Income Inequality Effects by Income Source: A New Approach and Applications to the United States
Author(s): Robert I. Lerman and Shlomo Yitzhaki
Source: *The Review of Economics and Statistics*, Vol. 67, No. 1 (Feb., 1985), pp. 151-156
Published by: The MIT Press
Stable URL: http://www.jstor.org/stable/1928447
Accessed: 06/10/2014 12:03

Background," *European Economic Review* (1973) 235–264.
Freeman, Richard B., "Black Economic Progress after 1964: Who Has Gained and Why?" in Sherwin Rosen (ed.), *Studies in Labor Markets* (Chicago: The University of Chicago Press for NBER, 1981), 247–294.
Harbury, Colin D., and D. M. W. N. Hitchens, *Inheritance and Wealth Inequality in Great Britain* (London: George Allen and Unwin, 1979).
Hauser, Robert, and Thomas Daymont, "Schooling, Ability, and Earnings: Cross Sectional Findings 8 to 14 Years after High School Graduation," *Sociology of Education* 50 (3) (1977).
Leibowitz, Arleen, "Education and Home Production," *American Economic Review* 64 (May 1974), 243–250.
Lillard, Lee, and Robert Willis, "Dynamic Aspects of Earnings Mobility," *Econometrica* 46 (Sept. 1978), 985–1012.
Mattila, J. Peter, "Determinants of Male School Enrollments: A Time Series Analysis," this REVIEW 64 (May 1982), 242–251.
Olneck, Michael, "On the Use of Sibling Data to Estimate the Effects of Family Background, Cognitive Skills, and Schooling: Results from the Kalamazoo Brothers Study," in P. Taubman (ed.), *Kinometrics: Determinants of Socioeconomic Success within and between Families* (Amsterdam: North-Holland, 1977).
Sewell, William, and Robert Hauser, *Education, Occupation and Earnings: Achievement in the Early Career* (New York: Academic Press, 1975).
Soltow, Lee, *Toward Income Equality in Norway* (Madison: University of Wisconsin, 1965).

INCOME INEQUALITY EFFECTS BY INCOME SOURCE: A NEW APPROACH AND APPLICATIONS TO THE UNITED STATES

Robert I. Lerman and Shlomo Yitzhaki*

Abstract—The paper develops a new approach to determining the marginal impact of various income sources on overall income inequality. We show that each source's contribution to the Gini coefficient may be viewed as the product of the source's own Gini, its share of total income, and its correlation with the rank of total income. Applying the approach to the 1980 U.S. distribution of income yields several interesting results, including the finding that spouse's earnings had a larger marginal impact on inequality than did property income.

How economic trends and government policies affect the distribution of income is a central topic in economic and policy analysis. This note adds to the literature on this topic by deriving a method for decomposing the Gini coefficient and by providing estimates of impacts of alternative income sources on U.S. income inequality. Our new approach answers the following question: What impact does a marginal increase in a particular income source have on inequality?

Our theoretical results in section I extend derivations (reported by Kakwani (1977), Shorrocks (1982) and others) in which a given source's contribution is the product of its share of total income and a term called the pseudo-Gini. In our analysis, the pseudo-Gini appears as the product of the source itself and the correlation between the source and the rank of total income. Further, we show that a similar result holds for the extended Gini, a measure that is like the Atkinson (1970) index in permitting alternative weights on different parts of the income distribution.

Section II addresses the Shorrocks' recent critique of decomposition methods similar to our own. Then, in section III, we present estimates of the marginal effects on income inequality from changes in earnings of family heads, earnings of other family members, capital income, and transfer income.

Received for publication April 25, 1983. Revision accepted for publication May 22, 1984.

*Brandeis University; and The Hebrew University and the Falk Institute of Economic Research, respectively.

The authors thank Winship Fuller for computer assistance and Burton Weisbrod and Greg Saltzman for helpful comments.

I. Decomposing the Gini by Sources of Income

A. *The Basic Derivation*

A well-known formula for half of Gini's mean difference (A) is

$$A = \int_a^b F(y)[1 - F(y)]\, dy. \tag{1}$$

Let y represent income, a the lowest income, b highest income, and F the cumulative distribution of income. Using integration by parts, with $u = F(y)[1 - F(y)]$ and $v = y$, we obtain

$$A = \int_a^b y[F(y) - 1/2] f(y)\, dy. \tag{2}$$

By transformation of variables, defining $y(F)$ as the inverse function of $F(y)$, we obtain

$$A = 2\int_0^1 y(F)(F - 1/2)\, dF. \tag{3}$$

Noting that F is uniformly distributed between $[0,1]$ so that its mean is $1/2$, (3) can be written as

$$A = 2\operatorname{cov}[y, F(y)]. \tag{4}$$

Dividing (4) by the mean income (m) yields the conventional Gini coefficient.[1]

Let $y_1, \ldots, y_k$ represent components of family income. Then, using the properties of the covariance and $y = \Sigma_{k=1}^{K} y_k$, we can write

$$A = 2 \sum_{k=1}^{K} \operatorname{cov}(y_k, F) \tag{5}$$

where $\operatorname{cov}(y_k, F)$ is the covariance of income component k with the cumulative distribution of income. Dividing (5) by m (obtaining the relative Gini) and then multiplying and dividing each component k by $\operatorname{cov}(y_k, F_k)$ and by m_k yields the decomposition by source:

$$G = \sum_{k=1}^{K} [\operatorname{cov}(y_k, F)/\operatorname{cov}(y_k, F_k)] \times [2 \operatorname{cov}(y_k, F_k)/m_k][m_k/m] \tag{6}$$

$$G = \sum_{k=1}^{K} R_k G_k S_k \tag{7}$$

where R_k is the "Gini correlation" between income component k and total income, G_k is the relative Gini of component k, and S_k is component k's share of total income.

The Gini correlation (R) has properties similar to Pearson's and the rank correlations.[2] Like both, the Gini correlation ranges between -1 and $+1$, but will take on more extreme values than Pearson's. A monotonically increasing (decreasing) function will yield a value of $+1$ (-1). Thus, R will equal 1 (-1) when an income source is an increasing (decreasing) function of total income. When the income source is a constant, then R will equal 0, implying that the source's share of the Gini is 0. As such components raise their share of total income, overall inequality will fall.

A key rationale for studying decompositions by source is to learn how changes in particular income sources will affect overall income inequality. Consider a change in each person's income from source k equal to eY_k, where e is close to 1. Starting from (7), we can derive a clear expression for the partial derivative of the overall Gini with respect to a percentage change (e) in source k. The derivation, which is available from the authors on request, yields

$$\partial G/\partial e_k = S_k(R_k G_k - G). \tag{8}$$

[1] Stuart (1954) pointed out the relationship between the absolute Gini and the covariance.

[2] The Pearson correlation and the Gini correlation between component y_k and F have the same numerators. But, where the Pearson correlation deflates the covariance by the products of the standard deviations of y_k and F, the Gini correlation uses the Gini of y_k as the denominator.

B. *Decomposition of the Extended Gini*

Atkinson developed an index of inequality that can yield different measures for a particular income distribution, depending on what social welfare judgments one specifies. The size of a parameter, ϵ, expresses the value placed on reducing inequality. The parameter may range from 0, which represents complete indifference to income inequality, to ∞, which represents the Rawlsian criterion that evaluates distributions according to the income of the poorest in the society.

Yitzhaki (1983) derived an extension of the Gini index that has properties similar to those of the Atkinson index. His formula for the extended Gini index is:[3]

$$G(v) = 1 - v(v-1)\int_0^1 (1-F)^{v-2} L(F)\, dF \qquad v > 1 \tag{9}$$

where $G(v)$ is the extended Gini index of inequality, $L(F)$ is the Lorenz curve, and v is a parameter that reflects a relative preference for equality.

As v goes from 0 to infinity, the index represents an increasing aversion to inequality. The range of v between 0 and 1 involves a preference for inequality. At $v = 1$, the index reflects indifference to inequality. At $v = 2$, the index is equivalent to the conventional Gini. As v reaches infinity, the index represents the Rawlsian criterion.

The decomposition of the extended Gini follows the same logic as the Gini decomposition. Equation (1) is now

$$A(v) = \int_a^b \{[1 - F_0(y)] - [1 - F_0(y)]^v\}\, dy, \tag{10}$$

while equations (3) and (4) are

$$A(v) = \int_0^1 y(F)\left[(1-F)^{v-1} - 1/v\right] dF$$
$$= -v \operatorname{cov}\left[y, (1-F)^{v-1}\right]. \tag{11}$$

We end up with an equation that substitutes for (7):

$$G(v) = \sum_{k=1}^{K} R_k(v) G_k(v) S_k, \tag{12}$$

where

$$R_k = \frac{\operatorname{cov}\left[y_k, (1-F_0)^{v-1}\right]}{\operatorname{cov}\left[y_k, (1-F_k)^{v-1}\right]}$$

and

$$G_k(v) = -v \operatorname{cov}\left[y_k, (1-F_k)^{v-1}\right]/m_k.$$

[3] See Yitzhaki (1983) for the derivation of this formula and a comparison with the Atkinson index.

II. Limitations of These and Other Decompositions

Shorrocks has demonstrated that there exists no unique way to decompose inequality. First, he derives what he calls "natural decompositions" of the Gini, in which each source's contribution to inequality equals the product of its share of total income times the pseudo-Gini. Then, after specifying criteria that decompositions ought to obey, Shorrocks examines the properties of expressions that meet the criteria. He finds that imposing four criteria on acceptable decompositions does little to restrict the set. Shorrocks argues that, except for decompositions into two exhaustive, exclusive sources or decompositions involving two persons, the contribution of (any) source to overall inequality "... can be made to give any value between plus and minus infinity!" (p. 202). He views as untenable the idea that one should choose "... the decomposition rule that follows naturally from the conventional way the Gini formula is written" (p. 203).

While our approach falls into the category of "natural decompositions" of the Gini, it is worth pursuing for three reasons. First, the use of the Gini is not simply acceptable (as Shorrocks states), it is desirable. As Yitzhaki (1982) showed, the Gini (but not variance-based measures like the coefficient of variation) and the mean permit one to form the necessary conditions for stochastic dominance.

Second, our decomposition yields an intuitive interpretation of the elements making up each source's contribution to inequality. Viewing each source's contribution as the product of its own inequality, its share of total income, and its correlation with the rank of total income, appears more compelling and less arbitrary than other specifications of the natural decomposition (where a source's contribution is the product of the income share and the pseudo-Gini). The alternatives Shorrocks develops require devising coefficients that, when multiplied by each individual's total income and his income from a particular source, yield an estimate of the source's contribution to inequality that meets the criteria for decompositions. We find the transformations made by Shorrocks of mathematical interest, but do not see why they should cause anyone to lose interest in a decomposition not based on these special ways of weighting each income. Shorrocks does not explain the economic content of forming these offsetting weights that happen to produce alternative ways to decompose inequality.

A third advantage of our approach is its use in examining the marginal changes in the size of an income source on overall inequality. How percentage changes in particular taxes or transfers will influence the distribution of income are important policy issues. The common approach (Danziger (1980) and Reynolds and Smolensky (1977)) is to compare inequality with and without the income source in question. This approach amounts to asking the less meaningful question of what a total elimination of one source would do to inequality. Moreover, this method can yield results that depend on the ordering of sources. For example, in estimating the inequality contribution of spouse's income, the outcome depends on whether one subtracts from the overall Gini: (a) the Gini of income net of spouse's income or (b) the Gini of spouse's income.

Such ambiguities cannot occur under our method, which derives effects on inequality associated with marginal changes by using equation (8):

$$\partial G/\partial e_k = S_k(R_k G_k - G). \tag{8}$$

Dividing (8) by G yields the source's marginal effect relative to the overall Gini, which can be written as the source's inequality contribution as a percentage of the overall Gini minus the source's share of total income:

$$\frac{\partial G/\partial e_k}{G} = \frac{S_k G_k R_k}{G} - S_k. \tag{13}$$

The sum of relative marginal effects is zero. Multiplying all sources by e leaves the overall Gini unchanged.

III. The Decomposition Estimates

Income may be decomposed into a variety of exclusive and exhaustive breakdowns. We have space to present only a few, based on pretax, post-transfer family income as reported on the March 1981 Current Population Survey. We exclude unrelated individuals.

CPS income data are subject to a variety of well-known limitations (see Blinder (1980) and Taussig (1976)), such as underreporting and the exclusion of taxes and capital gains. Our estimates are subject to the same strengths and weaknesses as other analyses using CPS micro data.

Table 1 shows the size of each source's contribution to inequality, as measured by the conventional Gini and two other values of the extended Ginis. Except for income transfers, which reduced inequality, the contribution of most sources was similar to their share of total income. For example, wage income of family heads accounted for 53% of total income and 59% of inequality.

The relative measures offer more appropriate comparisons. Looking at inequality components as a percentage of income shares (column 5) and the relative effects of a marginal increase in each source (column 6), we find the effect of property income was low in comparison to the effect of spouse's earnings or the head's wage and salary earnings. The components of each source's contribution reveal the reasons for these dif-

TABLE 1.—INCOME INEQUALITY EFFECTS BY INCOME SOURCE, BY AVERSION TO INEQUALITY AS MEASURED BY EXTENDED GINI PARAMETERS (1.5), 2, AND [4.0]

Income Source	Correlation with Rank of Total Income (R)	Gini of Source (G)	Income Share (S)	Share of Income Inequality (I)	Relative Income Inequality (I/S)	Relative Marginal Effect ($I-S$)
Head Wages and Salaries	(0.703) 0.724 [0.776]	(0.338) 0.530 [0.845]	0.532	(0.563) 0.586 [0.614]	(1.058) 1.100 [1.154]	(0.031) 0.054 [0.082]
Head Self-Employment	(0.379) 0.452 [0.609)	(0.845) 1.037 (1.169]	0.052	(0.075) 0.070 [0.065]	(1.442) 1.346 [1.250]	(0.023) 0.018 [0.013]
Spouse Earnings	(0.519) 0.576 [0.723]	(0.516) 0.744 [0.980]	0.160	(0.191) 0.197 [0.200]	(1.194) 1.231 [1.250]	(0.031) 0.037 [0.040]
Other Family Earnings	(0.463) 0.531 [0.703]	(0.681) 0.886 [1.001]	0.077	(0.108) 0.104 [0.095]	(1.403) 1.351 [1.231]	(0.031) 0.027 [0.018]
Transfers	(−0.291) −0.347 [−0.485]	(0.511) 0.741 [0.972]	0.082	(−0.054) −0.060 [−0.068]	(−0.659) −0.732 [−0.829]	(−0.136) −0.142 [−0.148]
Property Income	(0.425) 0.440 [0.533]	(0.636) 0.840 [1.016]	0.097	(0.117) 0.103 [0.093]	(1.206) 1.062 [0.959]	(0.020) 0.006 [−0.004]
Total	1.000 0.348 [0.568]	(0.225)	1.000	1.000	1.000	—

Source: Tabulations by authors from the March 1981 Current Population Survey.
Note: The shares of income inequality (I's) come from equation (7). Dividing equation (8) by the overall Gini yields the relative effect at the margin (column 6). Transfers includes social insurance and cash welfare benefits plus the market value of in-kind food and housing subsidies. Property income is total income less family earnings and cash transfers. The extended Gini at $v = 2$ is the conventional Gini. Aversion to inequality is higher (lower) at $v = 4$ ($v = 1.5$) than the conventional Gini. Calculating the G and R terms involved dividing the population into 400 subgroups ordered by each income source and computing the covariance between mean income of a particular source within subgroups and the cumulative level of the particular source (for the G terms) or the cumulative level of total income (for the R terms). The use of 400 groups allows us to neglect any bias due to grouping.

ferences. Relative to spouse's earnings and to wage income of family heads, property income was the most unequally distributed but had the lowest correlation with the rank of total income.

Since the Gini embodies only one social welfare weighting system, the pattern of results may change with the weight attached to inequality in various segments of the distribution. Table 1 shows results using the extended Gini, with $v = 1.5$ and $v = 4.0$. Recall that aversion to inequality rises with v.

As expected, transfer income exerted a larger negative effect on inequality when $v = 4.0$ than when $v = 1.5$. Of more interest, property income and head self-employment income had their relative contributions to inequality decline when the index reflects a high aversion to inequality. In fact, at $v = 4.0$, property income made up a smaller share of inequality than its share of total income.

Although property income's low total and moderate relative contribution to inequality may surprise many readers, it is consistent with the life cycle theory. Since a large component of property income substitutes for earnings late in the life cycle, its contribution to cross section inequality can be moderate. Evidence from the Internal Revenue Service's sample of tax returns shows that pension income is larger than dividend income and that interest income is more concentrated at the bottom part of the income distribution (as measured by adjusted gross income) than is wage and salary income. Adding capital gains to the CPS income measure would sharply increase the property income contribution to inequality. But, as Blinder (1980) concludes, excluding capital gains is reasonable given the finding of Eisner (1981) that over the 1946–77 period the average \$1 of capital gains simply offset the erosion of capital assets associated with inflation. According to the IRS data, property income other than capital gains is more concentrated at the bottom and the top than is wage and salary income.

The largest component of income is earnings of family heads. Variations in this source depend on variations in hours worked and wage rates and may be decomposed as

$$HE = \overline{W}\overline{H} + (W_i - \overline{W})\overline{H} + (H_i - \overline{H})\overline{W} + (W_i - \overline{W})(H_i - \overline{H}), \qquad (14)$$

where W_i and H_i are wage rates and hours of family

TABLE 2.—DECOMPOSITION OF FAMILY INCOME INEQUALITY, BY DETAILED ELEMENTS OF HEAD EARNINGS

Income Source	Correlation with Rank of Total Income (R)	Gini of Source (G)	Income Share (S)	Share of Income Inequality (I)	Relative Income Inequality (I/S)	Relative Marginal Effect ($I - S$)
Mean Wage at Mean Hours	.402	0.016	.320	.000	0.000	−.320
Variability in Head Wages	.728	2.687	.051	.289	5.615	.238
Variability in Head Hours	.570	1.772	.087	.251	2.900	.164
Interaction of Wage-Hours Variability	.375	0.988	.098	.104	1.052	.006

Source: Same as table 1.
Note: The measure of head hours is usual weekly hours times weeks worked in 1980. The head's wage rate equals 1980 earnings divided by 1980 hours. This method far overstates the number of family heads shown as earnings less than the minimum wage. Adjusting for this problem involved assigning the minimum wage to those whose computed wage fell below the minimum.

head i and $\overline{W}$ and $\overline{H}$ are means. Table 2 displays this decomposition for the conventional Gini.

The first element is a constant for all families. All variability in head earnings can be attributed to the deviation from average wages (at average hours), the deviation from average hours (at average wages), and the covariation between the two deviations. These variations reflect wage and hours differences across all families, not just those with heads reporting earnings.

Over half of head earnings and 32% of total income were associated with all family heads working the average number of hours per year at the average wage. Hours variability (weighted by average wages) and the wage-hours interaction made up nearly all of the rest of head earnings. A noteworthy finding is that variability in hours worked by family heads contributed almost as much to income inequality as did the variability in their wage rates.

While 29% of total income inequality was associated with wage variability, about one-quarter came from hours variability. The interaction between hours variability and wage rate variability accounted for almost 10% of inequality. The positive contribution from the wage-hours interaction implies that over the entire distribution, wages and hours were positively correlated among family heads.

Judging on the basis of marginal effects raises the role of wage variability. Still, the results document a high marginal impact of hours variability. As table 2 shows, the relative marginal effect of variability in hours worked by family heads is nearly 70% of the relative marginal effect of variability in head wage rates.

IV. Conclusions

We have derived a new approach to determining how various income sources affect income inequality. The application provided estimates of the contribution to family income inequality from property income, the family head's wages and self-employment income, earnings of the spouse and of other family members, and transfer income. Overall, 60% of inequality in the United States in 1980 came from differences in work effort by the family head and in earnings of other family members.

Our approach is well-suited to analyses of the distributional impact of public policies. It yields a sound method for estimating the marginal effects of changes in income sources on inequality. The method has the advantage over methods used by other authors of providing estimates that are independent of the order by which the sources are entered. In applying the method, we found that the marginal effect of head wage and salary income and of spouses' earnings exceeded the marginal effects of capital income.

REFERENCES

Atkinson, Anthony, "On the Measurement of Inequality," *Journal of Economic Theory* 2 (Sept. 1970), 244–263.
Blinder, Alan, "The Level and Distribution of Economic Well-Being," in Martin Feldstein (ed.), *The American Economy in Transition* (Chicago: The University of Chicago Press, 1980).
Danziger, Sheldon, "Do Working Wives Increase Family Income Inequality?," *Journal of Human Resources* 15 (Summer 1980), 444–451.
Eisner, Robert, "Capital Gains and Income: Real Changes in the Value of Capital in the United States, 1946–77," in Dan Usher (ed.), *The Measurement of Capital* (Chicago: University of Chicago Press, 1981).
Internal Revenue Service, *Statistics of Income—1979*, Individual Income Tax Returns, Washington, D.C. (1982).
Kakwani, N. C., "Applications of Lorenz Curves in Economic Analysis," *Econometrica* 45 (Apr. 1977), 719–727.
Reynolds, Morgan, and Eugene Smolensky, *Public Expenditures, Taxes, and the Distribution of Income* (New York: Academic Press, 1977).
Shorrocks, A. F., "Inequality Decomposition by Factor Components," *Econometrica* 50 (Jan. 1982), 193–211.

Stuart, Alan, "The Correlation between Variate-Values and Ranks in Samples from a Continuous Distribution," *British Journal of Statistical Psychology* 7 (May 1954), 37–44.

Taussig, Michael, "Trends in Inequality of Well-Offness in the United States since World War II," Special Report 11, Institute for Research on Poverty, University of Wisconsin-Madison, October 1976.

Yitzhaki, Shlomo, "Stochastic Dominance, Mean Variance and Gini's Mean Difference," *American Economic Review* 72 (Mar. 1982), 178–185.

______, "On an Extension of the Gini Inequality Index," *International Economic Review* 24 (Oct. 1983), 617–628.

THE DETERMINANTS OF SMALL PLANT MARKET SHARE IN CANADIAN MANUFACTURING INDUSTRIES IN THE 1970s

John R. Baldwin and Paul K. Gorecki*

Abstract—This paper examines the extent of small plant market share and the degree of suboptimal plant market share in the Canadian manufacturing sector in the 1970s at the 4-digit level of disaggregation. It does so by comparing the Canadian plant size distribution to the American so as to provide a standard for what might be considered suboptimal and then uses regression analysis to find the relationship between small plant market share and a set of explanatory variables which include market size, concentration, and tariff protection. It finds that the deleterious effect of tariffs is primarily found in highly concentrated industries.

I. Introduction

Two groups have been interested in the determinants of firm and plant size distributions. On the one hand, concentration studies have focused on the market share of large firms.[1] As Caves et al. (1980) have demonstrated, this involves explaining the relative plant size of large firms compared to the industry average, the relative multiplant development of large firms compared to the industry in general and the number of firms per industry. On the other hand, others have focused on small plant market share—the mirror image of large plant share. In the latter case, some have concentrated on the extent of plant scale suboptimality.[2] But this is only a partial explanation of small plant market share since small plants need not be inefficient plants. Indeed some studies have focused on the extent to which different strategies are available to small firms that allow them to coexist with larger firms.[3]

Received for publication March 22, 1983. Revision accepted for publication May 24, 1984.

*Queen's University and Economic Council of Canada, respectively.

The data base used in this paper could not have been constructed without the assistance of J. McVey of Statistics Canada and R. E. Caves of Harvard University. Two anonymous referees provided useful comments. The views are the authors and do not necessarily reflect those of the Economic Council of Canada.

[1] See Currie and George (1983) for a summary of these studies.

[2] Dickson (1979), Gupta (1979).

[3] Caves and Pugel (1980).

In this paper we focus on the determinants of small plant market share. It complements other papers that have focused on the extent of plant suboptimality. We extend the previous work in this area by examining the phenomenon at a more disaggregated level—the Canadian 4 digit SIC classification. In addition, we focus on a theme that has received recent attention—that shortcomings in performance related to tariff protection are most likely to occur in imperfect markets.[4]

II. Measuring Small Plant Market Share (SSHAR)

Small plants in this study are defined as those that are smaller than the Comanor-Wilson proxy for minimum efficient scale plant (*MES*)—the average size of the smallest number of the largest plants accounting for the top 50% of industry size.[5] Although we focus on Canadian industry in this study, the *MES* estimate is derived from U.S. data. The U.S. market, because of its size and competitiveness, is not subject to the same constraints which may cause scale and specialization problems at the plant level in Canada. Therefore, the *MES* proxy derived from U.S. plant size distributions is more likely to be a reflection of the true value of *MES*. Our dependent variable (*SSHAR*) is the proportion of the Canadian industry's sales accounted for by plants below this proxy for *MES*.[6] This variable averaged 0.835 in our sample for 1970 and 0.806 in 1979.

SSHAR represents the extent to which Canadian plants are small by the standard of the most successful U.S. plants—where size is chosen as the measure of success. It is expected to be larger where economies of

[4] Eastman and Stykolt (1967), Bloch (1974), Caves et al. (1980), Pugel (1978).

[5] Comanor and Wilson (1967), Caves et al. (1975), Caves et al. (1980).

[6] Using results reported in Davies (1980), p. 299, it can be demonstrated that if both Canadian and American plant size distributions were identical and if each were Pareto with parameter a, then *SSHAR* would equal $1 - .5(a/a - 1)^{1-a}$, $a > 1$. An appendix is available from the authors that derives this result and those reported in footnotes 10, 11, and 12.