELF+FS+MCAID*	23	23	45	30	37	28
10. *INCTX+INCTEST*	49	67	66	71	49	46
11. *TAX*	5	40	3	23	1	2

give the reverse order. These five indexes all rank *ALLT* eighth and place *INCTX+INCTEST* fifth. All five exhibit trivial normalized differences between *CASHT* and *CASHT+FS*. Only for rows 7, 8, 9, and 11 do the rankings and relative values differ noticeably. Though all five measures rank *WELF*, *WELF+FS*, and *WELF+FS+MCAID* in ascending order, they disagree on where the horizontal inequity of *TAX* stands in relation to the inequity of these three redistributions.

The ranking of C_0 differs substantially from those of the other measures (though it is nearly identical to that of C_{-1} shown in table 8.A.2). For example, C_0 indicates that *CASHT+TAX* (not *ALLT+TAX*) is most inequitable, that *CASHT+FS* is sharply less inequitable than *CASHT* (instead of being almost equal), that *WELF+FS* is less inequitable than *WELF* (instead of being more inequitable), and that *ALLT* clearly ranks seventh instead of eighth. Thus, the choice of index may well affect one's perceptions of the relative amount of horizontal inequity created by different redistributions.

To examine the effect of needs adjustments, tables like 8.2 were prepared using welfare ratios and income per family member in the computations. (See tables 8.A.4 and 8.A.5.) For each of redistributions 1 through 6, 10, and 11, the index values were usually smallest when income was used and largest with the per capita adjustment. (This was true in 85 percent of the comparisons.) For redistributions 7 through 9, though, results based on welfare ratios were lowest in twenty-three of the thirty cells. Since a major component of these three redistributions is cash welfare, which, like the poverty lines, increases with family size but at a decreasing rate, this difference is understandable. Thus, for a given set of tax and transfer programs, the particular measure of well-being defined by the needs adjustment does affect the absolute values of the indexes.

The sensitivity to needs adjustment varies across the measures. In redistributions 1 through 6, for example, values of A–P based on income and welfare ratios were about 54 and 82 percent, respectively, of the corresponding values based on income per member. For $K_{5,0}$ the same calculations were about 82 and 91 percent.

At the same time, the choice of needs adjustment tends to have little effect on how each index scales the relative degree of horizontal inequity of various redistributions. Compare table 8.3 to table 8.5, which contains the ordinal rankings of each index when welfare ratios were used in the calculations. The rankings in both tables are identical for columns (2), (5), and (6), and similar in the other three columns. With income per family member as the indicator of economic well-being, rankings again were very similar to those in tables 8.3 and 8.5. When rankings differed, the source was often small differences in cardinal index values. Tables of relative values for indexes calculated with welfare ratios and income per member (not shown) generally resembled table 8.4, as well.

While the figures in tables 8.2 through 8.5 provide evidence on how different measures behave, they do not inform us whether they signal a "lot" or a "little" horizontal inequity. The indexes with an upper bound of 1.0 are generally well below this value.

The following calculations may help decide if redistributions generate high, moderate, or low levels of horizontal inequity. Compute conventional inequality indexes for the initial and final distributions. For each redistribution divide its horizontal inequity index by the decline in inequality it produced as measured by initial inequality minus final inequality,

Table 8.5 **Ordinal Rankings of Redistributions in Terms of Horizontal Inequity**

	Index of Horizontal Inequity					
Redistribution	$A-P$ (1)	$K_{1,.5}$ (2)	$K_{2,-.5}$ (3)	P_1 (4)	C_0 (5)	S (6)
1. *CASHT*	6.5	7	7	7	8	6
2. *ALLT*	8	8	8	8	7	8
3. *CASHT+FS*	6.5	6	6	6	6	7
4. *CASHT+TAX*	9	10	10	10	11	9
5. *ALLT+TAX*	11	11	11	11	10	11
6. *CASHT+FS+TAX*	10	9	9	9	9	10
7. *WELF*	2	1	2	1	4	2
8. *WELF+FS*	3	2	3	2	2	3
9. *WELF+FS+MCAID*	4	3	4	4	3	4
10. *INCTX+INCTEST*	5	5	5	5	5	5
11. *TAX*	1	4	1	3	1	1

Note: This table is based on table 8.A.4, which uses income/poverty line as the indicator of well-being.

Table 8.6 **Redistributions' Horizontal Inequity Relative to Percentage Decline in Inequality**

Redistribution	Index of Horizontal Inequity				
	$A-P$ (1)	$K_{1,0}$ (2)	$K_{5,0}$ (3)	P_1 (4)	C_0 (5)
1. *CASHT*	.131	.205	.821	.815	.137
2. *ALLT*	.133	.196	.769	.763	.104
3. *CASHT+FS*	.125	.190	.762	.779	.109
4. *CASHT+TAX*	.151	.239	.899	.600	.127
5. *ALLT+TAX*	.163	.230	.840	.612	.102
6. *CASHT+FS+TAX*	.146	.223	.838	.585	.103
7. *WELF*	.059	.068	.327	.766	.214
8. *WELF+FS*	.055	.063	.301	.672	.134
9. *WELF+FS+MCAID*	.077	.091	.425	.713	.119
10. *INCTX+INCTEST*	.062	.152	.660	.379	.066
11. *TAX*	.016	.657	.310	.217	.005

Note: This table is computed from results in table 8.2, divided by (initial inequality–final inequality)/initial inequality.

divided by initial inequality. The quotients are indicative of the amount of horizontal inequity generated per unit reduction in vertical inequity.

In addition, some redistributions might show relatively little horizontal inequity but have a minor effect on inequality (e.g., cash welfare), while another might create more horizontal inequity but reduce inequality substantially (e.g., all cash transfers). The quotients are simple attempts to adjust for these differences and might be a useful alternative way to compare redistributions.[18]

Four of the horizontal inequity indexes have natural analogs among the inequality measures. For $A-P$, I used the Gini coefficient. For $K_{h,t}$, Atkinson's index with $e = 1 - t$ is the obvious choice. The coefficient of variation pairs with P_h. Theil's two entropy measures, which are special cases of a one-parameter family with the parameter set to zero or -1 (Cowell 1980), correspond to C_0 and C_{-1}. The fifth index, S, has no clear mate among inequality measures and is omitted from this analysis.

Table 8.6 contains the quotients for five of the indexes. Results for the other four are in table 8.A.6. They give widely varying readings. $K_{5,0}$ and P_1 suggest that most of the eleven redistributions create major horizontal inequities relative to the net vertical equalization. $A - P$ and Cowell's index, in contrast, suggest relatively small horizontal inequities, while $K_{1,0}$ falls in the moderate range. If these figures can be reasonably compared across a row (unlike those in table 8.2), the choice of index will strongly

18. A more rigorously derived method for balancing vertical and horizontal equity effects of a redistribution would be welcome.

Table 8.7 Ordinal Rankings of Redistributions

Redistribution	Index of Horizontal Inequity				
	$A-P$ (1)	$K_{1,0}$ (2)	$K_{5,0}$ (3)	P_1 (4)	C_0 (5)
1. *CASHT*	7	7	7	11	10
2. *ALLT*	8	6	6	8	5
3. *CASHT+FS*	6	5	5	10	6
4. *CASHT+TAX*	10	10	10	4	8
5. *ALLT+TAX*	11	9	9	5	3
6. *CASHT+FS+TAX*	9	8	8	3	4
7. *WELF*	3	2	2	9	11
8. *WELF+FS*	2	1	1	6	9
9. *WELF+FS+MCAID*	5	3	3	7	7
10. *INCTX+INCTEST*	4	4	4	2	2
11. *TAX*	1	11	11	1	1

Note: This table is based on table 8.6.

influence one's perception of the degree of horizontal inequity of a given redistribution.

Table 8.7 presents the ordinal ranking, by column, of the figures in table 8.6. Every index assigns a small rank to *INCTX+INCTEST* (row 10), which had a low rank in table 8.3 as well, where no adjustment for changes in inequality had been made. But this is the extent of any uniformity in the ordering and of any congruence with the rankings in tables 8.3 or 8.A.3. Only three indexes rank *WELF, WELF+FS,* and *WELF+FS+MCAID* low in table 8.7. Three rank *TAX* low, but two place it eleventh! Yet these four redistributions had consistently low ordinal values in table 8.3.[19] There is little agreement on the ranks of redistributions 1 through 6. So, in line with an earlier conclusion, the choice of measure will affect the relative amount of horizontal inequity observed among redistributions.

Finally, turn from this analysis of the anatomy of measures to the policy-oriented question: Do food stamps reduce the horizontal inequities created by the categorical nature of most cash welfare programs and state differences in their benefit levels? Since food stamp benefits are greater for families with lower incomes, unequal treatment of equally poor families by the cash welfare programs would tend to be reduced. But welfare recipients tend to be channeled to the food stamp program and are probably better informed of it than families who are ineligible for AFDC or SSI. If participation rates in the program are higher for welfare recipients, food stamps will tend to promote unequal treatment. The net effect is unclear a priori.

19. Normalized values derived from table 8.6 reveal similar disagreement with table 8.4.

From table 8.2 one concludes that the second effect probably dominates. Comparing rows 7 and 8 shows that every index except C_0 and C_{-1} has a larger value when the inequity of cash welfare and food stamps is assessed relative to the inequity of only cash welfare.[20] At the same time, food stamps reduce inequality. Thus, whether food stamps, on balance, are equitable overall depends on one's willingness to trade off more horizontal inequity for less inequality. Table 8.6 suggests that the trade-off is favorable, for all the numbers in row 7 exceed those in row 8. Different methods of evaluating this trade-off might reverse this finding. (Indexes computed using welfare ratios and income per person yield the same results.)

8.5 Summary and Conclusion

This chapter has sought to explore in a systematic fashion the behavior of five measures of horizontal inequity. The five were selected from many proposed in the literature because they possessed characteristics consistent with an interpretation of horizontal equity that emphasizes the social welfare costs due to reversals of rank in the distribution of economic well-being. These measures can be used to assess any actual redistributive program(s) or to see if a proposed reform or new program would change the extent of horizontal inequity. Their sensitivity to different types of redistributions and needs adjustments was examined using microdata for 1974. Three main findings emerged:

1. The choice of index may well affect one's perceptions of the relative amount of horizontal inequity of different redistributions.
2. The particular needs adjustment does affect the absolute values of the indexes. Sensitivity to such adjustments varies among the indexes.
3. The choice of needs adjustment tends to have little effect on how each index scales the relative degree of horizontal inequity of various redistributions.

20. This result may also be partly caused by the food stamp asset test. Suppose some low-income families are declared ineligible for food stamps because their assets are too large. Then it will appear in these data, which have no asset information, that food stamps create rank reversals and that living units with roughly equal levels of well-being are receiving different benefits from the program. The lack of asset data prevents analysis of the role of asset tests in producing horizontal inequity. Similarly, asset tests for cash public assistance and Medicaid may also be responsible for part of the measured horizontal inequity in the tables.

If the data were suitable, one might wish to incorporate assets into one's measure of well-being before determining initial and final rankings and measuring horizontal inequity. Even with such an adjustment, asset tests would lead to horizontal inequity. For example, consider two units with equal cash incomes that would qualify them both for $1,000 in food stamp assistance. Assume that one has assets $100 above the limit for benefit eligibility, while the other has assets $100 below. Although the latter's economic well-being before the in-kind transfer is less, it is not much less, and a $1,000 benefit would reverse ranks.

To improve the usefulness of the measures for policy applications, several steps might be taken. Better data sets such as the Survey on Income and Program Participation (SIPP), with information on more transfer programs and assets, and actual rather than imputed values for taxes and in-kind transfers, should be used. Such data would permit examination of the horizontal inequity of more varied combinations of transfers (and taxes) and the possible horizontal inequities created by asset tests. The calculations would be more accurate than those based on imputed benefits (as in this chapter) since variation within the imputed variables tends to be suppressed. Further development of methods for judging the magnitude of horizontal inequity in relation to redistributions' impacts on inequality or poverty is needed.[21] Behavioral responses to redistributive policies, and to possible changes in them, should be incorporated via simulation techniques developed in recent years. Exploration of horizontal inequity within demographic groups (e.g., the aged or families with female householders) remains on the research agenda. Last, detailed analysis of how the interaction between program rules and persons' economic and demographic circumstances creates horizontal inequity is needed for policy analysis and reform to reduce such inequity.

These exploratory findings provide no support for preferring one measure over the others because, as noted in part 8.3, all measures embody normative judgments. It would have simplified matters if all indexes had produced similar ordinal rankings. Since this did not occur, analysts must be sensitive to the normative issues.

Appendix Tables

(tables follow on pp. 258–62.)

21. On the other hand, instead of seeking an explicit formula, analysts perhaps should simply compute the level of horizontal inequity and changes in inequality and poverty, and let policymakers draw their own conclusions about the right balance.

Table 8.A.1 **Gini Coefficients of Initial and Final Economic Well-Being**

	Measure of Well-Being					
	Income		Welfare Ratio		Income Per Family Member	
Redistribution	Initial	Final	Initial	Final	Initial	Final
1. *CASHT*	.474	.403	.465	.386	.494	.412
2. *ALLT*	.474	.386	.465	.367	.494	.393
3. *CASHT + FS*	.474	.400	.465	.382	.494	.408
4. *CASHT + TAX*	.474	.367	.465	.351	.494	.380
5. *ALLT + TAX*	.474	.350	.465	.331	.494	.361
6. *CASHT + FS + TAX*	.474	.365	.465	.346	.494	.375
7. *WELF*	.416	.403	.400	.386	.426	.412
8. *WELF + FS*	.416	.400	.400	.382	.426	.408
9. *WELF + FS + MCAID*	.411	.386	.394	.367	.420	.393
10. *INCTX + INCTEST*	.414	.350	.397	.331	.423	.361
11. *TAX*	.474	.446	.465	.434	.494	.466

Table 8.A.2 Ordinal Rankings of Redistributions in Terms of Horizontal Inequity

Redistribution	Index of Horizontal Inequity			
	$K_{1,0}$ (1)	$K_{5,0}$ (2)	P_4 (3)	C_{-1} (4)
1. *CASHT*	7	7	5.5	8
2. *ALLT*	8	8	7	7
3. *CASHT + FS*	6	6	5.5	6
4. *CASHT + TAX*	10	10	9	11
5. *ALLT + TAX*	11	11	11	10
6. *CASHT + FS + TAX*	9	9	10	9
7. *WELF*	1	1	1	3
8. *WELF + FS*	2	2	2	2
9. *WELF + FS + MCAID*	4	4	3	4
10. *INCTX + INCTEST*	5	5	8	5
11. *TAX*	3	3	4	1

Note: This table based on table 8.2.

Table 8.A.3 Normalized Index Values as the Redistribution Varies

Redistribution	Index of Horizontal Inequity			
	$K_{1,0}$ (1)	$K_{5,0}$ (2)	P_4 (3)	C_{-1} (4)
1. *CASHT*	100	100	100	100
2. *ALLT*	110	107	101	98
3. *CASHT + FS*	99	99	100	87
4. *CASHT + TAX*	129	121	162	132
5. *ALLT + TAX*	140	128	165	130
6. *CASHT + FS + TAX*	128	120	163	116
7. *WELF*	17	21	30	23
8. *WELF + FS*	19	23	31	22
9. *WELF + FS + MCAID*	30	35	42	29
10. *INCTX + INCTEST*	64	69	109	42
11. *TAX*	27	31	46	4

Note: The figures are computed from unrounded values of the indexes, thus they may differ slightly from those calculated using the rounded values in table 8.2.

Table 8.A.4 **Values of Selected Indexes of Horizontal Inequity, Welfare Ratio as the Measure of Well-Being**

	Index of Horizontal Inequity									
Redistribution	$A-P$ (1)	$K_{1,.5}$ (2)	$K_{1,0}$ (3)	$K_{5,0}$ (4)	$K_{2,-.5}$ (5)	P_1 (6)	P_4 (7)	C_{-1} (8)	C_0 (9)	S (10)
1. *CASHT*	.0290	.131	.132	.508	.264	.134	.177	.0404	.0506	.0352
2. *ALLT*	.0374	.143	.145	.543	.289	.157	.179	.0399	.0477	.0479
3. *CASHT+FS*	.0290	.130	.130	.502	.262	.133	.177	.0349	.0421	.0356
4. *CASHT+TAX*	.0503	.172	.169	.604	.322	.191	.298	.0532	.0670	.0542
5. *ALLT+TAX*	.0652	.186	.184	.638	.351	.223	.302	.0528	.0638	.0749
6. *CASHT+FS+TAX*	.0506	.170	.166	.597	.323	.191	.303	.0457	.0564	.0547
7. *WELF*	.0015	.011	.018	.086	.070	.017	.040	.0078	.0149	.0020
8. *WELF+FS*	.0017	.012	.019	.091	.077	.018	.040	.0071	.0110	.0024
9. *WELF+FS+MCAID*	.0047	.024	.033	.157	.098	.034	.058	.0092	.0133	.0071
10. *INCTX+INCTEST*	.0107	.082	.079	.336	.157	.090	.175	.0138	.0184	.0132
11. *TAX*	.0007	.049	.032	.151	.010	.027	.073	.0011	.0008	.0004

Table 8.A.5 Values of Selected Indexes of Horizontal Inequity, Income per Family Member as the Measure of Well-Being

Redistribution	Index of Horizontal Inequity									
	$A-P$ (1)	$K_{1,.5}$ (2)	$K_{1,0}$ (3)	$K_{5,0}$ (4)	$K_{2,-.5}$ (5)	P_1 (6)	P_4 (7)	C_{-1} (8)	C_0 (9)	S (10)
1. *CASHT*	.0354	.151	.150	.556	.273	.146	.148	.0492	.0688	.0478
2. *ALLT*	.0478	.168	.168	.601	.308	.174	.150	.0503	.0666	.0695
3. *CASHT + FS*	.0357	.150	.148	.552	.281	.145	.148	.0430	.0569	.0489
4. *CASHT + TAX*	.0590	.196	.191	.653	.330	.205	.267	.0646	.0915	.0713
5. *ALLT + TAX*	.0795	.217	.212	.696	.371	.243	.272	.0666	.0898	.1026
6. *CASHT + FS + TAX*	.0597	.195	.189	.649	.341	.205	.267	.0573	.0770	.0735
7. *WELF*	.0019	.012	.019	.093	.073	.017	.039	.0086	.0200	.0033
8. *WELF + FS*	.0023	.014	.021	.101	.084	.019	.040	.0078	.0144	.0041
9. *WELF + FS + MCAID*	.0069	.030	.039	.179	.101	.037	.057	.0104	.0171	.0124
10. *INCTX + INCTEST*	.0138	.086	.083	.353	.152	.089	.122	.0156	.0243	.0211
11. *TAX*	.00002	.054	.037	.172	.006	.030	.083	.0010	.0018	.0007

Table 8.A.6 **Redistributions' Horizontal Inequity Relative to Percentage Decline in Inequality**

Redistribution	Index of Horizontal Inequity			
	$K_{1,.5}$ (1)	$K_{2,-.5}$ (2)	P_4 (3)	C_{-1} (4)
1. *CASHT*	.255	.413	1.39	.050
2. *ALLT*	.240	.335	1.14	.044
3. *CASHT + FS*	.242	.336	1.34	.041
4. *CASHT + TAX*	.276	.503	1.17	.061
5. *ALLT + TAX*	.264	.410	1.05	.055
6. *CASHT + FS + TAX*	.264	.414	1.15	.052
7. *WELF*	.098	.073	2.40	.024
8. *WELF + FS*	.090	.058	1.92	.019
9. *WELF + FS + MCAID*	.126	.092	1.67	.023
10. *INCTX + INCTEST*	.204	.243	.99	.027
11. *TAX*	.466	3.66	.76	.018

Note: This table is computed from results in table 8.2, divided by (initial inequality–final inequality)/initial inequality.

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Comment

Edward M. Gramlich

Robert Plotnick attempts to compute several newly developed measures of the horizontal inequity of tax- transfer changes in the distribution of income with real live data. The work is done with great care, comprehensiveness, and skill. However, one must read the chapter with more than the usual amount of discrimination to figure out what it is really saying. While the chapter has a good deal of promise and much useful material, the conclusions are shown in ways that are fairly awkward to think about and the results can easily be misunderstood. In these remarks I will show what Plotnick has done, mention some pitfalls, and suggest how such calculations can be better done in the future.

To begin with Plotnick's argument, he defines horizontal inequity in terms of rank reversals. A horizontally equitable redistribution of income is one that preserves the initial rank order of the units; an inequitable redistribution is one that does not. To measure rank reversals (the higher the score, the greater the inequity), Plotnick introduces five different measures of horizontal inequity:

1. An Atkinson-Plotnick measure that is roughly related to the impact of rank reversals on the Gini coefficient. It compares the actual Lorenz curve with a concentration curve that plots a unit's final level of well-being on its initial rank.
2. A measure developed by King that exponentiates the product of some prespecified measure of aversion to horizontal inequity and the difference in well-being due to rank reversals, then combines with another prespecified measure of aversion to inequality.
3. A measure developed by Cowell that weights percentage changes in well-being due to rank reversals by either the rank-preserving or final level of well-being.
4. A measure developed by Plotnick that appears to be similar to the weighted coefficient by variation of income due to rank reversals, with a prespecified weight.
5. A measure based on the Spearman rank correlation coefficient.

But these five soon become ten. To compute King's measure, the analyst must assign two parameters, so Plotnick uses four combinations. To compute Cowell's, Plotnick must use either the rank-preserving or final level of well-being, and he does both. To compute his own measure, Plotnick must assign one parameter, for which he tries two values.

And then the ten become thirty. This is because each measure could in principle be computed on rank reversals in the family income distribution, the per-family-member income distribution, or the welfare ratio (income

Edward M. Gramlich is professor of economics and public policy and chairman of the Department of Economics, University of Michigan.

over family needs) distribution. And then the thirty become sixty because each measure could either be examined in gross form, or computed in terms of the horizontal inequity generated by a given decline in overall inequality. When there are sixty ways of answering what you thought was a straightforward question, the reader begins to be overwhelmed.

Unfortunately the complexities do not end there. Because a variety of policy measures either try to or unintendedly do bring about redistribution, Plotnick can use his measures to answer various questions. He focuses on eleven, based on the rank reversals implicit in various packages of cash and in-kind transfers and income and payroll taxes. With sixty possible answers to each of eleven questions, it is no wonder that Plotnick's overall conclusion is a resounding "it all depends."

But Plotnick's chapter does have both promise and useful results. He is right that rank reversals are generally to be avoided, and it is helpful to compute measures of their importance. With this many questions asked and answered, there must be some useful information. Let us sort through his results to see what we can learn.

First I focus on the concept of rank reversals. Plotnick is on firm ground in stressing that a rank reversal is only undesirable if the pre–policy change ranking was desirable. If not, this whole approach has little merit. Using this reasoning, several types of rank reversals might be ignored. One class is based on the fact that what should be ranked is utility and what is ranked is income. If some relatively well-off poor person received a transfer and reduced labor supply, while some poorer person did not, we would observe an income rank reversal but not a utility rank reversal. This type of rank reversal should not bother redistributors, and measures showing it have little value. More broadly, if the income tax altered differentially propensities to invest in either human or physical capital, it could cause income but not utility rank reversals that should also be ignored. This theoretical point does *not* denigrate Plotnick's work because he simply assumes away endogenous behavioral responses. Late in the chapter he says he should not have assumed them away, and perhaps will not in his next paper. But if he does redo the analysis, he should be careful to rank utility, not income.

There is another type of not undesirable rank reversal that he should ignore but does not. Often a government policy, passed by duly elected representatives of the people, will explicitly try to bring about rank reversals. It makes little sense to criticize the policy by saying that people do not want rank reversals. In general that may be true, but they presumably do want these particular ones.

Barring the caveats listed above, it seems to me that the rank reversals to be avoided are the large ones. I would not be particularly bothered if, as a result of some general income redistribution, my neighbor's disposable income rose from one dollar below mine to one dollar above mine; I

would be bothered if the one dollar above mine became ten thousand. Hence, what is to be avoided is not rank reversals per se, but ones that entail sizeable changes in welfare. Plotnick recognizes this problem and adopts criteria for selecting horizontal equity measures that can be zero when either rank reversals are zero or the dollar changes in welfare due to rank reversals are small. But he does include one measure, based on the Spearman rank correlation unadjusted for the size of the cardinal change, that is not weighted by size of change and hence is not as meaningful as the others.

In like manner, just as nobody seems to worry about (or even compute) poverty statistics based on the unadjusted distribution of family income, Plotnick's measures that focus on the welfare ratio seem to be superior to the others. I also prefer his admittedly ad hoc calculation of horizontal inequity generated per unit of overall reduction in inequality. We do not want to make horizontal inequity comparisons between programs that bring about a lot or a little overall redistribution; this adjustment is one way to avoid them.

With these comments, I have pruned away a lot of Plotnick's numbers. The most important of his results are those that use his appropriate rank reversal measures on interesting questions. These numbers are summarized in table C8.1 (a subset of numbers given in table 8.A.6).

Even with all the weeding out of Plotnick's less meaningful results, the remaining results must be interpreted with great care. As an example, in the first row Plotnick compares the ranking of families before all taxes

Table C8.1 **Horizontal Inequity per Unit Decline in Overall Inequality**

Policy Measure	Ranking in Counterfactual Case	Measure of Horizontal Inequity			
		King 1	King 2	Plotnick	Cowell
Cash transfers	Pretax, pretransfer	.255	.413	1.39	.050
Cash transfers and food stamps	Pretax, pretransfer	.242	.336	1.34	.041
Cash transfers, food stamps, and taxes	Pretax, pretransfer	.264	.414	1.15	.052
Public assistance	Pretax, post–social insurance	.098	.073	2.40	.024
Public assistance and food stamps	Pretax, post–social insurance	.090	.058	1.92	.019

Source: Based on rankings of family welfare ratio, 1974 data, Current Population Survey.

and transfers with the ranking after all cash transfers (public assistance and social insurance payments). Using Plotnick's own measure with a prespecified high exponent of 4 on rank reversal welfare changes, a large degree of horizontal inequity appears to be created per unit reduction in overall inequality. The George Gilders of the world might well conclude from this 1.39 number that income redistribution is not worth the bother—a great deal of horizontal inequity is created in the process of reducing inequality. But there are several reasons why this conclusion would not necessarily be warranted. For one thing, it hinges on the arbitrarily specified high weight—all other measures show a moderate degree of horizontal inequity per unit of inequality reduction. For another, the units of horizontal inequity and inequality reduction are not comparable. Thirdly, part of the policy change dealt with here—social insurance transfers—intends to bring about rank reversals by favoring the aged and unemployed at the expense of the nonaged and employed. Even with all my pruning, what we are to make of this number of Plotnick's is still not clear.

But we can get closer if we take rows in pairs. Suppose we despair of knowing how to weight horizontal inequity and inequality reduction and focus just on food stamps. There are three reasons why food stamps should improve Plotnick's balance between horizontal inequity and inequality reduction. First, food stamps are available on a roughly standard basis across the country—inequality reduction without large rank reversals. Second, food stamps are taxed in the public assistance program—in states where AFDC benefits are high (implying potential rank reversals), benefits are lowered when recipients receive food stamps. Third, AFDC benefits are taxed by the food stamp program, again implying that food stamps will boost overall support levels in low-AFDC states more than in high-AFDC states. Food stamps, then, ought to lower all of the Plotnick horizontal inequity measures. Indeed they do that, as a comparison of the numbers in rows 1 and 2 of Table 8.1 indicate. The same is true if social insurance is taken as given, as in rows 4 and 5. The indication is that the food stamp program is doing a job in reducing horizontal inequity per degree of inequality reduction, and we need something like this calculation to show that. We are finally beginning to find some way of using Plotnick's numbers. But we are still not all the way home. The numbers do not say *how much* food stamps reduce horizontal inequity or increase inequality reduction.

As a final illustration of my point, compare rows 2 and 3 of table 8.1. Here Plotnick focuses on the differences in rank reversal made by income taxes; the suggestion is that incomes taxes go the wrong way—by all but one measure they increase horizontal inequity per unit of inequality reduction. Why is this? Plotnick gives no clue. Perhaps this strange result is based entirely on the impact of the income tax on high-income people and has little to do with the redistribution policy for low-income people,

which seems to receive more attention. Perhaps this result is due to the congressional mandate that various types of income should be taxed at different rates, or not taxed at all, leading to all manner of intended rank reversals (to say nothing of loopholes). Or perhaps the result is not even true. We should be focusing on the Plotnick measure and not on other measures. No doubt a great many possibilities exist; until we know more about why results are coming out the way they do, we will not know how seriously to take Plotnick's calculations.

All of this suggests how calculations of this sort might be better done. To a large extent my frustration with Plotnick's numbers can be explained by the fact that he has summarized too much material in one simple number. There is so much material that the summary begs as many questions as it answers. If Plotnick had taken the other tack and given appendix table after appendix table without any summary measure, I would chastise him for lacking a summary. However, we need both the summary and the underlying numbers to determine why the summary measure is doing what it is doing. The summary measure is a red flag indicating that the rank reversals in certain tax-transfer programs should be investigated. But it can do no more than motivate our search through the detailed tables—the summary measure alone is not very helpful.