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

Thesia I. Garner,* Javier Ruiz-Castillo,† and Mercedes Sastre‡

Previous research has suggested that inequality is lower in Spain than in the United States when it is based on income. For the present article, both inequality and social welfare are examined, with household consumption expenditures used as a proxy for household welfare. For tractability, equivalence scales depended only on the number of people in the household. Household-specific price indices were used to express the 1990–1991 expenditure distributions in 1981 and 1991 winter prices. Our results reveal that inequality and welfare comparisons are drastically different for smaller and larger households. When all households are considered, the two-country comparison suggests that the income inequality ranking can only be maintained for expenditure distributions when economies of scale are small or nonexistent. However, welfare is always higher in the United States than in Spain. Because inflation during the 1980s in both countries was essentially distributionally neutral, all results appear to be robust to the choice of time period.

1. Introduction

Recent international comparisons of economic well-being that have focused on individuals and households have two characteristics. First, perhaps because of the availability of data,

* Thesia I. Garner, Division of Price and Index Number Research, U.S. Department of Labor, Bureau of Labor Statistics, Postal Square Building, Room 3105, 2 Mass. Ave., N. E., Washington, D.C. 20212; E-mail: Garner_T@BLS.GOV (corresponding author).

† Javier Ruiz-Castillo, Departamento de Economía, Universidad Carlos III, 28903-Getafe, Spain; E-mail: jrc@eco.uc3m.es.

‡ Mercedes Sastre, Departamento de Economía Aplicada VI, Universidad Complutense de Madrid, Campus de Somosaguas, 28223 Madrid, Spain; E-mail: msastre@ccee.ucm.es.

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household[1] income has been most frequently used as the proxy for household economic well-being. Second, most studies have concentrated on income inequality comparisons.[2] An important finding from these international studies is that, during the late 1980s and early 1990s, the United States had the least equal distribution of household income among all industrialized countries (Atkinson, Rainwater, and Smeeding 1995; Gottschalk and Smeeding 1997, 2000).

Slesnick (1991, 1993), however, pointed out that, ideally, we should characterize economic well-being in terms of commodity consumption. Without entering the discussion of income versus consumption as proxies of economic well-being, it is fair to say that both deserve investigation. The important fact in this respect is that, for the United States, the consequences of using consumption-based measures have been dramatic. First, the level and trend of Slesnick's (1991) series of aggregate total expenditures from 1949–1989 differed substantially from those of before-tax income. Second, the substitution of total expenditures for income usually results in lower estimated poverty rates (Slesnick 1993; Garner, Johnson, and Kokoski 1996). Third, the distribution of household expenditures is substantially more equal than the distribution of income in the United States (Johnson and Shipp 1997).[3]

To examine whether results of consumption-based studies of household economic well-being provide the same ranking of countries as those based on income, international comparisons are needed. Such studies are not easy to conduct because, unlike for income,[4] there is no data source for which consumption expenditure data have been made comparable across countries. However, when microhousehold expenditure data are available to researchers, such comparisons are possible. This is the case in the present article, where the availability of household expenditure data for Spain and the United States presents us with a rare occasion to deal with the problems that plague international comparisons.

The comparison between Spain and the United States is also interesting for two additional reasons. First, as far as recent trends are concerned, inequality increased in the United States during the 1980s, regardless of the measure of well-being considered. However, the change in consumption-based inequality was smaller than the change in income inequality when using household expenditure survey data (Cutler and Katz 1992; Johnson and Shipp 1997). In contrast, over a similar period (1973–1974 to 1990–1991), household expenditure and income inequality fell in Spain (Ruiz-Castillo 1995; Del Río and Ruiz-Castillo 2001a, b). However, like for the United States, the change was greater for income inequality than for expenditure inequality in Spain (Alvarez Aledo et al. 1996).

Second, using microdata from household budget surveys, it has been found that in Spain, as in Portugal and the United Kingdom, income inequality is less than expenditure inequality.[5] General economic intuition would suggest that the greater prevalence of transitory components in current

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[1] The term "household" can be read also as "family" or "consumer unit" for the purposes of this research, although conceptually they can differ.

[2] Welfare comparisons are rare even at the country level. For some exceptions, see Jenkins (1991) for the United Kingdom, Bishop and Smith (1991) for the United States, and Ruiz-Castillo (1998) for Spain. For international comparisons of welfare, see Tsakloglou (1992) and Ruiz-Huerta, Martinez, and Ayala (1999).

[3] This result is not unique to the United States. Studies that have used data from expenditure survey found income inequality to be greater than consumption-based inequality in other developed countries, such as Canada (Pandakur 1998) and Australia (Barrett, Crossley, and Worswick 2000), and also in developing countries such as Bangladesh (Wodon 1999) and Taiwan (Deaton and Paxson 1994).

[4] The Luxembourg Income Study (LIS) includes data sets for which income has been made as comparable as possible across countries. See the LIS web site for more information at: www.lisproject.org.

[5] See Sastre (1999) for Spain, Gouveia and Tavares (1995) for Portugal, and Goodman and Webb (1995) and Deaton and Paxson (1994) for the United Kingdom. This is also the case in the Czech and Slovak Republics, where income and expenditures data are from household budget surveys. According to Garner (1998), this result might be explained by fundamental differences in economic systems and economic behavior in these two countries in the midst of a deep economic and political transition. However, these reasons cannot explain the situation in countries such as Portugal, Spain, and the United Kingdom.

income, relative to current expenditures, should lead to greater income than expenditure inequality, which was reported earlier for the United States. These conflicting results raise questions about previous international comparisons based on current population survey income data for the United States and income data from household budget surveys for Portugal, Spain, and the United Kingdom. In particular, according to Gottschalk and Smeeding (1997), income inequality was less in Spain than in the United States during the earlier 1990s. Whether this ranking remains the same when expenditure inequalities are compared is one of the questions addressed here.

We compared inequality and social welfare in Spain and the United States using current household consumption expenditures as the measure of economic well-being. The Spanish data are from the *Encuesta de Presupuestos Familiares* (EPF), conducted by the *Instituto Nacional de Estadística* (INE). Data for the United States are from the Consumer Expenditure Survey (CE), a Bureau of Labor Statistics (BLS) survey. Data from 1990–1991, the latest year for which information was available for Spain, were used for both countries. Although the survey methodologies differ in some respects, expenditures were defined as comparably as possible, and the same research methodology was used to conduct the comparison.

A focus of the study is the role of demographics and household-specific price indexes for the measurement of economic well-being. Their influence on the economic well-being rankings of the two countries was examined. The present study adds to the emerging basic literature on consumption-based measures of inequality and social welfare and introduces the role of relative price changes in international comparisons of distributional analysis.

Our results suggest that differences in demographic factors can be very important in international comparisons. For Spain and the United States, consumption-based inequality and social welfare are dramatically different for smaller and larger households. As a consequence, differences in economic well-being in Spain and the United States also strongly depend on the assumptions made about economies of scale within households for consumption and expenditures. There are three main findings of our study. (1) When greater economies of scale are assumed, overall inequality in the United States is less than in Spain. In contrast, fewer economies of scale result in greater overall inequality in the United States compared with Spain (about 15–40% higher, depending on which inequality index is used). However, differences are only statistically significant when economies of scale are assumed to be small or nonexistent. (2) Welfare is always significantly higher in the United States, but the gap between the two countries increased continuously from 12% to 41% as economies of scale decreased. (3) Inflation during the 1980s in both countries has been essentially neutral from a distributional point of view, so all results appear to be robust to the choice of time period.

The remainder of the article is organized into four sections and an Appendix. Section 2 includes background information, and section 3 presents a description of the methods and data. Section 4 includes the empirical results, and section 5 provides the conclusion. The Appendix is devoted to a brief description of the data for comparative purposes.

2. Background

Spain and the United States are rather different with respect to their economies, economic systems, and demographic compositions. Such differences are expected to contribute to differences in the economic well-being of the countries' populations and, thus, to their well-being rankings.

Spain has a smaller economy and has only recently moved to a more market-oriented system. In contrast, the United States has quite a large economy and has been rather open and market-oriented for

most of its history. Since the mid-1970s, Spain has been experiencing a strong process of economic modernization and liberalization, including full membership into the European Union (EU) in 1986 and becoming one of the founding states of the European Monetary Union in 1999. This process has resulted in a much more dynamic, open, and market-oriented economy than it was before the Union. For example, the share of the agricultural sector in Spain declined from 38.7% of GDP in the 1960s to 8.3% in 1997. In contrast, the services sector share surged from 31.0% to almost 61.7% of GDP during the same period. Likewise, the degree of openness, measured by the share of exports plus imports in GDP, increased from 8.4% in the 1960s to about 29.5% in 2000. Overall, from 1986 to 1996, Spanish GDP per capita rose from 48.7% to 54.2% of U.S. GDP per capita. (For a detailed description of the development of the Spanish economy over the past four decades, see Martín 1999 and Myro 2001.)

Since the mid-1970s, Spain has been taking important steps toward a fully fledged comprehensive social safety net, in the European style, whereas that of the United States is much more limited (see U.S. Dept. of Health and Human Services 1998). Thus, public sector expenditures, as a percentage of GDP, rose from 14.8% in 1960 to 40.7% in 2000 for Spain. In contrast, the percentage for the United States increased from 27.0% to 31.7% during the same time period.

Tax structures in the two countries are also rather different, and this too can contribute to differences in economic well-being in the two countries. A modern income tax system was not operative in Spain until 1978. However, since then, the minimum and maximum tax rates in the graduated personal income tax system, as well as the number of tax brackets, have been greater in Spain than in the United States (see Gago 2000). Both countries have excise taxes, but Spanish EU membership led to the introduction in 1986 of a tax system that includes a multistage value-added national tax. In contrast, a primarily single-stage sales tax system in the United States exists, with taxes collected at the state and local levels.

The demographic structures of the two countries are also quite different. In contrast to the United States, Spanish households include more members, on average, and are more likely to include multiple generations. In Spain, many young adults live with their parents, and more elderly people live with their children. Also, single-person and single-parent households are less prevalent in Spain than in the United States.

Reflecting both the economic and demographic characteristics of Spain and the United States, inequality differs in the two countries, and welfare is expected to differ as well. As was pointed out in the introduction, recent trends reflect both income and expenditure inequality moving in opposite directions for the two countries. More importantly, contrary to what has been found for the United States, in Spain, income is more equally distributed than expenditures. As was noted earlier, Gottschalk and Smeeding (1997) reported less income inequality for Spain than for the United States during the early 1990s. Therefore, it is important to determine whether the relationship between the two countries is the same when consumption expenditures rather than income are used as a proxy of well-being.

3. Methods and Data

Rigorous international comparisons require high standards of comparability in the definition of a household welfare measure. The present article constitutes an attempt to meet those standards, starting from the best available household budget information in the two countries: the EPF in Spain and the CE in the United States, and following through with the same methodology. In this section, methodological challenges faced by researchers conducting international comparisons of economic

well-being are highlighted, followed by a detailed description of the specific methods and data used for our study.

Issues of International Comparisons

Like intertemporal comparisons of income inequality and welfare in a single country, international comparisons of expenditures require the solution to five classical problems: (i) how to make comparable the money distributions across areas, (ii) how to make comparable two heterogeneous populations consisting of households with different needs, (iii) which measurement instruments to use among the admissible inequality measures, (iv) which measurement instruments to use among the admissible welfare measures, and (v) how to determine whether the estimated differences are statistically significant.

In addition, a primary concern for such comparisons is time period. Suppose that both country expenditure distributions are expressed at constant prices for the same point in time. Expenditure inequality comparisons would reflect not only differences in the quantities of goods and services purchased for consumption but also the differences in price structures prevailing in each country. Ideally, to express the quantity vectors reflecting purchases in both countries at common prices, it would be desirable to have a spatial price index relating, say, prices in the United States to prices in Spain. Such a price index is not available. As an alternative, in the present article, household-specific price indices are used to express each country's quantity vector in prices for two different time periods. With these indices, it is possible to determine the role of inflation in the two countries and any subsequent impact on comparative inequalities. For instance, if richer households in the United States experience a greater rate of inflation than do poorer households but the opposite situation exists for Spain, expenditure inequality and welfare comparisons would certainly be influenced by the choice of time period. Thus, there are reasons to study how robust expenditure inequality and welfare comparisons are to the choice of the time period used to express the expenditure distributions at constant prices. This aspect of international comparisons has not been dealt with in the literature before.

In the present article, the 1990–1991 household expenditure distribution in each country is expressed using constant prices (based on dollars for the United States and pesetas for Spain) for two different periods: winter 1981 and winter 1991. Winter covers the months January, February, and March. The fact that expenditure distributions are expressed in their own currencies does not affect inequality comparisons that use relative inequality indexes. However, for welfare comparisons, currencies are important, so the Spanish distributions are expressed in U.S. dollars, using purchasing power parities (PPPs).

To solve the difficulties arising from the demographic heterogeneity in international comparisons, researchers usually start by partitioning the household population into equivalent subgroups from the point of view of needs. These subgroups form what we refer to as the *basic partition*. Then, a single set of equivalence scales is usually used to make interpersonal welfare comparisons among the partition subgroups. In the present article, the quest for robustness began by investigating whether inequality in Spain, for example, was unambiguously smaller for all subgroups of the basic partition than it was for the United States. In addition, independent of the answer to this question, statements for the population as a whole are usually desirable. For this purpose, different equivalence scales were used to pool the expenditures of households belonging to the basic partition subgroups into a unique distribution of household equivalent expenditures. Whether the results at the population level are robust to the choice of equivalence scales was examined.

To make the analysis tractable, it was assumed that equivalence scales depend only on the number of people in the household. Following the methods of Buhmann et al. (1988) and Coulter, Cowell, and Jenkins (1992a, b), a parametric model of equivalence scales, which allows for different views about the importance of economies of scale in consumption within the household, was used.[6] To clarify the passage from the partition by household size to the population level, it was illuminating to work with additively decomposable measurement instruments. In this way, expenditure inequality differences between the United States and Spain could be accounted for in terms of two factors: within-group and between-group inequality. Differences in within-group inequalities are due to differences in subgroup inequality values and subgroup population shares. Differences in between-group inequalities are due to relative differences in subgroup means. In addition, following a suggestion in Coulter, Cowell, and Jenkins (1992a) and developed in Del Río and Ruiz-Castillo (2001a), a method was used to ensure that only the second of the above factors depended on the equivalence parameter. Thus, differences in within-group inequality across countries are independent of how large economies of scale are assumed to be.

As in most welfare analyses (e.g., Shorrocks 1983; Slesnick 1998), social or aggregate welfare was expressed in terms of two statistics of the income (or expenditure) distribution: the mean and an index of relative inequality. As a consequence, it was natural to work with social evaluation functions that permit the explanation of welfare differences in terms of differences in the mean and differences in relative inequality. In addition, for reasons explained later in this section, we were interested in social evaluation functions that penalize the inequality between the subgroups of the basic partition. As in the inequality case, additively decomposable social evaluation functions with those two features have been found to be useful in intertemporal welfare comparisons within a single country (see Ruiz-Castillo 1998). In the present article, these methods were shown to be equally useful for international comparisons, particularly when considerable welfare and demographic intercountry differences exist among the subgroups in the partition by household size.

Bootstrap methods were used throughout to obtain confidence intervals for all estimates, as in Mills and Zandvakili (1997).[7] Finally, following the method of Cowell, Litchfield, and Mercader-Prats (1999), the robustness of the inequality results were checked using systematic trimming at both ends of the household expenditure distributions.

Methods

Interpersonal Comparisons of Welfare

Assume that there is a population of $h = 1 - H$ households whose levels of living can be adequately represented by a one-dimensional variable that will be called expenditure,[8] x^h. Households can differ in expenditures and/or a vector of household characteristics. As was indicated previously, the partition by household size is taken to be the basic partition. Households of the same size are assumed to have the same needs; therefore, their expenditures are directly comparable. Larger

[6] For the use of this model in international comparisons, see Atkinson, Rainwater, and Smeeding (1995). For other recent papers that stress the issue of the sensitivity of international poverty comparisons to the choice of equivalence scales, see Burkhauser, Smeeding, Merz (1996); De Vos and Zaidi (1997); and Duclos and Mercader-Prats (1999).

[7] The dominance approach, as presented by Shorrocks (1983), could have been used for the inequality and welfare comparisons, along with the statistical inference procedures developed by Bishop, Formby, and Thistle (1989) and Bishop, Chakraborty, and Thistle (1994).

[8] The methods described in this section are applicable to any one-dimensional variable representing a household's level or standard of living. Given the actual data used in this article, that variable has been called "expenditure."

households have greater needs but also greater opportunities to achieve economies of scale in consumption. Assume that there are $m = 1, \ldots, M$ household sizes. Welfare comparisons across households of different size are made according to the following model of equivalence scales, first used by Buhmann et al. (1988) and Coulter, Cowell, and Jenkins (1992a, b). For each household h of size m, adjusted expenditure is defined by

$$z^h(\Theta) = x^h/m^\Theta, \quad \Theta \in [0, 1]. \tag{1}$$

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 the equivalence elasticity Θ, the smaller the economies of scale in consumption, in other words, the larger the number of equivalent adults. In particular, when $\Theta = 0$, economies of scale are assumed to be infinite and adjusted consumption coincides with unadjusted household expenditures, whereas if $\Theta = 1$, there are no economies of scale, and adjusted expenditures become per capita household expenditures.

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

$$I[z^m(\Theta)] = I[\boldsymbol{x}^m/m^\Theta] = I(\boldsymbol{x}^m). \tag{2}$$

Thus, within each subgroup with the same needs, households of size m, this model implies that the inequality of adjusted expenditure is equal to the inequality of original expenditure, independent of individual preferences and prices.

This is possibly the simplest and most convenient of all interesting equivalence-scale models.[9] Household size is undeniably a crucial characteristic underlying all models; the scheme adopted is widely used, and it allows for a wide range of assumptions about the importance of economies of scale. Moreover, this model combines very well with the decomposition procedure introduced in the next subsection, in which the effects of changing the value of Θ are conveniently isolated in a single term.

In welfare economics, the focus is on individual economic well-being and welfare rather than that of households. Thus, following standard practice for overall inequality and welfare measurement, household-adjusted expenditures were weighted by the number of people in the household—in other words, each person was assigned the adjusted expenditure of the household to which he or she belonged.

Inequality Measurement

An inequality index is said to be decomposable by population subgroups if the decomposition procedure of overall inequality into a within-group and a between-group term is valid for any arbitrary population partition. 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 population subgroups (e.g., Shorrocks 1980, 1984). The family can be described by means of the following convenient cardinalization:

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

where $\mu(\cdot)$ is the mean of the distribution. The parameter c summarizes the sensitivity of I_c, the inequality index, in different parts of the expenditure distribution. The more positive (negative) c is,

[9] For two-parameter empirical models that take into account household composition, see Cutler and Katz (1991) and Jenkins and Cowell (1994). For a critical survey of econometric and other methods, see Coulter, Cowell, and Jenkins (1992a).

the more sensitive I_c is to differences at the top (bottom) of the distribution (Cowell and Kuga 1981). When $c = 0$, 1, the following results:

$$I_0[z(\Theta)] = (1/H) \sum_h \ln\{\mu[z^h(\Theta)/z^h](\Theta)\}. \tag{4}$$

$$I_1[z(\Theta)] = (1/H) \sum_h \{z^h(\Theta)/\mu[z^h(\Theta)]\} \ln\{z^h(\Theta)/\mu[z^h(\Theta)]\}. \tag{5}$$

I_0 is the mean logarithmic deviation, and I_1 is the original Theil index. Coulter, Cowell, and Jenkins (1992a, b) have shown how the inequality estimates provided by the GE family vary systematically with the parameter Θ that captures the generosity of the scale. They illustrate their analysis with U.K. data.[10] However, the information about the equivalence scale can be incomplete or incorrect. For example, household size may not adequately account for differences in the needs of household members. The GE family is quite useful for isolating the impact or "contamination" on the inequality orderings that can arise when this situation exists. To see this, consider the formula for the GE index when it is written in decomposable form for the partition by household size:

$$I_c[z(\Theta)] = \sum_m [\nu^m(\Theta)]^c (p^m)^{1-c} I_c[z^m(\Theta)] + I_c[\mu^1(\Theta), \ldots, \mu^M(\Theta)], \tag{6}$$

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

$$I_0[z(\Theta)] = U + C(\Theta), \tag{7}$$

where

$$U = \sum_m p^m I_0(x^m) \tag{8}$$

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

$$C(\Theta) = I_0[\mu^1(\Theta), \ldots, \mu^M(\Theta)] \tag{9}$$

is the between-group inequality that depends on Θ, the scale-adjustment factor. The between-group inequality component is referred to as "contaminated," because this part of the inequality decomposition will change with different values of the scale-adjustment factor. Regardless of the scale-adjustment factor applied, the within-group inequality component of the decomposition will not be affected; thus, the term uncontaminated is used.

Welfare Measurement

A social evaluation function (SEF) is a real valued function S defined in the space R^H of adjusted expenditures, with the interpretation that, for each expenditure distribution $\boldsymbol{x} = (x^1, \ldots, x^H)$, $S(\boldsymbol{x})$

[10] This has been confirmed in other countries. For Portugal, see Rodrigues (1993). For Spain, see Ruiz-Castillo (1995) for the period 1973–1974 to 1980–1981. For Spain and the United States during the period 1980–1981 to 1990–1991, see section 4 of this article.

provides the "social" or, simply, the aggregate welfare from a normative point of view. Consider SEFs that satisfy the requirements discovered by Dutta and Esteban (1992) for expressing welfare as a function of the mean and an index of relative inequality, $I(.)$. In addition, assume a multiplicative trade off between the mean and inequality—that is,

$$S(x) = \mu(x)[1 - I(x)]. \tag{10}$$

But which SEFs within these classes should be used in applied work? The following property leads to an appropriate selection. Suppose that there are two islands where expenditures are 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 (or expenditure) inequality theory, we search for additively separable measures capable of expressing this intuition. In this context, for any partition, it is interesting to express the population's social welfare as the sum of two terms. The sum is a weighted average of welfare within the subgroups, with weights equal to demographic shares minus a term that penalizes the inequality between subgroups. In this case, the SEF is said to be additively decomposable.

Consider SEFs that 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. Herrero and Villar (1989) showed that the only SEF among them with the property of additive decomposability with demographic weights is the following:

$$W(x) = \mu(x)[1 - I_1(x)] = \sum_m p^m W(x^m) - \mu(x) I_1(\mu^1, \ldots, \mu^M), \tag{11}$$

where I_1 is the original Theil index. Those authors also showed that $W(x) = \Sigma_i \alpha_i x_i$, where $\alpha_i = |1 - \ln(x_i/\mu_x)|/N$, so that individuals whose expenditures equal the population mean receive a weight equal to $1/N$, and individuals with expenditures above or below the mean receive weights increasingly smaller or greater, respectively, than $1/N$. 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.[11] Taking into account the definition of adjusted expenditures, we have

$$W[z(\Theta)] = A(\Theta) - B(\Theta), \tag{12}$$

where

$$A(\Theta) = \sum_m p^m [W(x^m)/m^\Theta], \tag{13}$$

and

$$B(\Theta) = \mu[z(\Theta)] I_1[\mu^1(\Theta), \ldots, \mu^M(\Theta)], \quad \in \Theta[0, 1]. \tag{14}$$

Equation 13 is the within-group welfare, and Equation 14 is the penalty associated with between-group inequality in the partition by household size.

As an alternative to this approach, Atkinson and Bourguinon (1987) took as given a social ranking of all subgroups from the point of view of increasing needs; for example, singles, couples, lone parents with children, and couples with children. Instead of using equivalence scales to make welfare comparisons across these demographic types, those authors developed dominance criteria to establish

[11] If we take the index I_c in Equation 3 with $c = 2$ and define the SEF as $S_2(x) = \mu(x)[1 - I_2(x)]$, then the weights in the within-group term in Equation 11 are the subgroups' income shares, a less desirable choice from a normative point of view. For all the remaining values of c, the weights in that expression do not even add up to 1.

whether one distribution is socially preferred to another. However, this procedure depends on the assumption of a utilitarian SEF of the form $W(\boldsymbol{x}) = \sum_i x_i$. Unfortunately, this SEF is not additively separable in the sense defined above and does not penalize the inequality between subgroups.

Data

For our study, data from national government household budget or consumer expenditure surveys were used. The Spanish data were from the EPF, conducted by the INE. The U.S. data were from the CE Interview (augmented with data from the Diary) from the BLS. The latest available EPF data were from April 1990–March 1991. Although more recent data were available for the United States, data from 1990–1991 were used, to match the Spanish time period as much as possible. (Additional information concerning both sets of data can be found in the Appendix, including the definition of expenditures.) For both surveys, data were collected from consumer or economic units (also referred to as a household here), defined as a collection of people sharing some expenditures and possibly living quarters.[12] When comparing results based on data from different surveys, comparability issues arose. For these two surveys, questions arose specifically regarding population coverage and survey methods, including sample selection and size. The role of survey methods in estimating annual expenditures and the definition of household current total expenditures as a measure of household economic well-being were at issue.

The U.S. population was defined as the total civilian noninstitutional population and a portion of the institutional population living in select group quarters. These group quarters included 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. For the U.S. CE, students living in university or college residences were considered separate consumer units even if they were economically dependent on the financial support of their parents or others. Only people living at the same residence at the time of the interview were counted as household members for data collection and analysis purposes. Financial and nonfinancial transfers to people who live outside the immediate household or consumer unit, including university and college students living away from home, were considered gifts in the CE. Expenditures for gifts of goods and services given to nonresident household members were included among those for the giving household for the present study, as in official BLS publications.

The Spanish population referred exclusively to the civilian noninstitutional population living in residential housing. Like for the U.S. CE, the Spanish EPF recorded the transfers made to household members who were dependent on household resources but lived elsewhere at the time of the interview among the giving household's expenditures. These members might live in institutional or collective housing—for example, university residences, student apartments, hotels, hospitals, or elderly residences.

The inclusion of a portion of the institutional population for the United States is not likely to significantly affect the comparability of the U.S. and Spanish data, because this part of the total was relatively small. For example, students, one of the larger subpopulations of the group, represented only 1.4% of all households or consumer units in the total U.S. weighted sample and only 0.6% of all persons.

More serious with regard to comparability were the differences concerning the way expenditures are annualized. The EPF is a household budget survey in which interviews are spread out uniformly over a period of 52 weeks from April 1990 to March 1991. All household members, aged 14 years

[12] See BLS (1993) and INE (1992) for the definitions of a consumer unit in the United States and a household in Spain. Also see the Appendix.

or older, were to record, in a diary, all expenditures made during a sample week. Many goods and services with frequency of purchase beyond a week were likely not recorded in the diary. Thus, an in-depth personal interview was conducted in each household, to record past expenditures made within reasonable reference periods, determined by experts, prior to the sample week. These reference periods covered expenditures made during the past 1, 2, 3, or 12 months. Using both the diary and in-depth interviews, the INE estimates annual household total expenditures. In the present study, annual expenditures on food and beverages took into account the available information on bulk purchases according to the procedure developed in Peña and Ruiz-Castillo (1998). Annual household total expenditures, based on the set of different reporting periods, were assigned the reference period 1990–1991. Note, however, that the estimates of annual household total expenditures obtained from a sample spread out over 52 weeks during a year could be subject to seasonality bias.

The U.S. CE also has two components, a diary or record-keeping survey and an interview. The Diary is designed to capture expenditures for relatively small items purchased on a daily or weekly basis. However, participants are also asked to record all purchases made each day for two consecutive 1-week periods. Respondents receive each weekly diary during separate visits by the interviewer. The Interview captures most expenditures made during the 3 months prior to the beginning of the month of the interview. Consumer units are asked to participate in the Interview for five consecutive 3-month periods. Data from the first interview are used to "bound" expenditures for subsequent interviews and are not used in estimations. For official publication purposes, the BLS assumes that the quarters of expenditures are independent (see BLS 1993) and annualizes the quarterly data essentially by multiplying each quarter of data by four. There is no accounting for the panel aspects of the survey in official estimates. For the present study, however, the correlation of expenditures across quarters is taken into account. The longer the reference period, the smoother the distribution of expenditures is expected to be.

CE Interview consumer units formed the basis of the U.S. sample, because they provide the maximum expenditure data over the longest period of time relative to the diary sample. However, data from both the Diary and Interview were used to define annual total expenditures, following a method developed by Cage at the BLS (for more details, see the Appendix and Cage, Garner, and Ruiz-Castillo 2002). This procedure imputes expenditures for items collected in the Diary but not in the Interview.

The Interview sample is selected on a rotating panel basis. For the 1990–1991 period, the sample was targeted at 5000 consumer units each quarter. About 20% of the sample are interviewed for the first time each quarter, whereas 20% are interviewed for the last time. The continuous and rotating nature of the CE Interview in the U.S. case posed special problems for the determination of the 1990–1991 household expenditures distribution at current prices—that is, the equivalent of the expenditure distribution in the Spanish case. For our study, each U.S. household was required to have reported expenditures for two, three, or four quarters. In order that U.S. household expenditures reflect the same time period as for the Spanish sample, household-specific price indexes were used. By way of example, consider a household having reported expenditures only from spring (April, May, and June) 1990 to autumn (October, November, and December) 1990 but not reporting expenditures for winter (January, February, and March) 1990. How can this household's expenditures for winter 1991 be estimated? First, missing quarterly data for winter 1990 were made equal to the average of nonmissing quarterly values for the months with data, so that there were four quarters of data available, reported or imputed, for each household. Then these quarterly expenditures were converted to winter 1991 prices using household-specific price indexes described in Cage, Garner, and Ruiz-Castillo (2002). Indexes were based on a 207-dimensional commodity space. Annual expenditures were the sum of commodity quantities bought from spring to autumn of 1990 plus the quantities imputed for winter 1990, all in

winter 1991 prices. In this way, the seasonal nature of consumption patterns for individual households was preserved as best as possible.

To obtain annual expenditures for the United States, we could have restricted our attention to households with four quarters of complete data. However, that would have been unnecessarily restrictive. Including some households who did not have a year's worth of data resulted in a larger sample size. If households had been selected with interviews occurring over the exact time period as in the Spanish case (spring 1990 to winter 1991) and the sample had been restricted to those with four complete interviews only, there would only have been 1367 observations in the U.S. sample. In contrast, the final U.S. study sample was composed of 6284 households, representing 118,481,815 households and 307,204,548 people in 1990–1991 and having the characteristics as defined by the sample selection described (note that the distribution of households by size is essentially the same as that published by the BLS for 1990–1991). The EPF consisted of 21,155 households for a sample population of 11,298,509 households and 38,494,006 people living in residential housing over all of Spain, including the African cities of Ceuta and Melilla, during 1990–1991.

Given the two countries' household survey designs, it is likely that the CE does a better job than the EPF regarding problems that can arise from the frequency of purchases, seasonality of purchases, and expenditure recall. Thus, for any definition of household annual total expenditures and abstracting from large differences in sample size, expenditure inequality in Spain might be expected to have an upward bias relative to expenditure inequality in the United States. However, no hypothesis can be made on these grounds about the possible relative bias of mean household expenditure estimates within either country.

As far as the measurement of economic well-being is concerned, consumption expenditures were used as a proxy for consumption. The data that served as the starting point for our study were based on the two countries' household expenditure surveys. The household data were adjusted for use by the statistical agencies for the production of their official consumer price indexes (CPIs). The data were further adjusted to reflect more accurately household current consumption (see the Appendix for a detailed description and a discussion of possible bias).

To examine how robust expenditure inequality and welfare comparisons were to the choice of time period, 1990–1991 expenditures were expressed in winter 1981 and winter 1991 prices using household-specific price indexes created for each country. This price-index approach can be explained by considering the construction of statistical price indexes of the Laspeyres type for a set of households interviewed in surveys like the CE in the United States or the EPF in Spain. For this purpose, two pieces of information are needed: price changes, R_{it}, for a set of goods indexed by $i = 1, \ldots, n$, available for within-BLS use for the United States and published by the INE for Spain; and a set of vectors of household budget shares, $w^h = (w_1^h, \ldots, w_n^h)$, $h = 1, \ldots, H$, computed from the household-level data. An individual consumer price index (cpi^h) for household h is then defined by

$$\text{cpi}_t^h = \sum_i w^{ih} R_{it}.^{13} \tag{15}$$

(For descriptions of the production of these indexes for the United States and Spain, see Cage, Garner, and Ruiz-Castillo 2002 and Ruiz-Castillo et al. 1999, respectively.)

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[13] As was pointed out by Prais (1958), the official Consumer Price Index (CPI) of the Laspeyres type for a population of H households, published regularly by statistical offices in most countries of the world, is a weighted average of household specific statistical price indexes of the same type with weights proportional to household total expenditures. That is: $\text{CPI}_t = \sum_h \alpha^h \text{cpi}^h$, where $\alpha^h = x^h / \sum_h x^h$, and x^h is household's h total expenditures.

Assume, for simplicity, that the period in which households are interviewed coincides with the base year of the official CPI. Then, to convert any household value in nominal terms at base year prices, for instance, household expenditures x^h, into period t prices, all that is needed is to apply the following formula: $x^h \text{cpi}_t^h = x_t^h$. For the present article, the 1990–1991 household-expenditure distributions for the United States and Spain were expressed at constant prices using household-specific price indexes for two periods in each country: winter 1991 and winter 1981. In this way, the distributional role of price changes during the 1980s in both countries could be analyzed.

To standardize the comparisons of expenditures and welfare in the two countries, PPPs for private consumption expenditures are used. PPPs are defined as the number of currency units required to buy goods equivalent to what can be bought with one unit of the currency of the base country or with one unit of the common currency of a group of countries (United Nations 1992).[14] For the present study, PPPs based on the Elteto-Koves-Szulc (EKS) method of aggregation were used (OECD 1993). Although the EKS indexes are not additive, the OECD notes that the EKS can be used to compare levels.[15] The EKS indexes were used because we were interested in comparing levels of expenditures and welfare. For 1991, the PPP conversion factor was 108.9. Therefore, Spanish expenditures in pesetas are divided by 108.9 to obtain Spanish expenditures in U.S. dollars. For 1981, the PPP conversion factor was 74.74 (Godbout 1997; OECD 1993).

Household population weights were used throughout. When means and distributions by household sizes are shown, each household weight was multiplied by the number of people in each unit, to obtain a person-population weight for each household member. For the United States, the average household weight for the number of quarters that the household is in the sample was used; for the household size variable, the average size was also assumed.

4. Results

Household Size and Mean Household Expenditures

In this section, some fundamental demographic and economic features in both countries are examined. Table 1 shows the population distributions by household size.[16] One- and two-person households are much more prevalent in the United States than in Spain (around 57% vs 32% of all households, respectively), whereas the opposite is true for larger households.[17] The age distribution of

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[14] PPPs have an 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 differences in price levels.

[15] An alternative is to use the Geary-Khamis (GK) index. However, for our study, we do not expect major differences, given that the GK PPP index for 1981 is 73.3 (vs 74.74) and the index for 1991 is 106.8 (vs 108.9).

[16] Because of the small size of the remaining groups, only households with one to seven members, which represent about 99% of all households and 97% of all people in the population, are included. We use these households to examine in detail differences between Spain and the United States. However, when we produce inequality and welfare results, we use data from the entire weighted samples (where each household size is represented as a separate group and all households are accounted for).

[17] Duclos and Mercader-Prats (1999) also found similar differences between Spain and the United Kingdom in 1980–1981. They reported that there are about four times as many one-adult households in the United Kingdom as there are in Spain. Also, three- and more adult households are more prevalent in Spain than in the United Kingdom. This, together with the fact that the presence of children in Spain is much greater than in the United Kingdom, turns out to be a crucial factor in the poverty comparison between these two countries.

Table 1. Sample Size and Population Distributions by Household Size in Spain and the United States, 1990–1991 Distributions

	Sample size		Population Distribution of People			Population Distribution of Households		
Household Size	Spain	United States	Spain	United States	% Difference	Spain	United States	% Difference
1	2174	1672	2.9	10.3	252.1	10.0	26.8	168.0
2	4735	1837	13.1	23.4	78.8	22.3	30.3	36.1
3	4427	1106	18.3	19.8	8.1	20.8	17.1	−17.8
4	5052	968	29.3	23.7	−19.2	25.0	15.3	−38.5
5	2822	428	19.4	12.7	−34.3	13.2	6.6	−50.0
6	1206	162	9.6	5.4	−43.5	5.4	2.3	−57.0
7	471	63	4.5	2.1	−52.8	2.2	0.8	−64.1
Size 1–7	20,887	6236	97.1	97.4	0.4	98.9	99.3	0.4
Total	21,155	6284	100.0	100.0		100.0	100.0	

these two types of households differs considerably between both countries, with Spanish singles and couples being older and having lower expenditures than their U.S. counterparts (results not shown).[18]

Some of these differences noted in Table 1 are attributable to population coverage. As was noted earlier, part of the institutional population living in select group quarters was covered by the U.S. CE, whereas only the civilian noninstitutional population was covered by the Spanish EPF. Yet the presence of these other consumer units was not likely to affect the comparability of the data, because consumer units in the select group quarters represented a relatively small percentage of the U.S. total CE sample.

Table 2 shows mean household expenditures by household size, the only demographic characteristic considered in our study, as well as for the population as a whole for different equivalent scales, denoted by adjustment factor, Θ.[19] Using person-weighting, U.S. households had higher mean expenditures than same-sized households in Spain. The differences were statistically significant (at the 0.05 level) in all cases, except for households with six members, and were especially important for smaller households. Adjusting expenditures by an equivalence scale also resulted in higher values for the United States: adjusted expenditures were greater in the United States relative to those in Spain for all values of Θ.

In brief, the differences in household size were sufficiently large to indicate important differences in living arrangements. This is an important fact in inequality and welfare comparisons, as will be seen below.

Relative Inequality

GE indices for households of size one to seven, based on 1990–1991 expenditures in winter 1991 prices, are presented in Table 3. For both the United States and Spain, inequality was greater for the indices more sensitive to differences at the top and the bottom of the distributions (I_2 and I_{-1}, respectively). This means that, in both countries, inequality in the tails of the distributions was larger

[18] For age distributions, singles aged 65 or older represent 64% of the Spanish single population versus 34% in the United States. On the other hand, around a quarter of the single population are under age 31 in the United States versus 5.5% of Spanish singles.

[19] All comparisons in this article for the population as a whole are made for common values of the parameter Θ. Given that the age composition of various household size groups differs considerably between both countries, this assumption can be justifiably questioned. For the impact on poverty measurement from applying different definitions of equivalent income in each country, see Duclos and Mercader-Prats (1999).

Table 2. Means of Household Expenditures in Spain and the United States for 1990–1991 Distributions of Expenditures in Winter 1991 Prices and U.S. Dollars[a]

Household Size	Means of Household Expenditures		
	Spain, $	United States, $	% Difference[b]
1	9993	15,726	57.4*
2	15,417	25,127	63.0*
3	21,702	27,970	28.9*
4	26,646	30,665	15.1*
5	28,016	31,647	13.0*
6	29,785	29,006	−2.6
7	30,056	37,383	24.4*
Adjustment Factor Θ	All Households, Means of Adjusted Household Expenditures (person weighted)		
0.0	24,727	27,643	11.8*
0.3	16,230	19,498	20.1*
0.5	12,356	15,657	26.7*
0.7	9471	12,712	34.2*
1.0	6445	9504	47.5*

[a] Based on EKS purchasing price parity conversion factor of 108.9 Spanish pesetas to $1 U.S. for 1991.
[b] [(U.S. − Spain)/Spain] × 100.
* Difference statistically significant at the 0.05 level.

than in the middle part. Except for households with three and four members, differences between the estimated inequality indices for the two countries were of considerable magnitude (between 20% and 30%). However, only in smaller households (singles and two people) were expenditures significantly more equally distributed in the United States than in Spain.

The use of decomposable inequality measures facilitated the understanding of the results for the population as a whole. Table 4 provides the results of the decomposition for the basic partition using the mean logarithmic deviation or the index I_0.[20] As was seen in Equation 7, this index can be decomposed into two terms: (i) the within-group (or uncontaminated) term (i.e., the weighted average of the inequality within each household size, with weights equal to population shares); and (ii) the between-group inequality (or contaminated) term, which depends on the equivalence scale considered. Denote by $\Delta I_0(\Theta)$ the difference in inequality between Spain (country 1) and the United States (country 2) according to the mean logarithmic deviation index, I_0—that is, $\Delta I(\Theta) = I_0[z_2(\Theta)] - I_0[z_1(\Theta)]$. This magnitude can be expressed as

$$\Delta I(\Theta) = \Delta U + \Delta C(\Theta), \tag{16}$$

where

$$\Delta U = U_2 - U_1 \tag{17}$$

$$\Delta C(\Theta) = I_0[\mu_2^1(\Theta), \ldots, \mu_2^M(\Theta)] - I_0[\mu_1^1(\Theta), \ldots, \mu_1^M(\Theta)]. \tag{18}$$

Equation 17 is the difference in within-group expenditure inequality. This term is independent of Θ, the scale-adjustment factor, which only affects Equation 18—namely, the difference in contaminated

[20] Results for the population as a whole using the GE inequality indices with parameters other than $c = 0$ are presented in the upper panel of Table A1.

Table 3. Relative Inequality Indexes (and Standard Errors[a]) by Household Size for Spain and the United States Based on 1990–1991 Distributions of Household Expenditures in Winter 1991 Prices

	Generalized Entropy Inequality Indices (I_c)			
Household Size	I_{-1}	I_0	I_1	I_2
Spain				
1	0.315	0.243	0.244	0.323
	[0.017]	[0.013]	[0.018]	[0.042]
2	0.207	0.177	0.181	0.230
	[0.007]	[0.006]	[0.009]	[0.023]
3	0.149	0.128	0.131	0.159
	[0.007]	[0.006]	[0.010]	[0.023]
4	0.146	0.128	0.133	0.172
	[0.007]	[0.007]	[0.011]	[0.030]
5	0.142	0.122	0.122	0.141
	[0.007]	[0.005]	[0.006]	[0.008]
6	0.159	0.128	0.131	0.161
	[0.015]	[0.010]	[0.013]	[0.025]
7	0.143	0.122	0.117	0.127
	[0.010]	[0.008]	[0.008]	[0.011]
United States				
1	0.208	0.164	0.163	0.222
	[0.012]	[0.009]	[0.016]	[0.058]
2	0.156	0.136	0.140	0.175
	[0.008]	[0.007]	[0.009]	[0.019]
3	0.163	0.133	0.129	0.145
	[0.011]	[0.007]	[0.007]	[0.011]
4	0.151	0.127	0.124	0.140
	[0.011]	[0.008]	[0.008]	[0.0125]
5	0.171	0.148	0.156	0.210
	[0.018]	[0.017]	[0.025]	[0.058]
6	0.200	0.158	0.165	0.222
	[0.044]	[0.026]	[0.032]	[0.065]
7	0.192	0.162	0.160	0.184
	[0.043]	[0.033]	[0.035]	[0.050]
	% Difference Between the United States and Spain[b]			
1	−34.0*	−32.5*	−33.2*	−31.1
2	−24.7*	−23.1*	−22.6*	−23.9
3	9.4	3.7	−1.3	−9.2
4	3.5	−0.8	−6.7	−18.4
5	20.1	21.2	27.2	48.8
6	25.9	23.7	26.3	37.9
7	34.2	32.6	36.1	44.7

[a] Bootstrapped standard errors in brackets = 1000 replications.
[b] [(U.S. − Spain)/Spain] × 100.
* Difference statistically significant at the 0.05 level,

expenditure inequality in the partition by household size. The lower panel of Table 4 presents the results of the above decomposition.

The difference in within-group expenditure inequality was determined by the inequality differences between countries in the partition by household size. As was seen in the lower panel of

Table 4. Decomposition of Relative Inequality Index I_0 (and Standard Errors[a]) for Spain and the United States Based on 1990–1991 Distributions of Adjusted Household Expenditures in Winter 1991 Prices (person weighted)

	All Households,[b] Decomposition of I_0 by Household Size					
Adjustment	Spain			United States		
Factor Θ	Overall	Within Group	Between Group	Overall	Within Group	Between Group
0.0	0.166	0.136	0.030	0.161	0.140	0.021
	[0.0032]	[0.0027]	[0.0014]	[0.0053]	[0.0042]	[0.0029]
0.3	0.145		0.009	0.144		0.004
	[0.0034]		[0.0007]	[0.0044]		[0.0010]
0.5	0.139		0.003	0.146		0.006
	[0.0029]		[0.0004]	[0.0037]		[0.0013]
0.7	0.140		0.004	0.160		0.020
	[0.0033]		[0.0005]	[0.0045]		[0.0020]
1.0	0.155		0.018	0.201		0.061
	[0.0030]		[0.0013]	[0.0050]		[0.0032]

	Decomposition of Differences in Inequality According to I_0: U.S. Inequality − Spain Inequality			
	Absolute difference in overall inequality $\Delta I(\Theta)$	% difference in overall inequality	Difference in "uncontaminated" (within group) inequality ΔU	Difference in "contaminated" (between group) inequality $\Delta C(\Theta)$
0.0	−0.005	−3.3	0.004	−0.009*
0.3	−0.001	−0.6		−0.005*
0.5	0.008**	5.1		0.004*
0.7	0.020*	12.6		0.016*
1.0	0.046*	23.2		0.043*

[a] Bootstrapped standard errors in brackets: 1000 replications.
[b] Groups partitioned by household size with all households accounted for.
* Difference statistically significant at 0.05 level.
** Difference statistically significant when expenditure distributions trimmed to eliminate top and bottom 5% of the weighted sample.

Table 3, expenditure inequality was less in the United States for smaller households composed of one or two people. It was statistically equal in both countries for three- and four-person households and larger (although not statistically significant) in the United States for larger households. As it can be seen in columns 3 and 6 of Table 4 (upper panel), when such differences were weighted by population shares, within-group expenditure inequality was larger in the United States (0.140), but this difference is not statistically significant.[21]

In both countries, the importance of between-group inequality as an explanatory factor of overall inequality followed a nonlinear pattern with Θ. As can be seen in Table 4, when no allowance was made for household size and economies of scale were assumed to be infinite (i.e., $\Theta = 0$), between-

[21] It would be possible to introduce a further decomposition of the differences in within-group inequality that could be expressed as the sum of two terms. The sum would equal a weighted sum of differences in inequality within each subgroup and an additional term capturing the impact on within-group inequality of demographic differences across countries. However, this further decomposition is not worthy, because the differences in within-group inequality are not statistically significant. Moreover, given the large demographic differences between the two countries already examined, the explanation of the differences in within-group inequality in terms of the above components would be dominated by the demographic component.

group inequality accounted for a notable percentage of overall inequality, 13–18%. As the adjustment factor Θ increased, reflecting the decreasing importance of economies of scale in consumption, reorderings took place. In this case, larger households, who have larger unadjusted expenditures, tended to occupy lower positions as household size increased its role in the definition of adjusted expenditures. The opposite was the case for smaller households, whose adjusted expenditures depended relatively less on household size. This complex process of households' reorderings resulted in the ratio of between-group inequality to overall inequality to change dramatically. The ratio first declined and then increased again as Θ approached one and adjusted total expenditures became per capita total expenditures.

However, there were differences across countries that explained the differences in the contaminated part, $\Delta\ C(\Theta)$, shown in column 5 in the bottom panel of Table 4. Although mean expenditures were essentially an increasing function of household size in both countries (see Table 2), smaller households in the United States were found to be younger, more affluent (as represented by their expenditures), and more prevalent than in Spain. Consequently, on average, the range of variation between mean household expenditure by household size was smaller in the United States than in Spain. Thus, for low values of Θ, between-group inequality was lower in the United States than in Spain. On the other hand, for larger households the relationship between mean expenditures and household size was smoother in Spain (as a matter of fact, mean expenditures for six-person households in the United States were lower than for five-person households). It was also observed that the difference in favor of the United States tended to decline as household size increased (for six-person households, those differences were not statistically significant). As the scale factor grew toward 1, these differences manifested themselves in different U-shaped patterns of the ratio of between-group inequality to overall inequality for the two countries (see the upper panel in Table 4). The reorderings among households of different sizes that took place as the scale factor increased were more dramatic in the U.S, where between-group inequality reached a minimum before and increased afterward more rapidly than in Spain. Consequently, for larger values of Θ, between-group inequality was larger in the United States.

Because the difference in contaminated inequality tended to dominate the difference in uncontaminated inequality, the results on overall inequality depended on the assumptions concerning economies of scale. When economies of scale were assumed to be large (for values of $\Theta < 0.5$), expenditures were marginally more unequally distributed among Spanish households than among U.S. households, although the differences were not statistically significant. In contrast, when economies of scale were assumed to be low (for values of $\Theta \geq 0.5$), overall expenditure inequality was 13–23% greater in the United States and differences were statistically significant.

Inequality comparisons are quite vulnerable to what happens in the ends of the distributions where data imperfections might be particularly serious. Following the method of Cowell, Litchfield, and Mercader-Prats (1999), the robustness of the above results was analyzed by trimming each country's expenditure distribution. For this analysis, 1% and then 5% of the observations from each tail of the respective distributions were removed in both one- and two-tailed exercises. However, the results obtained (which are available on request) were essentially the same and increased only slightly the possibility of reranking the distributions between the two countries.

The overall conclusion from this analysis is that expenditure inequality comparisons in the basic partition crucially depend on household size. Expenditures are most unequally distributed in both countries for one-person households. On average, inequality decreased by household size for Spain. For the United States, the results were more mixed but, generally, inequality was higher for larger households. When all households were considered together, rather than by household size separately,

expenditure inequality was very similar for the two countries. Only when economies of scale were small or nonexistent did expenditures in the United States appear to be significantly more unequally distributed than in Spain.[22]

Welfare

Table 5 contains estimations of social welfare for households with one to seven members. Recall that social welfare is equal to mean expenditures corrected by a factor related to expenditure inequality. For this analysis, the GE inequality index I_1 was used (see section 3 for a justification).

According to Equation 11, for each household size, we have

$$W(x^m) = \mu(x^m)F(x^m), \tag{19}$$

where $F(x^m) = 1 - I_1(x^m)$. Table 2 showed that, except for six-person households, mean household expenditures were greater in the United States than in Spain. The difference was considerably larger for smaller households. On the other hand, for one- and two-person households, expenditures were more equally distributed in the United States than in Spain, whereas the differences in expenditure inequality for the rest of household sizes were not statistically significant (see Table 3). Consequently, the inequality adjustment, $F(x^m)$, in Equation 19 will tend to increase welfare differences for small households. As shown in Table 5, the social welfare of singles and households with two people in the United States was 70–75% greater than that of their Spanish counterparts. For three- and four-person households, social welfare was approximately 30% and 16% greater, respectively, in the United States. For larger households, differences in welfare for the two countries were not statistically significant.

How does this pattern manifest itself for the population as a whole? Recall that, according to the SEF selected in section 3, social welfare is a weighted average of within-group welfare minus a penalty imposed on between-group expenditure inequality:

$$W[z(\Theta)] = A(\Theta) - B(\Theta), \tag{20}$$

where

$$A(\Theta) = \sum_m p^m [W(x^m)/m^\Theta] \tag{21}$$

and

$$B(\Theta) = \mu[z(\Theta)]I_1[\mu^1(\Theta), \ldots, \mu^M(\Theta)], \quad \in \Theta[0, 1]. \tag{22}$$

As Θ increases, the role of household size in the denominator of Equation 21 increases also, causing within-group welfare to decline. Naturally, this effect is more pronounced for larger households. Consequently, as Table 6 shows, the percentage decrease in the within-group term was larger in Spain than in the United States.

Between-group expenditure inequality, according to I_1, was greater in Spain than in the United States for $\Theta = 0.0$ and 0.3. In contrast, with larger values of Θ, between-group expenditure inequality in Spain was lower than in the United States. (These results are not shown, but the same pattern

[22] In general, comparisons for the remaining members of the GE family of inequality indexes are not any more conclusive than these results. Only when $\Theta = 0.7$ and the index is I_{-1} and $\Theta = 1$ and the indices are I_{-1} and I_1 is an unambiguous ranking produced, which indicates that expenditure inequality is significantly greater in the United States than in Spain (see upper panel of Table A1).

Table 5. Means of Social Welfare (and Standard Errors[a]) by Household Size in Spain and the United States Based on 1990–1991 Distributions of Unadjusted Household Expenditures in Winter 1991 Prices and U.S. Dollars[b]

	Means of Social Welfare Based on Social Evaluation Function W		
Household Size	Spain, $	United States, $	% Difference[c]
1	7553	13,160	74.2*
	[155.5]	[255.5]	
2	12,624	21,601	71.1*
	[158.3]	[291.2]	
3	18,867	24,365	29.1*
	[188.8]	[425.5]	
4	23,102	26,859	16.3*
	[267.5]	[490.3]	
5	24,591	26,723	8.7
	[302.0]	[835.8]	
6	25,891	24,216	−6.5
	[529.9]	[1295.7]	
7	26,529	31,412	18.4
	[681.4]	[2752.9]	

[a] Bootstrapped standard errors in brackets: 1000 replications.
[b] Based on EKS purchasing price parity conversion factor of 108.9 Spanish pesetas to $1 U.S. for 1991.
[c] [(U.S. − Spain)/Spain] × 100.
* Difference statistically significant at 0.05 level.

is shown for I_0 in Table 4.) Thus, the penalty imposed on social welfare through this term was correspondingly larger (smaller) for Spain when the scale factor was low (high). This effect works in the opposite direction to the previous one (the variation in within-group welfare with Θ), but it is of a much lower order of magnitude. Therefore, the conclusion is that, although social welfare in the United States was significantly greater than in Spain, the difference grew continuously from 12% to 40% as the scale factor increased and economies of scale diminished.[23,24]

Accounting for Differences in Prices

As was pointed out before, when expenditure distributions are expressed at constant prices, expenditure inequality and welfare comparisons reflect both differences in the quantities of goods and services purchased and also differences in the price structures prevailing in each country. Lacking a spatial price index to compare prices across countries, this section examines the robustness of the results to the choice of the time period for reference prices. If the distributional impact of price changes for periods t and t' in country 1 is very different from the impact in country 2, expenditure inequality and welfare comparisons at prices of period t will typically differ from comparisons at prices of period t'.

Let $\Delta I_t(\Theta)$ denote the difference in expenditure inequality between two countries 1 and 2 at prices of period t—that is,

$$\Delta I_t(\Theta) = I_0[z_{2t}(\Theta)] - I_0[z_{1t}(\Theta)]. \tag{23}$$

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

[23] As can be seen in the lower panel of Table A1, this is also the case for SEFs that correct mean expenditures by inequality using members of the GE family different from I_1.
[24] See the Appendix for differences in the definition of total expenditures that could affect the welfare results.

Table 6. Means of Social Welfare (and Standard Errors[a]) in Spain and the United States Based on 1990–1991 Distributions of Adjusted Household Expenditures in Winter 1991 Prices and U.S. Dollars[b] (person weighted)

	All Households, Means of Social Welfare Based on Social Evaluation Function W								
	Spain, $			United States, $			% Difference[c]		
Adjustment Factor Θ	Overall	Within Group	Between Group	Overall	Within Group	Between Group	Overall	Within Group	Between Group
0.0	20,749 [129.7]	21,412	663	23,212 [230.9]	23,757	545	11.9*	11.0	−17.8
0.3	13,885 [80.7]	14,022	137	16,679 [133.9]	16,762	83	20.1*	19.5	−39.6
0.5	10,621 [60.2]	10,656	35	13,362 [122.9]	13,458	96	25.8*	26.3	172.7
0.7	8119 [40.3]	8151	32	10,687 [107.6]	10,924	237	31.6*	34.0	631.2
1.0	5412 [29.4]	5526	115	7602 [77.8]	8160	557	40.5*	47.7	385.4

[a] Bootstrapped standard errors in brackets: 1000 replications.
[b] Based on EKS purchasing price parity conversion factor of 108.9 Spanish pesetas to $1 U.S. for 1991.
[c] [(U.S. − Spain)/Spain] × 100.
* Difference statistically significant at 0.05 level.

$$\Delta I_{t'}(\Theta) = I_0[z_{2t'}(\Theta)] - I_0[z_{1t'}(\Theta)]. \tag{24}$$

For each country $i = 1, 2$, let $\Delta P_i(\Theta)$ denote the distributive effect of price changes from period t' to period t—that is,

$$\Delta P_i(\Theta) = I_0[z_{it}(\Theta)] - I_0[z_{it'}(\Theta)]. \tag{25}$$

Suppose, for instance, that the rate of inflation in country i during this period has been greater for the rich than for the poor, in which case the change in prices from t' to t is said to be antirich. This means that the Paasche indices required to deflate money magnitudes in period t to express them at period t' prices are greater for the rich than for the poor. Thus, the expenditure necessary to acquire the period t bundle of goods at t' prices is reduced for everyone but is reduced by more for the rich. Hence, inflation is greater for the rich than for others, and inequality at t' prices would be 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

$$\Delta I_t(\Theta) = \Delta P_2(\Theta) - \Delta P_1(\Theta) + \Delta I_{t'}(\Theta). \tag{26}$$

That is,

$$\begin{aligned} I_0[z_{2t}(\Theta)] - I_0[z_{1t}(\Theta)] = {} & \{I_0[z_{2t}(\Theta)] - I_0[z_{2t'}(\Theta)]\} \\ & - (\{I_0[z_{1t}(\Theta)] - I_0[z_{1t'}(\Theta)]\} + \{I_0[z_{2t'}(\Theta)] - I_0[z_{1t'}(\Theta)]\}). \end{aligned} \tag{27}$$

Thus, the difference in expenditure inequality between country 1 and country 2 is the same when analyzed in terms of the prices of both periods, that is, $\Delta I_t(\Theta) = \Delta I_{t'}(\Theta)$, if and only if the distributive effect of price changes from period t' to period t is the same for both countries: $\Delta P_2(\Theta) = \Delta P_1(\Theta)$.

In our case, we take t = winter 1991 and t' = winter 1981. The estimates of $\Delta P_2(\Theta)$, $\Delta P_1(\Theta)$, $\Delta I_t(\Theta)$, and $\Delta I_{t'}(\Theta)$ for the population as a whole according to the index I_0 are presented in Table 7

Table 7. The Impact of Prices on Relative Inequality (I_0) (with Standard Errors[a]) in Spain and the United States in 1981 and 1991 Based on 1990–1991 Adjusted Household Expenditures, All Households (person weighted)

	Inequality Based on Winter 1991 Prices Minus Inequality Based on 1981 Prices		Inequality in United States Minus Inequality in Spain	
Adjustment Factor Θ	Spain $\Delta P_1(\Theta)$	United States $\Delta P_2(\Theta)$	In Winter 1981 Prices $\Delta I_0(\Theta)$	In Winter 1991 Prices $\Delta I_0(\Theta)$
0.0	0.005	0.003	−0.004	−0.005
0.3	0.004	0.005	−0.001	−0.001
0.5	0.004	0.006	0.005	0.008
0.7	0.003	0.007	0.016*	0.020*
1.0	0.002	0.009	0.041*	0.046*

[a] Bootstrapped standard errors in brackets: 1000 replications.
* Difference statistically significant at 0.05 level.

(results by household size are available on request). The positive signs of $\Delta P_2(\Theta)$ and $\Delta P_1(\Theta)$ reveal that changes in prices from the winter of 1981 to the winter of 1991 were antirich in both countries, meaning that the rich faced higher inflation over the time period. However, neither of the two terms was statistically significant for any value of the adjustment factor, which indicates that inflation during this period in both countries was essentially neutral from a distributional point of view. Therefore, the results on expenditure inequality and welfare comparisons between the two countries were robust to the choice of the reference time period. For expenditure inequality comparisons based on winter 1981 and winter 1991 prices (see columns 3 and 4 in Table 7, respectively), the conclusion is that expenditure inequality in the United States and Spain are indistinguishable when economies of scale are assumed to be large (low values of Θ). U.S. expenditure inequality is significantly greater than that of Spain when economies of scale are assumed small or nonexistent (high values of Θ).

5. Summary and Conclusions

The present article has highlighted the role of demographics and the choice of the reference time period on expenditure inequality and welfare comparisons for Spain and the United States. To assess the statistical significance of all results, bootstrap estimates of the sampling variance of all magnitudes were computed throughout.

Using a model in which equivalence scales are assumed to depend only on household size and a parameter that reflects different views about the importance of economies of scale, the results showed that differences in demographic factors can be very important in international comparisons. Inequality and welfare comparisons of similarly defined 1990–1991 expenditure distributions for Spain and the United States were drastically different for smaller and larger households. In particular, smaller households in the United States were more prevalent, younger, and more affluent (based on expenditures) and exhibited less inequality than their Spanish counterparts, whereas larger households were relatively less prevalent and not as affluent and had greater inequality. Given this diversity, decomposable measurement instruments helped explain how results at the household size level were translated at the population level.

When the 1990–1991 expenditure distributions in both countries were expressed at winter of 1991 and winter of 1981 prices, inflation over the time period in both countries was essentially neutral from a distributional point of view. Because the distributional impact of price changes was of

a comparable order of magnitude, expenditure inequality and welfare comparisons were robust to the choice of the reference price vector. Those comparisons were also robust to the choice of the inequality or social welfare index and to potential problems associated with the data in the tails of the expenditure distributions.

There are good reasons to identify people's economic well-being with consumption (expenditures) rather than income, but there have been few countrywide and international studies that take this view, although the number is growing. Previous studies (Gottschalk and Smeeding 1997) showed that, around the year 1990, household income inequality was clearly greater in the United States than in Spain. However, when expenditures were substituted for income as the measure of economic well-being, the ranking of the two countries could not be maintained unequivocally. The ranking could be maintained only for the expenditure distributions when economies of scale were assumed to be small or nonexistent, in which case expenditure inequality was about 11–42% greater in the United States (depending on which inequality index is used). Otherwise, expenditure inequality was smaller in the United States although the differences were not statistically significant. On the other hand, social welfare was significantly greater in the United States than in Spain for all values of the equivalence scale parameter, and the difference increased as economies of scale diminished.

Appendix

1. The Household Definition

In the EPF, a household is defined as one person or more than one person who shares living quarters, or part of them, and consumes food and other products financed from a common budget. In the CE, a household (or consumer unit) is composed of all members of a particular household who are related by blood, marriage, adoption, or other legal arrangement; a person living alone or sharing a household with others or living as a roomer in a private home or lodging house or in permanent living quarters in a hotel or motel, but who is financially independent; or two or more people living together who use their incomes to make joint expenditure decisions. Financial independence is determined by the three major expense categories: housing, food, and other living expenses. To be considered financially independent, a least two of the three major expense categories are to be provided entirely, or in part, by the respondent. For further details on the Spanish and the U.S. surveys used for the study, see INE (1992) and BLS (1993).

2. The Merge of the Diary and the Interview in the CE

As was indicated in section 3, data from both the Diary and Interview were used to define total expenditures for the United States, following a method developed by Cage at the BLS (Cage, Garner, and Ruiz-Castillo 2002). The BLS (1993) estimated that about 80–95% of total household expenditures were accounted for in the Interview. Not accounted for in the Interview were roughly 40 specific goods and services: soaps, laundry and cleaning products, tolls, over-the-counter drugs, pet food, and personal care products. Data from the Diary were used to impute additional expenditures for these omitted items to Interview households. This was accomplished by calculating the expenditure for the Diary-unique item, as a percentage of total food expenditures, and taking the product of this factor and the total food expenditures reported in the Interview. The budget shares for these items were produced by CPI geographic area and consumer unit size in the Diary sample. These shares were then mapped to the CE Interview sample by CPI geographic area and consumer unit size and were used to impute expenditures for these additional items in the Interview.

Household size and age of head were based on the average of the quarterly values for the values reported (rounded values of average household size were used for our analysis). The population weights used were also the result of averaging the quarterly weights over the number of quarters for which the consumer unit participated in the survey.

3. Definition of Household Consumption Expenditures

In this article, household economic well-being is identified in terms of household consumption. It would have been desirable to include the value of all the items that households consume in this measure, but the exercise was restricted by the available data. Given this, economic well-being was current consumption expenditures.

The starting point was the expenditure bundle used by the statistical agencies for the production of their official CPIs. Included in the U.S. CPI bundle but not the Spanish CPI bundle were items like funeral articles, gambling expenditures, fines, hunting, fishing and other fees, rent and food in-kind from work, and expenditures for automobile insurance. All of these were considered commodities for current consumption in our study and were added to the Spanish bundle as well.

Expenditures for the acquisition of vehicles for private transportation, house maintenance and repairs, and life insurance are considered to be more forms of savings than current consumption. Thus, they were excluded for the analysis. Expenditures for housing (rent for renters and some type of rental equivalence for owners, as well as utilities) and health and vehicle insurance were included in the calculation of total household consumption expenditures. In addition, for the United States, adjustments were made to account for the flow of services from selected household durables (see Cage, Garner, and Ruiz-Castillo 2002).

However, some differences in the Spanish and U.S. definition of household consumption expenditures remained. For example, in both countries, health care and education are consumed by the population; however, households may or may not pay for these consumption services and related goods, or they may pay relatively little. This is of particular importance when making international comparisons when one country has national health insurance, for example, and the other does not, as is the case with Spain and the United States. For example, including household expenditures for a bundle of health care commodities for the United States that is not comparable to the bundle paid for by Spanish households will result in an underestimation of Spanish expenditures for these items. For full comparability, some adjustment for expenditures made on behalf of households by the Spanish government would need to be made. About 2.28% of total expenditures for Spain are for out-of-pocket health expenditures. This is in contrast to the share for the United States, about 7%.

There were three types of expenditures included in the Spanish measure but not the U.S. one. These include cash contributions to nonprofit institutions, cash transfers to members of the household who are not living at the residence[25] (e.g., college students), and the value of home production.[26] Cash contributions and transfers were not collected each quarter in the CE data, so they could not be included in the U.S. total. No information was collected in the CE on home production. However, when these last two sets of expenditures were excluded from the Spanish total, the overall results with respect to inequality and social welfare in Spain compared with the United States change very little.[27]

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[25] Cash contributions to nonprofit institutions and to persons not living in the household data were only collected in the fifth quarter of the CE Interview. Our sample included households who may not have had a fifth interview; based on this, expenditures were defined so that they would be the same across all quarters covered. Thus, these contributions were not included in the U.S. definition of current consumption expenditures.

[26] For Spain, home production included self-consumption and self-supply. Self-consumption was defined to be goods (mainly food) produced on one's own farm, in one's own factory or workshop, or by one or some members of the household. These goods were consumed by household members or given as gifts to others not of this household during the reference period. These goods were valued at local retail market prices.

[27] When the overall inequality (I_0) results were produced for each Θ with cash transfers and home production not included, the sign of the U.S.-Spanish differences did not change. However, expenditure inequality in Spain increased marginally with the exclusion of these expenditures. When $\Theta = 0.0$, the overall inequality index value was 0.171 (vs 0.166), when $\Theta = 0.3$, the index was 0.149 (vs 0.145), when $\Theta = 0.5$, the index was 0.143 (vs 0.139), when $\Theta = 0.7$, the index was 0.143 (vs 0.140), and when $\Theta = 1.0$, the index was 0.158 (vs 0.155).

Table A1. Relative Inequality and Overall Welfare (with Standard Errors[a]) for Spain and the United States Based on 1990–1991 Distributions of Adjusted Household Expenditures in Winter 1991 Prices and U.S. Dollars[b] (person weighted)

Adjustment Factor Θ	Spain			United States			% Difference[c]		
	I_{-1}	I_1	I_2	I_{-1}	I_1	I_2	I_{-1}	I_1	I_2
	Relative Inequality								
0.0	0.218	0.161	0.193	0.202	0.160	0.199	−7.6**	−0.4	2.8
	[0.004]	[0.005]	[0.012]	[0.006]	[0.008]	[0.017]			
0.3	0.178	0.144	0.176	0.175	0.145	0.177	−1.8	0.1	0.6
	[0.004]	[0.005]	[0.014]	[0.006]	[0.006]	[0.012]			
0.5	0.166	0.140	0.173	0.177	0.147	0.180	7.1**	4.3	4.1
	[0.003]	[0.004]	[0.012]	[0.006]	[0.005]	[0.009]			
0.7	0.164	0.143	0.178	0.196	0.159	0.198	19.7*	11.5	11.2
	[0.004]	[0.005]	[0.014]	[0.007]	[0.006]	[0.015]			
1.0	0.182	0.160	0.208	0.258	0.200	0.260	42.1*	24.8*	24.9**
	[0.004]	[0.004]	[0.012]	[0.009]	[0.006]	[0.0199]			
	L_1	I_0	I_2	L_1	I_0	I_2	L_{-1}	I_0	I_2
	Overall Welfare								
0.0	$19,336	$20,622	$19,948	$22,073	$23,191	$22,154	14.2*	12.5*	11.1*
	[123.9]	[125.7]	[250.1]	[244.7]	[202.0]	[390.4]			
0.3	13,342	13,876	13,381	16,092	16,684	16,055	20.6*	20.2*	20.0*
	[91.1]	[67.2]	[165.8]	[173.4]	[151.7]	[234.6]			
0.5	10,310	10,639	10,223	12,878	13,363	12,844	24.9*	25.6*	25.6*
	[71.4]	[61.3]	[133.2]	[148.6]	[123.3]	[192.5]			
0.7	7918	8149	7783	10,215	10,682	10,193	29.0*	31.1*	31.0*
	[56.9]	[46.1]	[80.9]	[133.3]	[108.6]	[155.8]			
1.0	5275	5449	5105	7052	7594	7036	33.7*	39.4*	37.8*
	[41.7]	[27.5]	[70.6]	[120.7]	[91.6]	[185.3]			

[a] Bootstrapped standard errors in brackets: 1000 replications.
[b] Based on EKS purchasing price parity conversion factor of 108.9 Spanish pesetas to $1 U.S. for 1991.
[c] [(U.S. − Spain)/Spain] × 100.
* Difference statistically significant at the 0.05 level.
** Difference statistically significant when expenditure distributions trimmed to eliminate top and bottom 5% of the weighted sample.

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