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WELFARE DISTRIBUTIONAL CHANGE AND THE MEASUREMENT OF SOCIAL MOBILITY

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Abstract—A new approach to the measurement of welfare distributional change and social mobility is developed. The novel feature of this model is the use of price dependent measures of individual and social welfare in evaluating the magnitude and direction of the movement in the distribution. In addition, the proposed indexes of mobility are decomposed into the sum of between-group and within-group mobility. Each measure is implemented for the United States over the period 1947–1982. It is found that in each year society is upwardly mobile relative to the 1947 distribution.

I. Introduction

THE purpose of this paper is to develop an alternative, implementable approach to the measurement of welfare distributional change. The measured movement is assumed to be the result of mobility of individuals within the welfare distribution. Aside from providing a descriptive measure of social mobility, the proposed indexes have important policy applications. Specifically, they can be utilized to evaluate the effectiveness of policies designed to change the relative standing of specific groups of individuals in the welfare distribution.

The standard approach to the measurement of mobility utilizes a transition matrix, say P, whose elements $\{p_{ij}\}$ represent the probability of moving to state j from state i over a specified time period.[1] The problem with mobility indexes based on transition matrices is that they are very difficult to implement in practice. An alternative method of measuring mobility focuses exclusively on relative changes in income levels. This approach begins with the observation that income inequality decreases as the accounting period over which income is measured is lengthened. It is assumed that this decrease is the result of mobility. The proposed indexes of mobility compare the degree of inequality defined over an extended time period against inequality which would exist if the income streams were assumed to be immobile.[2]

There are several problems of both a theoretical and practical nature with this latter approach to the measurement of mobility. First, consideration is restricted to movements in the distribution of income rather than the distribution of price dependent measures of individual welfare.[3] Therefore the impact of prices on the welfare distribution is ignored. Second, the proposed measures of mobility treat households symmetrically and ignore differences in the demographic composition of each consuming unit. Clearly this is a particularly serious oversight if one is to provide a welfare theoretic interpretation to the indexes of mobility.[4] Finally, the above methods of measuring mobility require the time paths of income of each individual in the population. Therefore, implementation requires panel data of substantial length which are quite scarce.

In this paper indexes of social mobility are developed which determine the degree to which the relative distribution of individual welfare changes over time. The concept of mobility measured is very different from previous approaches in that only net changes in the distribution are considered in evaluating the degree of welfare distributional change. The time paths of individual income do not affect the measured levels of social mobility. Therefore panel data are not required to implement this approach. In addition,

[1] For additional work in this tradition see Atkinson (1981), Kearl and Pope (1984), Prais (1955), Shorrocks (1976), and Theil (1972). Shorrocks (1978a) has shown that it is impossible to obtain mobility measures based on transition matrices which satisfy certain minimal properties.

[2] An early attempt to measure mobility using this approach is found in Shorrocks (1978b). A careful critique of Shorrocks' mobility measure is provided by Chakravarty, Dutta and Weymark (1985) who suggest several alternative indexes. Distinct but related approaches to the measurement of mobility are provided by Cowell (1985) and King (1983).

[3] Muellbauer (1974) and Roberts (1980) have discussed the limitations of restricting consideration to price independent measures of welfare.

[4] Ideally, one would like a mobility index which increases (decreases) only when movement in the distribution of individual welfare is socially desirable (undesirable). The indexes proposed by Chakravarty, Dutta and Weymark (1985) have this property while those of Cowell (1985), King (1983) and Shorrocks (1978b) do not.

the indexes of mobility are based on price dependent measures of individual and social welfare and thus have a well-defined welfare theoretic interpretation.

In section II measures of individual, group and social welfare are introduced. In section III translog indexes of social mobility are defined. In section IV money metric analogs to the translog mobility indexes are specified. These measures enable one to determine the monetary equivalent of the gain in social welfare that results from welfare distributional change.

II. Individual, Group and Social Welfare Measures

The first step in the measurement of mobility is to select a representation for individual welfare functions. For this purpose, the following notation is introduced:

$p = (p_1, p_2, \ldots, p_N)$ is the vector of prices of all commodities.

x_{nk} is the quantity of the nth commodity group consumed by the kth consuming unit $(n = 1, 2, \ldots, N; \quad k = 1, 2, \ldots, K)$.

$M_k = \sum_{n=1}^{N} p_n x_{nk}$ is the total expenditure of the kth consuming unit $(k = 1, 2, \ldots, K)$.

$\ln p = (\ln p_1, \ln p_2, \ldots, \ln p_N)$ is the vector of logarithms of prices.

A_k is the vector of attributes of the kth consuming unit $(k = 1, 2, \ldots, K)$.

Following Jorgenson and Slesnick (1983, 1984a, b) it is assumed that individual welfare for the kth consuming unit, say W_k $(k = 1, 2, \ldots, K)$ is a positive affine transformation of the logarithm of the translog indirect utility function:[5]

$$W_k = \ln V_k$$
$$= \left(\ln p' \alpha_p + 1/2 \ln p' B_{pp} \ln p \right)$$
$$- D(p)(\ln M_k / m_0(p, A_k))$$
$$(k = 1, 2, \ldots, K). \quad (1)$$

where

$$D(p) = -1 + i' B_{pp} \ln p,$$
$$i' = (1, 1, \ldots, 1),$$

and

$$\ln m_0(p, A_k) = 1/D(p)(\ln m(A_k)' \alpha_p$$
$$+ 1/2 \ln m(A_k)' B_{pp} \ln m(A_k)$$
$$+ \ln m(A_k)' B_{pp} \ln p)$$

where

$$\ln m(A_k) = B_{pp}^{-1} B_{pA} A_k \qquad (k = 1, 2, \ldots, K).$$

In this representation of individual welfare $m_0(p, A_k)$ is a general translog household equivalence scale and can be interpreted as the number of household equivalent members.[6] An implication of the above specification is that households facing the same prices with identical levels of per equivalent expenditure attain the same level of welfare.

To evaluate the level of individual welfare for each consuming unit one needs to determine the demographic attributes A_k, the level of total expenditure M_k, and the prices p faced by each household. In addition, the unknown parameters α_p, B_{pp}, and B_{pA} must be estimated. An econometric model of aggregate consumer behavior developed by Jorgenson, Lau and Stoker (1982) is used for this purpose.[7]

In the implementation of the econometric model, consumer expenditures are divided among five commodity groups: energy, food, consumer goods, capital services, and consumer services. The demographic characteristics employed as household attributes are family size, age of head, region of residence, race of head, and type of residence. Estimates of the unknown parameters of the demand system are obtained by pooling time series data from the National Income and Product Accounts with cross section data from the 1973 Consumer Expenditure Survey. Estimates of the parameters of the demand functions yield estimates of the unknown parameters required to evaluate the level of welfare for each consuming unit.

The next objective is to generate a social welfare function that can provide the basis for analyzing

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[5] This form of the translog indirect utility function was introduced by Jorgenson and Slesnick (1983).

[6] See Jorgenson and Slesnick (1982) for further discussion of this form of the household equivalence scales.

[7] This econometric model is based on the theory of exact aggregation. This model enables one to recover the individual indirect utility function from a system of aggregate demand functions. The empirical implementation of the model and estimates of the unknown parameters are given by Jorgenson and Slesnick (1982).

social mobility. For this purpose the following additional notation is utilized:

x is a matrix with elements $\{x_{nk}\}$ describing the social state.

$u = (W_1, W_2, \ldots, W_K)$ is a vector of individual welfare functions of all K individuals.

It is assumed that social welfare, say W, is a function of the measures of individual welfare (1):[8]

$$W(u, x) = \ln \overline{V}$$
$$-\gamma(p) \left[\frac{\sum_{k=1}^{K} m_0(p, A_k) |\ln V_k - \ln \overline{V}|^{-\rho}}{\sum_{k=1}^{K} m_0(p, A_k)} \right]^{-1/\rho}$$

$$(2)$$

where

$$\ln \overline{V} = \frac{\sum_{k=1}^{K} m_0(p, A_k) \ln V_k}{\sum_{k=1}^{K} m_0(p, A_k)}$$

and

$$\gamma(p) = \left[\frac{\sum_{\substack{k \neq j}}^{K} m_0(p, A_k)}{\sum_{k=1}^{K} m_0(p, A_k)} \right]$$

$$\times \left[1 + \left[\frac{\sum_{\substack{k \neq j}}^{K} m_0(p, A_k)}{m_0(p, A_j)} \right]^{-(\rho+1)} \right]^{1/\rho}$$

$$m_0(p, A_j) = \min_k m_0(p, A_k)$$

$$(k = 1, 2, \ldots, K).$$

The social welfare function (2) is the sum of two functions of the distribution of individual welfare. The first function, $\ln \overline{V}$, is a weighted average of the measures of individual welfare $\{W_k\}$ with weights that depend on the number of household equivalent members $\{m_0(p, A_k)\}$ of each con-

suming unit. The second function is a mean value function of order ρ of the deviations of measures of individual welfare from their average. The parameter ρ is referred to as the degree of aversion to inequality and determines the curvature of the social welfare function. The calculation of the social welfare function for various years requires the evaluation of the level of individual welfare of each household in each year.[9]

Finally, we consider the level of between-group social welfare. For this purpose the population is partitioned into B mutually exclusive and exhaustive groups. The potential level of welfare for each group can be attained by equalizing total expenditure per household equivalent member within the group.[10] When actual group welfare is equal to potential group welfare, the group behaves like an individual with a number of household equivalent members equal to the total for all households in the group.[11] The potential level of group welfare corresponds to the value of the translog indirect utility function (1) evaluated at group expenditure per household equivalent member for the group as a whole. The between-group social welfare function is specified to have the same functional form as that given in (2). It has as arguments the vector of potential group welfare functions.

Given measures of individual, group and social welfare, it is now possible to develop measures of social mobility. It is to this issue that we now turn.

III. Indexes of Social Mobility

In this section indexes of social mobility are developed. For this purpose the level of social welfare attained at a fixed distribution of individual welfare is calculated. An absolute index of mobility is defined as the difference between the actual level of social welfare and the level of social welfare attained at the fixed distribution. A relative index of mobility is the ratio of the absolute index of mobility to the actual level of social welfare. In this approach any net change in the welfare distribution is classified as social mobility.

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[8] For a detailed derivation of this social welfare function, see Jorgenson and Slesnick (1984b), pp. 84–93.

[9] See Slesnick (1984) for a discussion of the methods used to calculate levels of social welfare over time.

[10] For a proof of this proposition, see Jorgenson and Slesnick (1984a).

[11] See Pollak (1981) and Samuelson (1956) for a proof of this result.

A fixed distribution of individual welfare is defined using the following notation:[12]

$u_t = (W_{1t}, W_{2t}, \ldots, W_{Kt})$ is a vector of individual welfare functions of all K individuals at time t ($t = 1, 2, \ldots, T$).

$\tilde{W}_t = \sum_{k=1}^{K} W_{kt}$ is the total amount of individual welfare at time t ($t = 1, 2, \ldots, T$).

Using the individual welfare distribution attained in period 1 as the reference distribution, the fixed distribution of individual welfare in period t is defined to be of the form:[13]

$$u_t^F = u_1 \frac{\tilde{W}_t}{\tilde{W}_1}$$

$$= \left(W_{11} \frac{\tilde{W}_t}{\tilde{W}_1}, \ldots, W_{K1} \frac{\tilde{W}_t}{\tilde{W}_1} \right)$$

$$(t = 1, 2, \ldots, T).$$

A measure of mobility is defined to be the difference between the actual level of social welfare and the level of social welfare attained at the fixed distribution of individual welfare:

$$S(x, u_t, u_t^F) = W(u_t, x) - W(u_t^F, x)$$

$$(t = 1, 2, \ldots, T). \quad (3)$$

This measure is referred to as the translog index of social mobility. An important feature of this index is that it distinguishes socially desirable movements in the distribution of individual welfare from undesirable movements. If the index is positive, society is classified as being upwardly mobile while if it is negative society is said to be downwardly mobile. If the translog index of social mobility is equal to zero, society is completely immobile.[14]

Similarly, a relative measure of mobility is defined to be

$$R(x, u_t, u_t^F) = 1 - W(u_t^F, x)/W(u_t, x)$$

$$(t = 1, 2, \ldots, T)$$

$$= \frac{S(x, u_t, u_t^F)}{W(u_t, x)}. \quad (4)$$

This index is referred to as the translog relative index of social mobility. It can be interpreted as the proportional change in social welfare that results from moving from the reference distribution of welfare to the existing distribution.

The translog indexes of mobility (3) and (4) are measures of welfare distributional change.[15] Any change in the welfare vector from the reference period to the current period is classified as social mobility. These indexes differ from traditional measures of social mobility in several ways. First, the mobility indexes are defined over price dependent measures of welfare rather than income. Second, demographic effects are also incorporated in evaluating the level of social mobility. Third, the translog mobility indexes distinguish socially desirable movements in the welfare distribution from undesirable movements.

Most importantly, traditional measures of mobility incorporate the entire time paths of income of each individual in the population in evaluating the level of mobility. In contrast, the social mobility indexes defined above incorporate only net changes in the welfare distribution, and the time paths of welfare have no effect on the measured levels of mobility. For example, if two demographically identical households exchanged levels of welfare, ceteris paribus, the indexes of mobility defined above would attain a value of zero. This is due to the fact that the resulting change in the welfare distribution is ethically neutral due to the symmetry of the social welfare function (2) in the welfare levels of identical households.[16] Thus,

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[12] To avoid the problem of comparing welfare vectors of different dimensions, consideration is restricted to populations of fixed size.

[13] The measures of mobility proposed are in the same spirit as those suggested by Chakravarty, Dutta, and Weymark (1985) insofar as mobility is evaluated by comparing the actual distribution with an immobile distribution. They note that one could also specify a fixed distribution as one which keeps absolute deviations of welfare constant.

[14] It should be noted that in this approach, complete immobility is attained when the joint distribution of welfare levels and demographic characteristics remains unchanged.

[15] It is useful to compare the proposed mobility indexes with the corresponding inequality indexes. The inequality indexes defined by Jorgenson and Slesnick (1984a, b) measure the deviation of the actual distribution of welfare from the perfectly egalitarian distribution of welfare in the same time period. The mobility indexes measure the deviation of the existing welfare distribution in the current period from the distribution that existed in the reference period.

[16] Specifically, the social welfare function satisfies the property of anonymity in the welfare levels of households with

TABLE 1.—INDEXES OF MOBILITY

Year	Translog Index of Mobility			Translog Index of Relative Mobility		
	Total	Between	Within	Total	Between	Within
1947	.00000	.00000	.00000	.00000	.00000	.00000
1948	.00286	.00668	− .00382	.00047	.00101	− .00054
1949	.00042	.00132	− .00090	.00007	.00020	− .00013
1950	.03006	.00534	.02472	.00486	.00080	.00406
1951	.02879	.00066	.02813	.00463	.00010	.00453
1952	.02357	.00163	.02194	.00377	.00024	.00353
1953	.01466	.00380	.01086	.00234	.00056	.00178
1954	.02210	− .00994	.03204	.00353	− .00148	.00501
1955	.02012	− .01583	.03595	.00320	− .00234	.00554
1956	.03178	− .01122	.04300	.00503	− .00165	.00668
1957	.01727	− .01857	.03584	.00273	− .00274	.00547
1958	.02831	− .02041	.04872	.00447	− .00301	.00748
1959	.08741	− .02359	.11101	.01359	− .00345	.01704
1960	.09769	− .01284	.11053	.01509	− .00187	.01695
1961	.10425	− .01919	.12344	.01604	− .00278	.01883
1962	.10906	− .02893	.13799	.01674	− .00419	.02093
1963	.11941	− .02697	.14638	.01827	− .00390	.02217
1964	.11253	− .02023	.13276	.01708	− .00290	.01999
1965	.13468	− .02155	.15622	.02022	− .00307	.02329
1966	.15405	− .01695	.17100	.02297	− .00240	.02536
1967	.16469	− .01218	.17687	.02449	− .00172	.02621
1968	.17171	− .00458	.17629	.02533	− .00064	.02597
1969	.18760	− .00645	.19405	.02747	− .00090	.02837
1970	.18980	− .00197	.19177	.02776	− .00027	.02804
1971	.19894	− .00029	.19923	.02892	− .00004	.02896
1972	.21615	− .00343	.21958	.03113	− .00047	.03160
1973	.22422	− .00257	.22679	.03205	− .00035	.03240
1974	.23274	− .00067	.23341	.03340	− .00009	.03349
1975	.24026	.00449	.23577	.03431	.00061	.03370
1976	.25378	.00442	.24936	.03592	.00060	.03533
1977	.27112	.00764	.26347	.03805	.00103	.03702
1978	.28846	.01385	.27460	.04015	.00185	.03830
1979	.29098	.00848	.28250	.04046	.00113	.03932
1980	.28279	.00941	.27337	.03954	.00126	.03827
1981	.28501	.01016	.27485	.03981	.00136	.03845
1982	.28874	.01480	.27393	.04013	.00197	.03816

while standard measures would indicate a degree of mobility, the indexes defined in (3) and (4) would suggest complete immobility since the net result of the change in the distribution is no change in the level of social welfare. That is, such movements in the distribution are socially irrelevant and therefore do not contribute to social mobility.[17]

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identical demographic characteristics. Of course this property of the social welfare function represents a value judgment with ethical implications.

[17] It would be possible to identify such changes in the welfare distributions with mobility using this approach. This would require incorporating the time paths of income as arguments of an intertemporal social welfare function. It is in this framework that alternative welfare theoretic approaches analyze mobility using income as the welfare measure. Of course, the implementation of such measures of mobility requires data which follow individuals over time.

Between-group mobility can be defined in a precisely analogous manner as the mobility indexes (3) and (4). The translog index of between-group mobility is the difference between the level of between-group social welfare attained at the existing distribution of welfare between groups and the level of welfare attained at a fixed distribution of between-group welfare. The translog index of within-group mobility is the difference between the translog index of mobility and the translog index of between-group mobility. The indexes of within- and between-group relative mobility are defined similarly.

To illustrate these measures of mobility, the indexes have been calculated for the United States over the period 1947–1982. The reference distribution of individual welfare is that which existed in 1947. These mobility indexes have also been

decomposed into within-group and between-group components for the U.S. population divided between two subgroups classified by the race of the head of household. Specifically, we consider households headed by white individuals and households headed by nonwhite individuals.

The translog indexes of mobility and the translog indexes of relative mobility are presented in table 1.[18] It is observed that the translog index is positive over the thirty-five year period ranging from 0.00042 in 1949 to 0.29098 in 1979. This index can be interpreted as the gain in social welfare that results from having the actual welfare distribution rather than the distribution that existed in 1947. Further, the between-group mobility for subgroups differentiated by the race of the head of household is very small in comparison to within-group mobility. In fact, over the period 1954 to 1974 there is downward mobility between groups while the total distribution of welfare indicates society is upwardly mobile.

One obtains a better idea of the magnitude of the change in welfare due to social mobility by considering the translog relative index of mobility. This index can be interpreted as the proportional change in social welfare that results exclusively from attaining the actual distribution of welfare vis à vis the 1947 welfare distribution. It is observed that low levels of mobility occurred over the period 1948–1958 with the gain in social welfare ranging from 0.007% to 0.50%. Substantial increases in social mobility are found over the period 1959–1982. The largest gain in social welfare due to distributional change is 4.04% in 1979.

In decomposing total relative social mobility into within-group and between-group components, it is noted that social mobility within groups differentiated by the race of the head of household accounts for most of the movement in the welfare distribution. The between-group welfare distribution is quite stable over the entire thirty-five year period. However, downward mobility be-

tween groups is indicated in every year from 1954 to 1974.

IV. Money Metric Mobility

In order to quantify gains to society that result from mobility it is useful to express measures of social welfare in terms of equivalent levels of aggregate expenditure. For this purpose the social expenditure function is defined as the minimum level of aggregate expenditure $M = \sum_{k=1}^{K} M_k$ required to attain a given level of social welfare, say W, at a specified price system p.[19] More formally, the social expenditure function $M(p, W)$ is defined by

$$M(p, W)$$
$$= \min\left\{ M\colon W(u, x) \geq W;\ M = \sum M_k \right\}.$$

To construct a social expenditure function social welfare is maximized for a fixed level of aggregate expenditure by equalizing total expenditure per household equivalent member for all consuming units. The maximum level of welfare is equal to the translog indirect utility function (1), evaluated at total expenditure per household equivalent member $M/\sum_{k=1}^{K} m_0(p, A_k)$ for the economy as a whole. We solve for aggregate expenditure as a function of the level of social welfare and prices:

$$\ln M(p, W)$$
$$= 1/D(p)\big(\ln p'(\alpha_p + 1/2 B_{pp}\ln p) - W\big)$$
$$+ \ln\left(\sum_{k=1}^{K} m_0(p, A_k) \right). \tag{5}$$

This function is referred to as the translog social expenditure function.[20]

A money measure of mobility is defined as the difference between the money measure of the actual level of social welfare and the money measure of the level of social welfare attained at a fixed

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[18] All mobility measures presented in this paper are calculated with the inequality aversion parameter, ρ, equal to minus one. The qualitative results do not change for alternative values of ρ. In addition, sensitivity of the results to alternative definitions of a fixed distribution of welfare has also been evaluated. While the measured levels of mobility change substantially, the qualitative features of mobility in the United States reported in this paper are sustained.

[19] The social expenditure function was introduced by Pollak (1981).

[20] The value of aggregate expenditure is obtained by evaluating the translog individual expenditure function at the level of social welfare W and the number of household equivalent members $\sum_{k=1}^{K} m_0(p, A_k)$ for the economy as a whole. See Jorgenson and Slesnick (1983, 1984a, b) for details.

distribution both evaluated at prices p_0:

$$A\left(p_0, x, u_t, u_t^F\right)$$
$$= M\left(p_0, W(x, u_t)\right) - M\left(p_0, W\left(x, u_t^F\right)\right)$$
$$(t = 1, 2, \ldots, T). \quad (6)$$

This index can be interpreted as the amount society would be willing to pay for the actual welfare distribution over the reference welfare distribution.

Similarly, a money measure of relative mobility is defined as

$$D\left(p_0, x, u_t, u_t^F\right) = 1 - \frac{M\left(p_0, W\left(x, u_t^F\right)\right)}{M\left(p_0, W(x, u_t)\right)}$$
$$= \frac{A\left(p_0, x, u_t, u_t^F\right)}{M\left(p_0, W(x, u_t)\right)}$$
$$(t = 1, 2, \ldots, T). \quad (7)$$

The money measure of relative mobility is the proportion of money metric social welfare that is gained as a result of social mobility.

As with the translog indexes of mobility, money metric mobility can be decomposed into within-group and between-group components. Money metric between-group mobility is the difference between the actual level of money metric between-group social welfare and the money measure of between-group social welfare attained at a fixed distribution. The money measure of within-group mobility is the difference between total money metric mobility and the money measure of between-group mobility. The money metric measures of within-group and between-group relative mobility are defined in an exactly analogous manner.

The money measures of mobility have been implemented for the United States over the period

TABLE 2.—MONEY METRIC INDEXES OF MOBILITY

	Money Metric Mobility (billions of 1972 dollars)			Money Metric Relative Mobility		
Year	Total	Between	Within	Total	Between	Within
1947	0.000	0.000	0.000	.00000	.00000	.00000
1948	0.628	2.364	−1.737	.00286	.00665	−.00380
1949	0.091	0.460	−0.369	.00042	.00132	−.00090
1950	6.714	1.927	4.787	.02961	.00533	.02428
1951	6.666	0.249	6.417	.02838	.00066	.02772
1952	5.628	0.629	4.999	.02329	.00163	.02167
1953	3.570	1.508	2.062	.01455	.00379	.01076
1954	5.437	−3.968	9.405	.02186	−.00999	.03185
1955	5.130	−6.549	11.679	.01992	−.01595	.03587
1956	8.274	−4.736	13.011	.03128	−.01128	.04256
1957	4.534	−7.898	12.432	.01712	−.01875	.03587
1958	7.471	−8.670	16.141	.02791	−.02062	.04853
1959	24.329	−10.382	34.711	.08370	−.02387	.10758
1960	27.814	−5.792	33.605	.09307	−.01292	.10599
1961	30.151	−8.733	38.883	.09900	−.01938	.11837
1962	32.632	−13.563	46.195	.10332	−.02935	.13267
1963	36.228	−12.750	48.978	.11256	−.02734	.13989
1964	35.639	−10.035	45.674	.10643	−.02044	.12687
1965	45.002	−11.248	56.250	.12600	−.02178	.14778
1966	53.029	−9.072	62.101	.14277	−.01709	.15987
1967	56.823	−6.539	63.362	.15184	−.01225	.16409
1968	60.932	−2.530	63.462	.15778	−.00459	.16237
1969	68.465	−3.660	72.125	.17105	−.00647	.17752
1970	68.658	−1.107	69.765	.17287	−.00197	.17485
1971	73.390	−0.165	73.555	.18040	−.00029	.18069
1972	82.697	−2.035	84.732	.19439	−.00344	.19782
1973	87.888	−1.559	89.447	.20086	−.00257	.20343
1974	87.281	−0.389	87.671	.20764	−.00067	.20831
1975	90.864	2.626	88.237	.21358	.00448	.20910
1976	99.791	2.678	97.113	.22413	.00441	.21972
1977	109.591	4.756	104.835	.23747	.00761	.22986
1978	120.028	8.875	111.153	.25058	.01376	.23682
1979	120.078	5.405	114.673	.25247	.00845	.24402
1980	110.999	5.700	105.299	.24632	.00937	.23695
1981	112.054	6.164	105.890	.24799	.01011	.23788
1982	117.750	9.317	108.432	.25079	.01469	.23610

1947–1982. In table 2 it is observed that in every year, society is upwardly mobile relative to the 1947 distribution of individual welfare. These indexes can be interpreted as the monetary gain in social welfare due exclusively to movements in the welfare distribution. The change in social welfare attributed to social mobility is relatively small over the period 1948–1958. A sharp increase in mobility is found in 1959 and subsequent levels are high ranging (in constant 1972 dollars) from $24.329 billion in 1959 to $120.078 billion in 1979. As was found with the translog indexes of mobility, most of the movement in the welfare distribution is within groups differentiated by the race of the head of household. Movements in the between-group welfare distribution induce losses in money metric social welfare in every year over the period 1954–1974 and gains in the remaining years.

The same qualitative results are found with the money measures of relative mobility. These indexes represent the proportional gain in money metric social welfare that results from movements in the distribution of individual welfare. It is found that total relative money metric social mobility ranges from 0.04% in 1949 to 25.25% in 1979. Changes in the between-group welfare distribution yield much smaller levels of social mobility ranging from −2.94% to 1.47%. It is concluded that within-group movements in the welfare distribution account for most of the total money metric relative mobility.

V. Summary and Conclusion

In this paper an alternative approach to the measurement of mobility is presented. The proposed measures are based on an explicit social welfare function defined over price dependent measures of individual welfare. Unlike previous approaches, only net changes in the welfare distribution are utilized in evaluating levels of mobility. This eliminates the need for panel data and facilitates the implementation of the suggested indexes.

Translog indexes of social mobility have been defined and implemented for the United States over the period 1947–1982. It is found that society is upwardly mobile over this time period. Social mobility has been decomposed into within- and between-group components for households differentiated by the race of the head of household. It is observed that the between-group welfare distribu-

tion is quite stable over the thirty-five years. In addition, most of the mobility can be attributed to within-group movements of the welfare distribution. Money metric measures of mobility reinforce these findings.

REFERENCES

Atkinson, Anthony B., "The Measurement of Economic Mobility," in P. J. Eggelshoven and L. J. van Gemerden (eds.), *Inkommens verdeling en Openbare Financien* (Leiden: Het Spectrum, 1981).

Chakravarty, Satya R., Bhaskar Dutta, and John A. Weymark, "Ethical Indices of Income Mobility," *Social Choice and Welfare* 2 (1) (1985), 1–21.

Cowell, Frank A., "Measures of Distributional Change: An Axiomatic Approach," *Review of Economic Studies* 52 (Jan. 1985), 135–151.

Jorgenson, Dale W., Lawrence J. Lau, and Thomas M. Stoker, "The Transcendental Logarithmic Model of Aggregate Consumer Behavior," in R. L. Basmann and G. F. Rhodes, Jr. (eds.), *Advances in Econometrics* 1 (Greenwich, CT: JAI Press, 1982), 97–238.

Jorgenson, Dale W., and Daniel T. Slesnick, "Aggregate Consumer Behavior and Household Equivalence Scales," Harvard Institute of Economic Research Paper No. 928, Cambridge, Nov. 1982.

——, "Individual and Social Cost of Living Indexes," in W. E. Diewert and C. Montmarquette (eds.), *Price Level Measurement* (Ottawa: Statistics Canada, 1983), 241–323.

——, "Aggregate Consumer Behavior and the Measurement of Inequality," *Review of Economic Studies* 51 (July 1984a), 369–392.

——, "Inequality in the Distribution of Individual Welfare," in R. L. Basmann and G. F. Rhodes (eds.), *Advances in Econometrics* 3 (Greenwich, CT: JAI Press, 1984b).

Kearl, James P., and Clayne L. Pope, "Mobility and Distributions," this REVIEW 66 (May 1984), 192–199.

King, Mervyn A., "An Index of Inequality: With Applications to Horizontal Equity and Social Mobility," *Econometrica* 51 (Jan. 1983), 99–115.

Muellbauer, John, "Inequality Measures, Prices and Household Composition," *Review of Economic Studies* 41 (Oct. 1974), 493–504.

Pollak, Robert A., "The Social Cost of Living Index," *Journal of Public Economics* 15 (June 1981), 311–336.

Prais, S. J., "Measuring Social Mobility," *Journal of the Royal Statistical Society*, Series A, 118, part 1 (1955), 55–66.

Roberts, Kevin W. S., "Price Independent Welfare Prescriptions," *Journal of Public Economics* 13 (June 1980), 277–298.

Samuelson, Paul A., "Social Indifference Curves," *Quarterly Journal of Economics* 70 (Feb. 1956), 1–22.

Shorrocks, Anthony F., "Income Mobility and the Markov Assumption," *Economic Journal* 86 (Sept. 1976), 566–578.

——, "The Measurement of Mobility," *Econometrica* 46 (5) (1978a), 1013–1024.

——, "Income Inequality and Income Mobility," *Journal of Economic Theory* 19 (Dec. 1978b), 376–393.

Slesnick, Daniel T., "The Measurement of Effective Commodity Tax Progressivity," University of Texas Center for Economic Research Discussion Paper No. 84–16 (1984).

Theil, Henri, *Statistical Decomposition Analysis* (Amsterdam: North-Holland, 1972).