The Influence of Demographics and Household Specific Price Indices on Expenditure Based Inequality and Welfare: A Comparison of Spain and the United States

BY

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ABSTRACT

The purpose of this research is to examine the role of household size and household specific price indices on inequality and welfare measurement in Spain and the U.S. Total household expenditures from each countries' 1990-91 consumer expenditure surveys are used for the analysis. Decomposable measurement instruments are used both for the inequality and social welfare analyses. Thus we can isolate the impact of household size on inequality, separating this affect from the distributional impact due to between group differences in inequality. For different time periods, we examine the impact of changes in relative prices on both inequality and welfare. To test the sensitivity of our overall results, different household size scale factors are applied to total expenditures to produce adjusted expenditures. The household specific price indices are used to express the 199091 expenditure distributions at winter of 1981 and winter of 1991 prices. Diary data are employed to allocate Diary specific commodities to Interview households in the U.S. case. Our results show that wide differences in demographic factors can be very important in international comparisons. Inequality and welfare comparisons are drastically different for smaller and larger households. Given this diversity, decomposable measurement instruments help to explain how results at the household size level get translated at the population level. In terms of the influence of relative prices on inequality, for both countries, we find that from the point of view of winter 1981; the amount of expenditures that we would need to give to richer households to compensate them for inflation, over the 1981 to 1991 period, would be greater than the amount that we would need to give to poorer households for them to remain at the same level of welfare. However, because the distributional impact of relative prices is of a comparable order of magnitude, our inequality comparisons are rather robust to the choice of the reference price vector.

KEYWORDS: Theil Inequality; Welfare; Household Expenditures; Household Specific Price Indexes

1. INTRODUCTION

In this paper we compare levels of living in Spain and the United States (U.S.) using current household consumption expenditures as our level of living measure. As in most welfare analysis, we assume that social or aggregate welfare can be expressed in terms of two statistics of the expenditure distribution: the mean and an index of relative inequality.

Like intertemporal comparisons of income inequality and welfare in a single country, international comparisons of expenditures require the solution to the following four classical problems: (a) how to make comparable two heterogeneous populations consisting of households with different needs; (b) which measurement instruments to use among the admissible inequality measures; (c) which measurement instruments to use among the admissible welfare measures, and (d) how to make comparable the money distributions in both countries.

To solve the difficulties arising from the demographic heterogeneity in international comparisons, researchers usually compare the distributions of equivalent expenditures (or equivalent income) using some common equivalence scale.[1] However, as Coulter et al. (1992a) conclude in their review of the literature, there is no single 'correct' equivalence scale for adjusting incomes. Thus, a range of scale relativities is both justifiable and inevitable. In this paper, to make the analysis tractable we assume that equivalence scales depend only on the number of persons in the household. Following Buhmann et al. (1988) and Coulter et al. (1992a, 1992b), to pool all households into a unique distribution within each country we use a parametric model of equivalence scales which allows for different views about the importance of economies of scale in consumption within the household. [2]

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[1] See Phipps and Garner (1994) and Burkhauser et al. (1996).
[2] For the use in this model in international comparisons, see also Atkinson et al. (1995).

In the equivalence scales model, expenditures for households of the same size are directly comparable. Thus, we believe it is important to start our analysis from inequality (or welfare) comparisons *separately* for each of subgroups in the partition by household size. Then, in order to go from the household size to the population level, we find illuminating to work with additively decomposable measurement instruments. For every population partition, decomposable measures of (relative) inequality allow us to express overall inequality in a cross-section as the sum of two terms: a weighted sum of *within-group* inequalities, plus a *between-group* inequality component calculated as if each person within a given group received the group's mean income.

Using decomposable measures, in this paper we explain the overall inequality differences between the U.S. and Spain in terms of three factors: i) the difference in within-group inequality (due to differences in subgroup inequality values), ii) the difference in between-group inequality (due to the relative differences in subgroup means), and iii) the demographic change across partition subgroups (due to differences in subgroup population shares). In addition, following a suggestion in Coulter *et al* (1992a) and developed in Del Rio and Ruiz-Castillo (1997b), we use a method to free the decomposition analysis from the possible 'contamination' that will arise if we use an inappropriate equivalence scale.

As far as the measurement of welfare is concerned, we are interested in social evaluation functions (SEF for short) which permit the explanation of welfare differences in terms of differences in the mean and differences in relative inequality. As in the inequality case, additively decomposable SEFs have been found useful in intertemporal welfare comparisons within a single country.[3] In this paper we show that these methods are equally useful in international comparisons. This is important in a context in which we find considerable welfare and demographic inter-country differences between the subgroups in the partition by household size.

[3]See Ruiz-Castillo (1998).

We address each of these issues using data from household budget surveys. The Spanish data are from the Encuesta de Presupuestos Familiares (EPF) conducted by the Instituto Nacional de Estadistica (INE), and the U.S. data are from the Consumer Expenditure Survey (CEX) from the Bureau of Labor Statistics (BLS). We compare annual consumer unit (referred to here as household) expenditures, which were collected by the agencies from April 1990 through March 1991 for Spain and from January 1990 through December 1991 for the U.S. We refer to this time period as 1990-91. We express both distributions at constant prices for two periods in each country: the winter of 1991 and the winter of 1981. Since we use household specific price indices, we are able to take into account the distributional role of changes in price relatives during the 1980's in both countries. Finally, we express the Spanish distributions in U.S dollars using EKS Purchasing Power Parities (Godbout 1997; OCED 1993).

The comparison between Spain and the U.S. is an interesting one. First, Spain has been experiencing a complex process of economic modernization and liberalization since the mid-1970's, including full membership into the European Union in January 1986, resulting in a more open and market oriented economy. In contrast, the U.S.- has a much larger economic system which is rather open and market oriented. Second, during this period Spain has been taking important steps toward a fairly comprehensive social safety net, in the European style, while that of the U.S. is rather limited. Third, tax structures are rather different too. Although a modern income tax system did not start in Spain until 1978, it is more progressive today than is the U.S. tax system. On the other hand, the EU membership lead to the introduction in 1986 of a value added tax in Spain, in contrast to the indirect tax system in the U.S. Fourth, recent trends in inequality and welfare are quite different. In particular, from 1973-74 to 1990-91, expenditure inequality has fallen in Spain (Del Rio and Ruiz-Castillo 1997a, 1997b; Ruiz-Castillo 1995b), but has increased during the 1980's in the U.S. (for example, see Johnson and Shipp 1997). And

fifth, the demographic structure of the two countries is very different, with larger consuming units in Spain on average than in the U.S.

The remainder of this paper is organized into four sections. Section two presents the methods and Section three, a description of the data. Section four includes our results and Section five summaries and concludes.

II. METHODS

A. Interpersonal Comparisons of Welfare

Assume we have a population of h = 1,...,H households whose living standards can be adequately represented by a one-dimensional variable we call income, x^h. Households can differ in income and/or a vector of household characteristics. As indicated in the Introduction, we assume that equivalence scales depend only on the number of persons in the household. Households of the same size are assumed to have the same needs and, therefore, their incomes are directly comparable. Larger households have greater needs, but also greater opportunities to achieve economies of scale in consumption. Assume that there are m = 1,...,M household sizes. Following Buhmann et al. (1988) and Coulter et al. (1992a, 1992b), for each household h of size m we define adjusted income by

$$z^h(\Theta) := x^h/m^\Theta, \in \Theta\ [0,1]. \qquad (1)$$

When $\Theta = 0$, adjusted income coincides with unadjusted household income, while if $\Theta = 1$, it becomes *per capita* household income. Taking a single adult as the reference type, the expression m^Θ can be interpreted as the number of equivalent adults in a household of size m. Thus, the greater is the equivalence elasticity Θ, the smaller are the economies of scale in consumption or, in other words, the larger is the number of equivalent adults.

Let $\mathbf{x}^m$ and $\mathbf{z}^m(\Theta)$ be, respectively, the vector of original and adjusted incomes for households of size m. Notice that, if I is any index of relative inequality, then for each m

$$I(\mathbf{z}^m(\Theta)) = I(\mathbf{x}^m/(m^{\Theta}) = I(\mathbf{x}^m). \quad (2)$$

Thus, within each subgroup with the same needs, we assume that the inequality of adjusted income is equal to the inequality of original income, independently of individual income and prices.

In welfare economics, we are mostly interested in personal economic well-being and welfare, rather than that of the household. Thus, following standard practice for overall inequality and welfare measurement, household adjusted income is weighted by the number of persons in the household. Or in other words, each person is assigned the adjusted income of the household to which he or she belongs. In the next section, notice that for the decomposition by household size partition, we obtain the same results if we use adjusted or unadjusted household income and weight by persons or households. So we use unadjusted incomes and household weighting. [4]

Inequality Measurement

1. Decomposition of Overall Inequality for the Partition by Household Size

We say that an inequality index is decomposable by population subgroup, if the decomposition procedure of overall inequality into a within-group and a between-group term is valid for any arbitrary population partition. It is well known that the Generalized Entropy (GE) family of inequality indices are the only measures of relative inequality that satisfy the usual normative properties required from any inequality index and, in addition, are decomposable by

[4] If the partition is by any other characteristic than household size, adjusted incomes and person weighting would need to be used.

population subgroup. (See, for example, Shorrocks (1984)). The family can be described by means of the following convenient cardinalization:

$$I_c(z(\Theta)) = (1/H)\,(1/c^2 - c)\sum_h \{(z^h(\Theta)/\mu(z^h(\Theta))^c - 1\} \quad c \neq 0,1 \qquad (3)$$

where $\mu(\cdot)$ is the mean of the distribution. The parameter c summarizes the sensitivity of I_c in different parts of the income distribution: the more positive (negative) c is, the more sensitive I_c is to differences at the top (bottom) of the distribution (Cowell and Kuga (1981)).

When c=0 the following results:

$$I_0(z(\Theta)) = (1/H)\sum_h \log\{\mu(z^h(\Theta)/z^h(\Theta)\}. \qquad (4)$$

When c=1 the following results:

$$I_1(z(\Theta)) = (1/H)\sum_h \{(z^h(\Theta)/\mu(z^h(\Theta)\}\log\{z^h(\Theta)/\mu(z^h(\Theta)\}. \qquad (5)$$

I_0 is the mean logarithmic deviation, while I_1 is the original Theil index.

Coulter et al. (1992a, 1992b) have shown how the inequality estimates provided by the GE family vary systematically with the parameter O which captures the generosity of the scale. They illustrate their analysis with UK data.[5] However, using the GE family in its decomposable form restricts the 'contamination' of the inequality orderings that will arise if there is incomplete or incorrect information about the equivalence scales. To see this, consider the formula for the GE index when written in decomposable form for the partition by household size:

[5] This has been confirmed in other countries. For Portugal, see Rodrigues (1993). For Spain, see Ruiz-Castillo (1995b) for the period 1973-74 to 1980-81. For Spain and the U.S. during the period 1980-81 to 1990-91, see Section four of this paper.

$$I_c(z(\Theta)) = \sum_m (v^m(\Theta))^c (p^m)^{1-c} I_c(z^m(\Theta)) + I_c(\mu^1(\Theta),...,\mu^M(\Theta)), \quad (6)$$

where $v^m(\Theta)$ is the share of total adjusted income held by households of size m for each Θ; p^m is group m's population share, and $I_c(\mu^1(\Theta),...,\mu^M(\Theta))$ is the between-group inequality calculated as if each household of a given size m received that group's mean adjusted income $\mu^m(\Theta)$. Recall that, for each m, $I_c(z^m(\Theta)) = I_c(x^m)$. When c = 0 the expression $v^m(\Theta)^c (p^m)^{1-c}$ reduces to p^m, so that using the 'wrong' equivalence scale contaminates only the between group component. Denoting U and $C(\Theta)$ the uncontaminated and the contaminated terms, we have:

$$I_0(z(\Theta)) = U + C(\Theta), \quad (7)$$

where

$$U = \sum_m p^m I_0(x^m) \quad (8)$$

is the weighted average of the inequality within each household size with weights equal to population shares, and

$$C(\Theta) = I_0(\mu^1(\Theta),...,\mu^M(\Theta)) \quad (9)$$

is the between-group inequality which depends on Θ. For our analysis by household size, we only consider households of size 1-7 persons (in both countries such households represent about 97 percent of all persons covered by the surveys).

2. Decomposition of Overall Inequality Change

Let us denote by $\Delta I(\Theta)$ the difference in inequality between two countries 1 and 2, i.e., $\Delta I(\Theta) = I_0(z_2(\Theta)) - I_0(z_1(\Theta))$. This magnitude can be expressed as

$$\Delta I(\Theta) = \Delta U + \Delta C(\Theta), \tag{10}$$

where: $$\Delta U = U_2 - U_1 = \Delta W + \Delta D, \tag{11}$$

$$\Delta W = \sum_m \; p_1^m \, [I_0(x_2^m) - I_0(x_1^m)], \tag{12}$$

$$\Delta D = \sum_m \; [p_2^m - p_1^m] I_0(x_2^m), \tag{13}$$

$$\Delta C(\Theta) = I_0(\mu_2{}^1(\Theta),\ldots,\mu_2{}^M(\Theta)) - I_0(\mu_1{}^1(\Theta),\ldots,\mu_1{}^M(\Theta)) \tag{14}$$

Equation (11) is the difference in uncontaminated inequality, which is seen to be the sum of two terms: equation (12), which is the weighted sum of inequality differences within each household size, and equation (13) which captures the impact on the uncontaminated inequality of demographic differences across the partition by household size. Both are independent of Θ , which only affects equation (14), namely, the difference in between-group inequality in the partition by household size.

Of course, demographic shares for country 2, rather than for country 1, and the inequality for country I can be used in the above decomposition. In this case, we

$$\Delta U = U_2 - U_1 = \Delta W' + \Delta D', \tag{11'}$$

$$\Delta W' = \sum_m \; p_2^m \, [I_0(x_2^m) - I_0(x_1^m)], \tag{12'}$$

$$\Delta D' = \sum_m \; [p_2^m - p_1^m] \; I_0(x_1^m). \tag{13'}$$

C. Welfare Measurement

1. Admissible Social Evaluation Functions

A SEF is a real valued function S defined in the space R^H of adjusted incomes, with the interpretation that for each income distribution $\mathbf{x} = (x^1,...,x^H)$, $S(\mathbf{x})$ provides the "social" or, simply, the aggregate welfare from a normative point of view. Let us assume that our SEFs satisfy the requirements discovered by Dutta and Esteban (1991) for expressing welfare as a function of the mean and an index of relative inequality. In addition, let us adopt a multiplicative trade off between the mean and inequality, that is:

$$S(\mathbf{x}) = \mu(\mathbf{x})(1 - I(\mathbf{x})). \tag{15}$$

But which SEFs within these classes should we use in applied work? The following property leads us to an appropriate selection.

Suppose that we have two islands where income is equally distributed but whose means are different. If they now form a single entity, there will be no within-island inequality but there would be inequality between them. In income inequality theory we search for additively separable measures capable of expressing this intuition. In our context, for any partition we are interested in expressing social welfare for the population as the sum of two terms: a weighted average of welfare within the subgroups, with weights equal to demographic shares, minus a term which penalizes the inequality between subgroups. In this case, we say that the SEF is additively decomposable.

Consider SEFs which can be expressed as the product of the mean and a term equal to one minus a member of the GE family of inequality measures. Ruiz-Castillo (1995a) shows that the only SEF among them with the property of additive decomposability with demographic weights, is the following:

$$S^*(\mathbf{x}) = \mu(\mathbf{x})(1 - I_1(\mathbf{x})) = \sum_m p^m S^*(\mathbf{x}^m) - \mu(\mathbf{x}) I_1(\mu^1,..., \mu^M), \tag{16}$$

where I_1 is the original Theil index. Thus, social welfare is seen to be a weighted average of the welfare within each subgroup with weights equal to demographic shares, minus the between-group inequality weighted by the population mean. Taking into account our definitions of adjusted income, we have:

$$S^*(\mathbf{z}(\Theta)) = A(\Theta) - B(\Theta) \tag{17}$$

where:

$$A(\Theta) = \sum_m \; p^m \, [S^*(\mathbf{x}^m)/m^{\Theta}], \tag{18}$$

and

$$B(\Theta) = \mu(\mathbf{z}(\Theta)) I_1(\mu^1(\Theta),...,\mu^M(\Theta)), \in \Theta[0,1]. \tag{19}$$

Equation (18) is the within-group welfare, while equation (19) is the penalty associated to between-group inequality in the partition by household size. Between group inequality is the inequality that arises if we give each household the mean of the household size. As for the inequality decomposition by household size, we only consider households of size 1-7 persons since we needed to simplify our analysis.

2. Decomposition of Overall Welfare Change

Let us denote by $\Delta S(\Theta)$ the difference in welfare between two countries 1 and 2, i.e., $\Delta S(\Theta) = S^*(z_2(\Theta)) - S^*(z_1(\Theta))$. This magnitude can be expressed as

$$\Delta S(\Theta) = \Delta A(\Theta) - \Delta B(\Theta), \tag{20}$$

where: $$\Delta A(\Theta) = A_2(\Theta) - A_1(\Theta) = \Delta W(\Theta) + \Delta D(\Theta), \tag{21}$$

$$\Delta W(\Theta) = \sum_m \; p_1^m \, [(S_2^* (\mathbf{x}_2^m/m^{\Theta})) - (S_1^*(\mathbf{x}_1^m/m^{\Theta}))], \tag{22}$$

$$\Delta D(\Theta) = \sum_m [p_2^m - p_1^m](S_2*(x_2^m/m^\Theta)) \quad (23)$$

$$\Delta B(\Theta) = \mu(z_2(\Theta))I_1(\mu_2{}^1(\Theta),...,\mu_2{}^M(\Theta)) - \mu(z_1(\Theta))I_1(\mu_1{}^1(\Theta),...,\mu_1{}^M(\Theta)) \quad (24)$$

Equation (21) is the difference in the A (Θ) terms, which is seen to be the sum of two terms: equation (22), which is the weighted sum of welfare differences within each household size, and equation (23) which captures the impact of demographic differences across the partition by household size. Both terms depend on Θ , but in a way that allows us to establish a clear link between the household size and the population level. Finally, equation (24) captures the difference in the penalty attributed to between-group inequality in the partition by household size.

Of course, demographic shares for country 2, rather than for country 1, and welfare for country 2 can be used in the above decomposition. In this case, we have:

$$\Delta A(\Theta) = A_2(\Theta) - A_1(\Theta) = \Delta W'(\Theta) + \Delta D'(\Theta), \quad (21')$$

$$\Delta W'(\Theta) = \sum_m p_2^m [(S_2*(x_2^m/m^\Theta)) - (S_1*(x_1^m/m^\Theta))], \quad (22')$$

$$\Delta D'(\Theta) = \sum_m [p_2^m - p_1^m](S_1*(x_1^m/m^\Theta)). \quad (23')$$

D. Accounting for Differences in Prices

Differences in prices over time affect the differences in mean expenditures of the countries as well as differences in inequality and overall welfare. In this section, we present an approach to identify the impact of price change on overall inequality between country l and country 2. A similar analysis can be done for welfare.

Let us denote $\Delta I_t(\Theta)$ as the difference in inequality between two countries 1 and 2 at prices of period t, i.e.,

$$\Delta I_t(\Theta) = I_0(z_{2t}(\Theta)) - I_0(z_{1t}(\Theta)). \quad (25)$$

Similarly, at prices of period $t' < t$ we have

$$\Delta I_{t'}(\Theta) = I_0(z_{2t'}(\Theta)) - I_0(z_{1t'}(\Theta)). \quad (26)$$

For each country i = 1, 2, let us denote by $\Delta P_i(\Theta)$ the distributive effect of the change in relative prices from period t' to period t, that is,

$$\Delta P_i(\Theta) = I_0(z_{it}(\Theta)) - I_0(z_{it'}(\Theta)). \quad (27)$$

Suppose that the rate of inflation during this period has been greater for the rich than for the poor, in which case we say that the change in relative prices from t' to t has been pro-poor. Then the Paasche indices to express money magnitudes in period t at period t' prices are greater for the rich than for the poor. The income necessary to acquire the period t bundle of goods at t' prices is reduced for everyone, but is reduced by more for the rich. Therefore, inequality at t' prices is smaller than inequality at t prices, that is

to say, $\Delta P_i(\Theta) = I_0(z_{it}(\Theta)) - I_0(z_{it'}(\Theta)) > 0$.

It is easy to see that

$$\Delta I_t(\Theta) = \Delta P_2(\Theta) - \Delta P_1(\Theta) + \Delta I_{t'}(\Theta) \quad (28)$$

that is:

$$I_0(z_{2t}(\Theta)) - I_0(z_{1t}(\Theta)) = (I_0(z_{2t}(\Theta)) - I_0(z_{2t'}(\Theta))) - ((I_0(z_{1t}(\Theta)) - I_0(z_{1t'}(\Theta)))$$
$$+ (I_0(z_{2t'}(\Theta)) - I_0(z_{1t'}(\Theta))). \quad (29)$$

Therefore, $\Delta I_t(\Theta) = \Delta I_{t'}(\Theta)$ if and only if $\Delta P_2(\Theta) = \Delta P_1(\Theta)$. In our case, it turns out that both $\Delta P_2(\Theta)$ and $\Delta P_1(\Theta)$ are positive, but of a different magnitude.

III. DATA

For our analysis, we use data from household budget surveys. The Spanish data are from the Encuesta de Presupuestos Familiares (EPF) conducted by the Instituto Nacional de Estadistica (INE), and the U.S. data are from the Consumer Expenditure Survey (CEX) Interview (augmented with data from the Diary) from the Bureau of Labor Statistics (BLS). For both budget surveys, data are collected from consumer or economic units. In general a consumer unit (referred to in this paper as a household) is a collection of people who share a budget and some living quarters. The U.S. population is defined as the total civilian noninstitutional population and a portion of the institutional population living in the following group quarters: boarding houses, housing facilities for students and workers, staff units in hospitals, and homes for the aged, infirmed or needy, permanent living quarters in hotels and motels, and mobile home parks. The Spanish population is defined similarly with the additional requirement that persons living in institutional or collective housing must be economically independent from other household units. For the U. S. CEX, students living in college residences are considered separate consumer units even if they are economically dependent upon the financial support of their parents or others.

We use consumption expenditures as our measure of income. We start with the expenditure bundle used by the statistical agencies for the production of their official Consumer Price Indexes (CPIs) to define expenditures. To this base expenditure bundle

we add other expenditures not usually accounted for in a country's CPI, but which we assume are part of a household's consumption. These include expenditures for items like funeral articles, gambling expenditures, fines, hunting, fishing and other fees, rent and food in-kind from work, and expenditures for housing, health, and automobile insurance (only the part that is considered to be for current consumption). Also included in Spanish expenditures are contributions to non-profit institutions and the value of home production. Data on such contributions were not available to us for this analysis for all the households in the U.S. sample.[6] Information on home production in the U.S. is not collected. Excluded from the definition of expenditures for both countries are expenditures for the purchase of vehicles, house maintenance and repairs financed by the household, and life insurance. Adjustments to total expenditures as collected by the statistical offices are made to account for the flow of services from owner occupied housing. In addition, for the U.S., adjustments are made to account for the flow of services from selected household durables (see Cage et al. 1997).

We analyze annualized consumer unit (referred to here as a household) consumption expenditures. These data were collected by the statistical agencies from April 1990 through March 1991 for Spain and from January 1990 through December 1991 for the U.S. We refer to this time period as 1990-91. We express both distributions at constant prices, using household specific price indexes (for descriptions of the production of these indexes for the U.S. and Spain, see Cage et al. 1997 and Ruiz-Castillo and Sastre 1997, respectively) for two periods in each country: the winter of 1991 and

[6] These data are only collected in the fifth quarter of the CEX Interview. Our sample includes consumer units who may not have a fifth interview; based on this, we decided to define expenditures so that they would be the same across all quarters covered.

the winter of 1981. Since we use household specific price indices, we are able to take into account the distributional role of changes in price relatives during the 1980's in both countries.

For comparing expenditures and welfare in the two countries, we use purchasing power parities (PPPs) for private consumption expenditures. These are rates of currency conversion that equalize the purchasing power of the two countries. This means that a given sum of money, when converted into different currencies at the PPP rates, will buy the same basket of goods and services. PPPs have the advantage over exchange rates in that they reflect only differences in the volume of goods and services purchased; in contrast, exchange rates reflect both differences in the volumes purchased in each country and also differences in price levels. PPPs based on the Elteto-Koves-Szulc (EKS) method of aggregation are used (DECD 1993). Although the EKS indexes are not additive, the DECD notes that the EKS can be used to compare levels? The EKS indexes are used since we are interested in comparing levels of expenditures and welfare. For 1991, the PPP conversion factor is 108.9 so that Spanish expenditures in pesetas are divided by 108.9 to obtain Spanish expenditures in U.S. dollars. For 1981, the PPP conversion factor is 74.74 (Godbout 1997; DECD 1993).

[7]An alternative is to use the Geary-Khamis (GK) index which is additive. This index is most appropriate to use when comparing structures and applying subindexes such that the sum of the adjusted subcomponent expenditures, for example, will equal total PPP adjusted expenditures. Since we are using the overall index and not subcomponent indexes to make our PPP adjustments for total expenditures, it is acceptable to use the EKS indexes. Dukhanov (1997) has noted that substantial differences result however when the two different indexes are used in adjusting subcomponents and then adding up to produce overall national account incomes, for example. However, for our study, we do not expect major differences, given that the GK PPP index for 1981 is 73.3 (versus 74.74) and the index for 1991 is and 106.8 (versus 108.9).

For all analyses, consumer unit population weights are used. For the U.S., the average consumer unit weight for the number of quarters that the consumer unit is in the sample is used; for the household size variable, the average size is also assumed.

A. Spanish Data

The Spanish EPF is a household budget survey in which interviews are spread out uniformly over a period of 52 weeks. All household members, 14 years of age or older, are supposed to record all expenditures taking place during a sample week. Then indepth interviews are conducted to register past expenditures over reference periods beyond a week and up to a year. From that information the INE estimates annual household total expenditures. Annual expenditures on food and drinks in Spain take into account the available information on bulk purchases according to the procedure developed in Pena and Ruiz-Castillo (1995). For our study, annual household total expenditures, based on this set of different reporting periods, are assigned the reference 1990-91 period according to the quarter in which the interview took place.

Data from the two most recent EPFs, collected from April 1980 to March 1981 and from April 1990 to March 1991, are used for our analysis (for details on the 1980-81 and 1990-91 surveys, respectively, see INE (1983) and INE (1992)). In the 1990-91 period, approximately 23,000 households were included in the sample. These households represent 11,298,509 households in the population and 38,494,006 persons.

B. U.S. Data

The U.S. CEX has two components: a Diary or recordkeeping survey completed by participating consumer units for two consecutive one-week periods, and an Interview survey in which the expenditures of consumer units are obtained in five interviews

conducted every three months. Survey participants record dollar amounts for goods and services purchased during the week of data collection for the Diary and during the previous three months (from the date of the interview) for the Interview. The expenditure amounts (full purchase price regardless of financing with the exception of vehicles and housing) include all sales and excise taxes for all items purchased by the consumer unit for itself or for others. Excluded from both surveys are all business-related expenditures and expenditures for which the consumer unit is reimbursed.

The Interview sample is selected on a rotating panel basis, targeted at 5,000 consumer units each quarter. About twenty percent of the sample are interviewed for the first time each quarter while twenty percent are interviewed for the last time. Consumer units are interviewed up to five times, at three-month intervals. Data from the first interview are used to `bound' expenditures for subsequent interviews and are not used in estimation.

Since we are interested in total expenditures, we use data from both the Diary and Interview following a method developed by Rob Cage at the BLS (Cage et al. 1997. The BLS (1995) estimates that about 80 to 95 percent of all expenditures are accounted for in the Interview. Not accounted for in the Interview are roughly 40 specific goods and services, e.g., soaps, laundry and cleaning products, tolls, over-the counter drugs, pet food, and personal care products. We use data from the Diary to impute additional expenditures for these omitted items to the Interview households. This was accomplished by calculating the expenditure for the Diary-unique item, as a percent of total food expense, and taking the product of this factor and the total food expense reported in the Interview. The budget shares for these items were produced by index-area and consumer

unit size in the Diary sample. These shares were then mapped to the CEX Interview sample by index area and consumer unit size, and used to impute expenditures for these additional items in the Interview.

The continuous and rotating nature of the CEX Interview in the U.S. case poses special problems for the determination of the 1990-91 household expenditures distribution at current prices, that is, the equivalent of the expenditure distribution in the Spanish case. We limit ourselves to the Interview survey consumer units only, since these consumer units provide the maximum of data over the longest period of time, relative to the Diary sample. For our analysis we do not assume that the quarterly expenditure reports are independent (as in official CEX publications, see BLS 1995), but require each consumer unit to have reported expenditures for two, three, or four quarters during the time period of our study. We refer to our sample as horizontal. Restricting ourselves to households with four quarters of complete data would have been unnecessarily restrictive, while including some incomplete households allows us to increase the sample size. If we selected our households with interviews occurring over the exact time period as in the Spanish case (Summer 1990 to Spring 1991), there would only be 1,367 consumer units in the U.S. sample. In contrast, our horizontal sample is composed of 6,284 consumer units, representing 118,481,815 consumer units in the population and 307,204,548 persons. The U. S. data were collected from January 1990 to December 1991. Data from the reported quarters, during this time period, are used to produce annualized expenditures for each consumer unit. The consumer unit characteristics of household size[8] and age of head are based on the average of the

[8] Rounded values of average household size were used for our analysis.

quarterly values for the values reported. The population weights used for our analysis are also the result of averaging the quarterly weights over the number of quarters for which the consumer unit participates in the survey.

IV. **RESULTS**

Our study confirms that, in international comparisons, demographic structure and prices are important. In this section we examine the population distributions by household size, expenditures of households, inequality, and welfare. Unadjusted expenditures are used for the inequality analysis when we examine within group differences by household size. However, adjusted expenditures are used when examining overall inequality since between group differences are dependent on the adjustment factor. Since welfare for each household size depends on the scale adjustment factor, we present the unadjusted values by household size, but focus most of our attention on the results for all persons.

As shown in Table 1, we observe one and two person households in the U.S. are more numerous and have much greater mean expenditures than those in Spain. For three person households, representing about 20 percent of all persons in each country, mean expenditures are still substantially higher for the U.S. For four person households, representing about 30 percent of all persons in Spain and 24 percent in the U.S., mean expenditures are greater in the U.S., but not as great as for smaller household sizes. Except for six person households, larger households have greater mean levels of expenditures in the U.S.

The results in Table 2 illustrate the impact on means expenditures of using person versus household weighting. With person weighting, each person in a household is assigned the adjusted expenditure while with household weighting each household only is assigned a weight of 1. This means persons living in larger households will have more weight in the overall distribution of expenditures. When comparing the person weighted and household weighted expenditures, expenditures are greater in the U.S. relative to those in Spain for each scale adjustment factor. However, when comparing person weighted versus household weighted expenditures for each country, household weighted expenditures are less than person weighted expenditures when the scale factor adjustment is smaller for the U.S. (Θ= 0.0 or 0.3). The pattern is more pronounced for Spain; household weighted expenditures are less for all scale adjustment factors other than for the per capita adjustment (Θ =1.0).

The Theil indexes for households of size one to seven, based on expenditures in winter 199-91 prices, are presented in Table 3. As noted earlier, the parameter c (here equal to -1, 0, 1, and 2) summaries the sensitivity of the inequality index in different parts of the expenditure distribution: the more positive (negative) c is, the more sensitive the index is to differences at the top (bottom) of the distribution. For both the U.S. and Spain, inequality is greater when c=-1 than when c=0, and also when c=2 versus c=1. In general, inequality in Spain is greatest when c=2 across household sizes. For the U.S., inequality is greatest when c=-1 or c=2, with greater values for c=-1 for households with three, four, five, or seven members. Inequality in the U.S. is less than inequality in Spain for one and two person households when c=-1, 0, or 1. Thus we could conclude that differences at the lower end of the distribution are greater for Spain than for the U.S. for

these households. When c=2, inequality is less in the U.S. for households with fewer than five persons. For these households we can surmise that the differences in expenditures at the top of the Spanish distribution are greater than the differences in expenditures at the top of the U.S. distribution.

The use of decomposable inequality measures facilitates our understanding of the results for the population as a whole. In particular, for the person weighted distributions (Table 4), within group inequality is smaller in Spain than in the U.S., while the results on overall inequality depend crucially on our assumptions about the importance of economies of scale (denoted by our scale adjustment factors). As the scale adjustment factor (Θ) varies from 0 to 1 and economies of scale tend to diminish, overall inequality in the U.S. is smaller, about the same, or considerably larger than in Spain. This difference is due to the between group differences in inequality.

Concerning the influence of prices, our results reveal that changes in relative prices from the winter of 1981 to the winter of 1991 are pro-poor in both countries (Table 5). This means that from the point of view of winter 1981, the amount that we would need to give to richer households to compensate them for inflation would be greater than the amount that we would need to give to poorer households for them to remain at the same level of welfare. However, in Spain the strength of this phenomenon decreases with household size, while the opposite is the case in the U.S. The percentage difference in inequality in the U.S. 1990-91 expenditure distribution relative to the Spanish one is rather robust to the choice of the reference price vector. The percentage differences in inequality in the U.S. relative to Spain are sensitive to household size and to our choice of

the scale adjustment factor. For households of size 1 or 2 and when the scale adjustment factor equals 0.0 or 0.3, inequality is greater in Spain.

Recall that welfare is equal to mean expenditures corrected by a factor related to inequality. For the welfare analysis, we use the Theil inequality index with c=1. In Table 6 we present overall welfare for households with one to seven members. For this table, unadjusted expenditures are used. The differences in welfare exhibit the same pattern as for the means presented in Table 2. Welfare is greater in the U.S. than in Spain for all households with the exception of those with six members.

Not surprisingly, results presented in Table 7 indicate greater overall welfare for households in the U.S. as compared to those in Spain regardless of the value of Θ. The greatest percentage of this difference is due to differences in within group inequality. Between group inequality is greater in Spain than in the U.S. when Θ = 0.0 or 0.3. Thus, for the U.S.-Spanish case, we conclude that between group inequality is sensitive to the assumption about economies of scale.

The influence of changing prices on welfare can be examined using the results presented in Table 8. The change in welfare is a function of the ratio of the change in mean expenditures and the change in inequality when inequality is defined as the Theil index with the parameter c=1. When changes in prices are greater in the U. S. relative to Spain, the ratio of the differences in means will be less than one. Since inequality, as measured by the Theil index with c=1, is dependent upon the scale adjustment factor, the ratio of the differences in inequality in the U.S may be less than, equal to, or greater than inequality in Spain. If the index value is greater in period two than in period one, then prices can be considered to be pro-poor. Thus we cannot predict the whether the

differences in welfare are greater in the U.S. than in Spain when prices from one period are used versus those from another period. The ratio of the means is the impact of inflation on mean expenditures, the inequality indexes, and welfare.

As seem in Table 8, for all adjusted expenditures, inflation is greater over the 1981 to 1991 period in Spain than in the U.S. The impact on welfare is slightly less. Inequality in 1981 and 1991 for both countries is similar. However, in contrast to the impact on means, the impact of inflation on inequality is marginally greater in the U.S. than in Spain. The result of these divergent influences of inflation are reflected in the ratios of welfare at the two price vectors.

The ratios of the changes in the means, indexes, and welfare from 1981 to 1991 are presented in the last two columns of the Table 8. When the ratio is less than one, the impact of price change in the U.S. is less than the impact of price change in Spain. Our results reveal that the effect of price change in the U.S. is greater in the U.S. than for Spain for the means and for overall welfare. However, the influence on inequality is in the opposite direction.

V. SUMMARY AND CONCLUSIONS

The purpose of this research was to examine the role of demographics and household specific price indices on expenditure based inequality and welfare comparisons for Spain and the U.S. Equivalence scales were assumed to depend only on household size. The 1990-91 expenditure distributions in both countries were expressed at winter of 1991 and winter of 1981 prices. Our results show that differences in demographic factors can be very important in international comparisons. We find that inequality and welfare

comparisons are drastically different for smaller and larger households. Given this diversity, decomposable measurement instruments help to explain how results at the household size level get translated at the population level. In terms of the influence of relative prices on inequality, for both countries, prices are pro-poor. This implies that we would need to give more income to richer households than to poorer households to compensate them for inflation, over the 1981 to 1991 period. Because the distributional impact of relative prices is of a comparable order of magnitude, our inequality comparisons are robust to the choice of the reference price vector. When examining the impact of changes in overall welfare over time and across the two countries, we found less change in the U.S. in means and overall welfare, but greater changes in inequality.

In future analyses we plan examine the impact on inequality and welfare of demographic changes across partition subgroups (due to shifts in subgroup population shares over time), in addition to the impact due to differences in tastes and preferences as reflected in expenditures from an earlier period of time. Decompositions by other demographic subgroups would also be useful in helping us understand the differences that we obtain for Spain and the U.S.

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Table 1. Population Distributions and Mean Household Expenditures by Household Size in Spain and the United States
1990-91 Distributions, Expenditures in Winter 1991 Prices
Expenditures in U.S. Dollars Based on EKS Purchasing Power Parities

Household Size	Population Distribution of Persons		Population Distribution of Households		Mean Household Expenditures		
	Spain	United States	Spain	United States	Spain	United States	% difference
1	2.9	10.3	10.0	26.78	$9,993.24	$15,726.00	57.4
2	13.1	23.4	22.3	30.34	15,417.42	25,126.74	63.0
3	18.3	19.8	20.8	17.08	21,702.08	27,970.45	28.9
4	29.3	23.7	25.0	15.35	26,646.48	30,664.80	15.1
5	19.4	12.7	13.2	6.61	28,016.07	31,646.61	13.0
6	9.6	5.4	5.4	2.34	29,785.21	29,005.84	-2.6
7	4.5	2.1	2.2	0.78	30,056.00	37,382.72	24.4
	97.1	97.4	98.9	99.28			

EKS purchasing price parity conversion factor is 108.9 Spanish pesetas to $1 U.S. for 1991
% difference=((U.S.-Spain)/Spain)*100

Table 2. Mean Adjusted Household Expenditures for All Households in Spain and the United States 1990-91 Distributions, Expenditures in Winter 1991 Prices

Expenditures in U.S. Dollars Based on EKS Purchasing Power Parities

Scale Adjustment Factor	Person Weighted Mean Household Expenditures			Household Weighted Mean Household Expenditures		
	Spain	United States	% difference	Spain	United States	% difference
0.0	$24,727.08	$27,643.47	11.8	$21,958.12	$24,642.51	12.2
0.3	16,229.58	19,498.38	20.1	15,218.54	18,928.60	24.4
0.5	12,355.62	15,656.51	26.7	12,052.83	16,122.20	33.8
0.7	9,471.01	12,711.96	34.2	9,639.08	13,903.28	44.2
1.0	6,445.01	9,504.06	47.5	7,031.38	11,393.82	62.0

EKS purchasing power parity conversion factor is 108.9 Spanish pesetas to $1 U. S. for 1991

% difference=((U.S.-Spain)/Spain)*100

Table 3. Relative Inequality Indexes by Household Size for Spain and the United States, 1990-91 Distributions of Household Expenditures in Winter 1991 Prices

Household Size	Theil (-1)	Theil (0)	Theil (1)	Theil (2)
		Spain		
1	0.315	0.243	0.244	0.323
2	0.207	0.177	0.181	0.230
3	0.149	0.128	0.131	0.159
4	0.146	0.128	0.133	0.172
5	0.142	0.122	0.122	0.141
6	0.159	0.128	0.131	0.161
7	0.143	0.122	0.117	0.127
		United States		
1	0.208	0.164	0.163	0.222
2	0.156	0.136	0.140	0.175
3	0.163	0.133	0.129	0.145
4	0.151	0.127	0.124	0.140
5	0.171	0.148	0.156	0.210
6	0.200	0.158	0.165	0.222
7	0.192	0.162	0.160	0.184
	% difference between the United States and Spain			
1	-34.0	-32.5	-9.0	-49.4
2	-24.7	-23.1	-3.4	-39.0
3	9.4	3.7	10.9	-19.2
4	3.5	-0.8	5.6	-27.8
5	20.1	21.2	72.0	10.1
6	25.9	23.7	69.6	2.7
7	34.2	32.6	56.8	25.5

% difference=((U.S.-Spain)/Spain)*100

Table 4. Relative Inequality (Theil c=0) Indexes of 1990-91 Distributions of Adjusted Household Expenditures in Winter 1991 Prices All Households in Spain and the United States

(person weighted)

Scale Adjustment Factor	Inequality in Spain					Inequality in the United States					% difference between the United States and Spain		
		Within Group		Between Groups			Within Group		Between Groups				
	Overall		% of total		% of total	Overall		% of total		% of total	Overall	Within Group	Between Groups
0.0	0.166	0.136	81.8	0.030	18.2	0.161	0.140	86.9	0.021	13.0	-3.2	2.9	-30.8
0.3	0.145	0.136	93.7	0.009	6.3	0.144	0.140	97.0	0.004	3.0	-0.6	2.9	-52.5
0.5	0.139	0.136	97.9	0.003	2.1	0.146	0.140	95.6	0.006	4.4	5.4	2.9	122.0
0.7	0.140	0.136	97.4	0.004	2.6	0.160	0.140	95.6	0.020	13.4	4.9	2.9	451.6
1.0	0.155	0.136	88.1	0.018	11.9	0.201	0.140	69.6	0.061	30.4	30.3	2.9	231.9

For text later: At winter 1981 prices, the within group change marginally favors the U.S. (% difference between the U.S. and Spain is negative), contrary to what happens at winter 1991 prices.

Table 5. Changes in Relative Inequality (Theil c=0) Based on 1990-91 Distributions of Household Expenditures in Winter 1981 Prices and Winter 1991 Prices by Household Size and for All Households in Spain and the United States

Household Size	% change in 1990-91 Distribution Inequality at Both Price Vectors (Winter 1981 and Winter 1991)		% difference in Inequality between the United States and Spain	
	Spain	United States	Winter 1981 Prices	Winter 1991 Prices
1	3.7	1.5	-31.0	-32.5
2	3.6	1.8	-21.7	-23.1
3	3.0	4.4	2.2	3.7
4	1.9	5.6	-4.4	-0.8
5	3.5	5.4	19.1	21.2
6	1.5	5.1	19.5	23.7
7	2.6	8.3	25.6	32.6
All Households (person weighted) Scale Adjustment Factor				
0.0	3.1	2.2	-2.4	-3.2
0.3	3.1	3.5	-1.0	-0.6
0.5	2.8	4.2	4.0	5.4
0.7	2.4	4.6	12.0	14.4
1.0	1.6	4.4	26.8	30.3

% change=((1991-1981)/1981)*100

% difference=((U.S.-Spain)/Spain)*100

Table 6. Overall Welfare (Theil c=1) by Household Size Based on 1990-91 Distributions of Unadjusted Household Expenditures in Winter 1991 Prices in Spain and the United States
(person weighted)

Household Size	Spain	United States	% difference between the United States and Spain
1	$7,552.91	$13,159.99	74.2
2	12,623.77	21,600.89	71.1
3	18,867.20	24,365.14	29.1
4	23,102.40	26,859.48	16.3
5	24,590.56	26,723.39	8.7
6	25,891.05	24,215.68	-6.5
7	26,528.68	31,412.34	18.4

Table 7. Overall Welfare (Theil c=1) Based on 1990-91 Distributions of Adjusted Household Expenditures in Winter 1991 Prices All Households in Spain and in the United States

Expenditures in U.S. Dollars Based on EKS Purchasing Power Parities

(person weighted)

Scale Adjustment Factor	Welfare in Spain					Welfare in United States					% difference between the United States and Spain		
		Within Group	% of total	Between Groups	% of total		Within Group	% of total	Between Groups	% of total			
	Overall					Overall					Overall	Within Group	Between Groups
0.0	$20,748.78	$21,411.95	103.2	$663.16	3.2	$23,212.13	$23,757.05	102.3	$544.92	2.3	11.9	11.0	-17.8
0.3	13,885.10	14,021.83	101.0	136.73	1.0	16,679.46	16,762.07	100.5	82.60	0.5	20.1	19.5	-39.6
0.5	10,620.52	10,655.68	100.3	35.16	0.3	13,362.29	13,458.17	100.7	95.88	0.7	25.8	26.3	172.7
0.7	8,118.73	8,151.08	100.4	32.36	0.4	10,687.04	10,923.62	102.2	236.59	2.2	31.6	34.0	631.2
1.0	5,411.52	5,526.35	102.1	114.84	2.1	7,602.38	8,159.77	107.3	557.38	7.3	40.5	47.7	385.4

EKS purchasing price parity conversion factor is 108.9 Spanish pesetas to $1 U.S. for 1991

% difference=((U.S.-Spain)/Spain)*100

Table 8. Means, Overall Inequality (Theil c=1), and Welfare from 1981 to 1991 Based on 1990-91 Distributions of Household Adjusted Expenditures in Spain and the United States (all households, person weighted)

Scale Adjustment Factor	Means				Ratio of Means Winter 1981 to Winter 1991		Ratio of Change in Means from 1981 to 1991 for the U.S. versus Spain
	Spain		United States		Spain	United States	
	1981 prices	1991 prices	1981 prices	1991 prices			
0.0	$15,892.33	$24,727.08	$18,327.48	$27,643.47	1.556	1.508	0.969
0.3	10,438.47	16,229.58	12,908.400	19,498.38	1.555	1.511	0.972
0.5	7,950.82	12,355.62	10,354.590	15,656.51	1.554	1.512	0.973
0.7	6,097.75	9,471.01	8,398.580	12,711.96	1.553	1.514	0.974
1.0	4,152.93	6,445.01	6,269.350	9,504.06	1.552	1.516	0.977
	Theil Index (c=1)				Ratio of Indexes Winter 1981 to Winter 1991		Ratio of Change in Indexes from 1981 to 1991 for the U.S. versus Spain
	Spain		United States		Spain	United States	
	1981 prices	1991 prices	1981 prices	1991 prices			
0.0	0.157	0.161	0.156	0.160	1.026	1.027	1.001
0.3	0.141	0.144	0.139	0.145	1.025	1.039	1.014
0.5	0.137	0.140	0.140	0.147	1.023	1.045	1.021
0.7	0.140	0.143	0.152	0.159	1.020	1.047	1.026
1.0	0.158	0.160	0.192	0.200	1.014	1.044	1.029
	Overall Welfare				Ratio of Welfare Winter 1981 to Winter 1991		Ratio of Change in Welfare from 1981 to 1991 for the U.S. versus Spain
	Spain		United States		Spain	United States	
	1981 prices	1991 prices	1981 prices	1991 prices			
0.0	$13,400.09	$20,748.74	$15,467.79	$23,212.13	1.548	1.501	0.969
0.3	8,967.48	13,885.05	11,112.48	16,679.46	1.548	1.501	0.969
0.5	6,859.57	10,620.52	8,902.02	13,362.29	1.548	1.501	0.969
0.7	5,244.25	8,118.74	7,120.23	10,687.04	1.548	1.501	0.970
1.0	3,496.14	5,411.48	5,067.25	7,602.38	1.548	1.500	0.969

ratio of price change = 1991/1981

ratio of change in mean, inequality, and welfare = U.S./Spain

Appendix Table. Distribution of All, One, and Two Person Households by Age of Household Head Spain and the United States, 1990-91

	Spain			United States			difference between the United States and Spain		
Age of Head	All Households	One Person Households	Two Person Households	All Households	One Person Households	Two Person Households	All Households	One Person Households	Two Person Households
<21 years	0.2	0.3	0.2	2.7	7.1	1.3	2.5	6.8	1.1
21-25 years	1.8	1.1	2.6	6.5	9.4	6.2	4.7	8.3	3.6
26-30 years	5.5	4.1	5.4	10.0	9.1	8.1	4.5	5.0	2.7
31-35 years	9.3	3.1	4.1	11.6	7.7	7.3	2.3	4.6	3.2
36-40 years	9.4	2.2	2.6	11.2	6.8	7.0	1.8	4.6	4.4
41-45 years	10.7	2.4	2.3	10.7	6.8	7.0	0.0	4.4	4.7
46-50 years	9.4	2.2	2.8	8.5	4.5	6.9	-0.9	2.3	4.1
51-55 years	9.3	4.4	4.8	6.1	4.0	7.9	-3.2	-0.4	3.1
56-60 years	11.1	7.9	10.5	6.3	4.6	9.4	-4.8	-3.3	-1.1
61-64 years	8.1	8.4	12.0	5.6	5.5	8.7	-2.5	-2.9	-3.3
65 and + years	25.0	63.8	52.7	20.8	34.4	30.1	-4.2	-29.4	-22.6

difference=United States-Spain