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ABSTRACT

Previous research suggests that income inequality is lower in Spain than in the U.S. This paper studies whether this ranking remains the same when household consumption expenditures are used as a proxy for household welfare. Both inequality and social welfare, as components of economic well-being, are examined. Total household expenditures from each country's 1990-91 consumer expenditure survey are used as the basis for the analysis. For tractability, equivalence scales depend only on the number of people in the household and not any other demographic characteristic. Household specific price indices are used to express the 1990-91 expenditure distributions at winter of 1981 and winter of 1991 prices. Decomposable measurement instruments are used both for the inequality and social welfare analyses. Bootstrap methods are used to produce confidence intervals for all estimates.

When consumption expenditures are substituted for income as the measure of economic well-being, the ranking of Spain and the U.S. varies as both household size and the equivalence scale adjustment change. When focusing on household size alone, inequality and welfare comparisons are drastically different for smaller and larger households. The income inequality ranking can only be maintained for expenditure distributions when economies of scale are assumed to be small or non-existent. However, welfare is always higher in the U.S. than in Spain. It is concluded that household demographic characteristics, as well as equivalence scale adjustments, can be very important in international comparisons. With regard to household-specific relative price effects, inflation during the 1980s in both countries has been essentially neutral from a distributional point of view, so that all results are robust to the choice of time period.

KEY WORDS: Theil Inequality; Social Welfare; Demographic Factors; Household Expenditures; Household Specific Price Indexes

I. INTRODUCTION

Recent international comparisons of economic well-being that focus on individuals and households have two characteristics. First, perhaps because of the availability of data, household[1] income most often has been 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, in the late 1980s and early 1990s, the United States (U.S.) had the least equal distribution of household income among all industrialized countries (Gottschalk and Smeeding 1997, 2000; Atkinson *et al.* 1995).

Slesnick (1991, 1993), however, has pointed out that ideally we should characterize economic well-being in terms of commodity consumption. Without entering into 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 U.S., 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 to 1989 differ substantially from those of before tax income. Second, the substitution of total expenditures for income usually results in lower estimated poverty rates (Garner *et al.* 1996, Slesnick 1993). And third, the distribution of household expenditures is substantially more equal than the distribution of income in the U.S. (Johnson and Shipp 1997).[3] As far as recent trends for the U.S., while it is true that inequality

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

[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 U.S., and Ruiz-Castillo (1998) for Spain. For international comparisons of welfare, see Tsakloglou (1992) and Ruiz-Huerta *et al.* (1999).

[3] This result is not unique to the U.S. Studies using data from expenditure surveys find income inequality to be greater than consumption-based inequality in other developed countries such as Canada (Pendakur 1998) and

increased during the 1980s, no matter how it was measured, the increase in consumption-based inequality was smaller than the increase in income inequality however (Cutler and Katz 1992; Johnson and Shipp 1997).

In order 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 because of the preponderance of country studies that use household income as the key variable representing household welfare, as previously mentioned. In addition, it is difficult to make comparisons when definitions and methodologies differ across country data sources. Unlike for income,[4] there is no data source for which consumption expenditure data have been make comparable across countries, thus exacerbating the challenge of conducting such comparisons. However, when micro household expenditure data are available to researchers, such comparisons are possible. Such is the case here.

In this paper Spain and the U.S. are compared in inequality and social welfare terms using current household consumption expenditures as the measure of economic well-being. Household expenditure survey data from each country are used. The Spanish data are from the *Encuesta de Presupuestos Familiares* (EPF) and conducted by the *Instituto Nacional de Estadística* (INE). Data for the U.S. are from the Consumer Expenditure Survey (CE), a Bureau of Labor Statistics (BLS) product. Data from 1990-91 are used for both countries. More recent data are available for the U.S.; however, 1990-91 represents the latest data available for Spain. Although the survey methodologies differ in some respects, expenditures are defined as comparably as

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Australia (Barret *et al.* 2000), and also in developing countries such as Bangladesh (Wodon 1999) and Taiwan (Deaton and Paxon 1994).

possible and the same research methodology is 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 is examined. This study adds to the basic literature emerging on consumption based measures of inequality and social welfare, and introduces the role of relative price changes in international comparisons of distributional analysis.

The results of this study suggest that differences in demographic factors can be very important in international comparisons. For Spain and the U.S., consumption-based inequality and social welfare are dramatically different for smaller and larger households. Differences in economic well-being in Spain and the U.S. also depend strongly on the assumptions made about economies of scale in consumption within households. The main findings of the study are as follows: (i) as economies of scale diminish, overall inequality in the U.S. is smaller, about the same or larger than in Spain, although differences are only statistically significant when economies of scale are small or non-existent; (ii) welfare is always significantly greater in the U.S., but the gap between the two countries grows continuously from 12 to 40 percent as economies of scale are assumed to be smaller; and (iii) inflation during the 1980s in both countries has been essentially neutral from a distributional point of view, so that all results are robust to the choice of time period.

The remainder of this paper is organized into four sections and an Appendix. Section II includes background information, and Section III presents a description of the methods and data. Section IV includes the empirical results and Section V concludes. The Appendix is devoted to a brief discussion of the data for comparative purposes.

[4] The Luxembourg Income Study (LIS) includes data sets for which income has been made as comparable as

II. BACKGROUND

Spain and the U.S. 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 U.S. has quite a large economy and has been rather open and market-oriented for most of its history. Since the mid-1970's, 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 declined from 38.7 percent of Gross Domestic Product (GDP) in the 1960s to 8.3 percent in 1997. In contrast, the services sector share surged from 31.0 percent to almost 61.7 percent 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 percent in the 1960s to about 29.5 percent in 2000. Overall, from 1986 to 1996 Spanish GDP *per capita* rose from 48.7 percent to 54.2 percent of U.S. GDP *per capita*. (for a detailed description of the development of the Spanish economy over the last 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, while that of the U.S. is much more limited (see U.S. Dept. of Health and Human Services 1998). Thus, public sector expenditures, as a percent of the GDP, rose from 14.8 in 1960 to 40.7 percent in 2000 for Spain. In contrast,

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possible across countries. See the LIS web site for more information at: www.lisproject.org.

the percentage for the U.S. only increased from 27.0 to 31.7 per cent during the same time period.

Tax structures in the two countries are also rather different and this can contribute, not surprisingly, 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 the maximum tax rates in the graduated personal income tax system, as well as the number of tax brackets, have been larger in Spain than in the U.S. (see Gago 2000). Both countries have excise taxes but EU membership lead to the introduction in 1986 of a multi-stage value added national tax in Spain, in contrast to the primarily single stage sales tax system in the U.S. with taxes collected at the state and local levels.

The demographic structures of the two countries are also quite different. This is not surprising since Spanish households are characterized by a higher average household size, and a higher frequency of multigenerational households as more young adults live with their parents and more dependent elderly live with their children. Single-person and single parent households are also less prevalent in Spain than in the U.S.

Reflecting both the economic and demographic characteristics of Spain and the U.S.; inequality and welfare differ in the two countries. In particular, from 1973-74 to 1990-91, household expenditure and income inequality fell in Spain (Del Río and Ruiz-Castillo 2001a, 2001b; Ruiz-Castillo 1995). In contrast, during the 1980s in the U.S. household expenditure and income inequality increased (for example, see Johnson and Shipp 1997).[5]

[5] For the U.S., while it is true that inequality increased during the 1980s, no matter how it was measured, the increase in consumption-based inequality was smaller than the increase in income inequality (Cutler and Katz 1991, and Johnson and Shipp 1997). For Spain, the decrease in income inequality during the 1980s was greater than the decrease in expenditure inequality (Alvarez Aledo *et al.* 1996).

When comparing inequality based on income *versus* expenditures, Sastre (1999) found that for Spain income is more equal than expenditures.[6] The opposite result has been reported by Johnson and Shipp (1997) for the U.S. as noted earlier. The finding for Spain is counter to general economic intuition about the prevalence of transitory components in current income. However, the shorter time reference period for expenditures in the EPF relative to the reference period for income could also contribute to this result. This point is discussed in the Data section. With regard to the ranking of the countries, Gottschalk and Smeeding (1997) found that Spain had less income inequality than the U.S. during the earlier 1990s. Whether the ranking of the two countries remains the same when expenditure inequalities are compared is a question addressed in this research.

III. METHODS and DATA

Rigorous international comparisons require high standards of comparability in the definition of a household welfare measure. This paper 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 U.S., 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 this study.

[6] 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. These reasons cannot explain the situation, however, in countries such as Portugal, Spain nor the United Kingdom where, according to the results obtained using micro-data on household budgets, (the Survey of Family Budgets in Portugal, the EPF for the Spanish case, and the FES -Family Expenditure Survey- in the U.K.) income inequality is also lower than expenditures inequality (see Goodman and Webb 1995, Deaton and Paxson 1994, and Gouveia and Tavares

A. Issues of International Comparisons

Like intertemporal comparisons of income inequality and welfare in a single country, international comparisons of expenditures require the solution to the following five classical problems: (a) how to make comparable the money distributions in both countries; (b) how to make comparable two heterogeneous populations consisting of households with different needs; (c) which measurement instruments to use among the admissible inequality measures; (d) which measurement instruments to use among the admissible welfare measures, and (e) 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 at the same moment in time. Expenditure inequality comparisons would reflect not only differences in the quantities of goods and services consumed but also differences in the price structures prevailing in each country. Ideally, in order to express the quantity vectors bought in both countries at common prices it would be desirable to have a spatial price index relating, say, prices in the U.S. to prices in Spain. Such a price index is not available. As an alternative, in this paper household specific price indices are used in order to express each country's quantity vector at prices of two different moments in time. If, for instance, richer households have a greater rate of inflation than poorer households do in the U.S., while the opposite pattern is experienced in Spain, the expenditure inequality and welfare comparisons will certainly be influenced by the choice of time period. Thus, there are reasons to study how robust expenditures 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 non been dealt with in the literature before.

1995). This casts some doubts about previous comparisons between CPS income data for the U.S. and EPF or FES

In this paper, the 1990-91 household expenditure distribution in each country is expressed at constant prices of the following two periods: January, February and March of 1991 and 1981, or the winter of 1991 and 1981. The fact that expenditure distributions are expressed in their own currencies does not affect inequality comparisons using relative inequality indexes, However, for welfare comparisons, 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 will be referred to as the *basic partition.* Then a single set of equivalence scales is usually used in order to make interpersonal welfare comparisons among the partition subgroups. In this paper, the quest for robustness begins by investigating whether, say, inequality in Spain, for example, is unambiguously smaller for all subgroups of the basic partition than it is for the U.S. 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 are used to pool the expenditures of households belonging to the basic partition subgroups into a unique distribution of household equivalent expenditure. Then it is investigated whether the results at the population level are robust to the choice of equivalence scales.

To make the analysis tractable it is assumed that equivalence scales depend only on the number of people in the household.[7] Following Buhmann *et al.* (1988) and Coulter *et al.* (1992a, 1992b), a parametric model of equivalence scales, which allows for different views about the

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income data for Spain, Portugal or the United Kingdom, respectively.

importance of economies of scale in consumption within the household, are used.[8] To clarify the passage from the partition by household size to the population level, it is illuminating to work with additively decomposable measurement instruments. In this way, expenditure inequality differences between the U.S. and Spain can be accounted for in terms of two factors: a) the difference in within-group inequality (due to differences in subgroup inequality values and subgroup population shares); and b) the difference in between-group inequality (due to relative differences in subgroup means). In addition, following a suggestion in Coulter *et al.* (1992a) and developed in Del Río and Ruiz-Castillo (2001a), a method is used to ensure that only the second of the above factors depends 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 (for instance, see Slesnick 1998 and Shorrocks 1983), social or aggregate welfare is expressed in terms of two statistics of the income (or expenditure) distribution: the mean and an index of relative inequality. Consequently, it is 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 are 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 useful in intertemporal welfare comparisons within a single country (see Ruiz-Castillo 1998). In this paper, these methods are shown to be equally useful in international comparisons. This is important in a

[7] Atkinson and Bourguignon (1987) suggest an alternative approach for ranking income distributions that allows for differences regarding the treatment of different types of families. This approach (sequential stochastic dominance) uses methods that do not require cardinal specifications of equivalence scales.

situation characterized by considerable welfare and demographic inter-country differences between the subgroups in the partition by household size.

Bootstrap methods are used throughout to obtain confidence intervals for all estimates as in Mills and Zandvakili (1997).[9] Finally, following Cowell *et al.* (1999), systematic trimming at both ends of the household expenditure distributions is used to check the robustness of the inequality results.

B. Methods

1. Interpersonal Comparisons of Welfare

Assume 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[10], x^h. Households can differ in expenditures and/or a vector of household characteristics. As indicated above, the partition by household size is taken to be what is called the *basic partition*. Households of the same size are assumed to have the same needs and, therefore, their expenditures are directly comparable. Larger households have greater needs, but also greater opportunities to achieve economies of scale in consumption. Assume that there is $m = 1,..., M$ 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 *et al.* (1992a, 1992b). For each household h of size m adjusted expenditure is defined by

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

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

[9] The dominance approach (as presented by Shorrocks 1983) could have been used to for the inequality and welfare comparisons, along with the statistical inference procedures developed by Bishop *et al.* (1989, 1994).

[10] 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 paper, that variable has been called "expenditure".

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. In particular, when $\Theta = 0$ economies of scale are assumed to be infinite and adjusted consumption coincides with unadjusted household expenditures, while if $\Theta = 1$ there are no economies of scale and adjusted expenditures become *per capita* household expenditures.

Let $\boldsymbol{x}^m$ and $\boldsymbol{z}^m(\Theta)$ 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*

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

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, independently of individual preferences and prices.

This is possibly the simplest and most convenient of all interesting equivalence scale models[11]. 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 on that of households. Thus, following standard practice for overall inequality and

[11] For two parameters 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 *et al.* (1992a).

welfare measurement, household adjusted expenditure is weighted by the number of people in the household. Or in other words, each person is assigned the adjusted expenditure of the household to which he or she belongs.

2. 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. (See, for example, Shorrocks 1980, 1984). The family can be described by means of the following convenient cardinalization:

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

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, 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:

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

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

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 Θ which captures the generosity of the scale. They illustrate their analysis

with U.K. data[12]. However, incomplete or incorrect information about the equivalence scale chosen can arise. For example, household size may not adequately account for differences in the needs of household members. Given this, the GE family is quite useful, in its decomposable form, for isolating the impact or "contamination" on the inequality orderings that can arise when this situation exists. Some robust conclusions, independent of the equivalence scale, can be obtained by applying the decomposable formulation. To see this, consider the formula for the GE index when written in decomposable form for the partition by household size:

$$I_C(\mathbf{z}(\Theta)) = \sum_m (v^m(\Theta))^c (p^m)^{1-c} I_C(\mathbf{z}^m(\Theta)) + I_C(\mu^1(\Theta),\ldots,\mu^M(\Theta)). \qquad (6)$$

where $v^m(\Theta)$ 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, $I_C(\mathbf{z}^m(\Theta)) = I_C(\mathbf{x}^m)$.

When $c = 0$ the expression $v^m(\Theta)^c (p^m)^{1-c}$ 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:

$$I_0(\mathbf{z}(\Theta)) = U + C(\Theta), \qquad (7)$$

where

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

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

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

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

is the between-group inequality that depends on Θ, the scale adjustment factor. The between group inequality component is referred to as "contaminated" since 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.

3. Welfare Measurement

A social evaluation function (SEF for short) is a real valued function *S* defined in the space R^H of adjusted expenditures, with the interpretation that for each expenditure distribution $\boldsymbol{x} = (x^1,...,x^H)$, $S(\boldsymbol{x})$ provides the "social" or, simply, the aggregate welfare from a normative point of view. Consider SEFs which 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:

$$S(\boldsymbol{x}) = \mu(\boldsymbol{x})(1 - I(\boldsymbol{x})). \quad (10)$$

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: a weighted average of welfare within the subgroups, with

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4 of this paper.

weights equal to demographic shares, minus a term which 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) show that the only SEF among them with the property of additive decomposability with demographic weights, is the following:

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

where I_1 is the original Theil index. These authors also show that $W(\mathbf{x}) = \Sigma_i \alpha_i x_i$, *where* $\alpha_i = [1 - \ln(x_i/\mu_{\mathbf{x}})]/N$, 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.[13] Taking into account the definition of adjusted expenditures, we have:

$$W(\mathbf{z}(\Theta)) = A(\Theta) - B(\Theta) \quad (12)$$

where:

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

and

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

Equation (13) is the within-group welfare, while equation (14) is the penalty associated to between-group inequality in the partition by household size.

[13] If we take the index I_c in equation (3) with $c = 2$ and define the SEF $S_2(\mathbf{x}) = \mu(\mathbf{x})(1 - I_2(\mathbf{x}))$, 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 one.

As an alternative to this approach, Atkinson and Bourguinon (1987) take as given a social ranking of all subgroups from the point of view of increasing needs; for instance: singles, couples, lone parents with a child, couples with a child, and other household types. Instead of using equivalence scales to make welfare comparisons across these demographic types, these authors develop dominance criteria to establish whether one distribution is socially preferred to another one. However, this procedure depends on the assumption of a utilitarian SEF of the form $W(\mathbf{x}) = \Sigma_i x_i$, Unfortunately, this SEF is not additively separable in the sense defined above, and does not penalize the inequality between subgroups.

C. Data

As noted earlier, this paper uses data from national government consumer expenditure surveys. The Spanish data are from the EPF conducted by the INE, and the U.S. data are from the CE Interview (augmented with data from the Diary) from the BLS. The latest available EPF data, conducted from April 1990 to March 1991, determines the 1990-91 comparison period although more recent data are available for the U.S. (Further information concerning the data can be found in the Appendix including the definition of expenditures.) For both expenditure surveys, data are collected from consumer or economic units (referred to in this paper as a household, as noted earlier) defined as a collection of people sharing some expenditures and possibly living quarters.[14] Comparability issues are of four types, referring to the population covered, the nature of the survey and its effect on the way annual expenditures are estimated in each country, the sample size, and the definition of household current total expenditures as a measure of household economic well-being.

[14] See BLS (1993) and INE (1992) for the definitions of a consumer unit in the U.S. and a household in Spain. See also the Appendix.

The U.S. population is defined as the total civilian non-institutional population and a portion of the institutional population living in 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. For the U.S. CE, 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. The Spanish population refers exclusively to the civilian non-institutional population living in residential housing. However, the Spanish EPF records the transfers made to household members who are dependent on household resources but who live elsewhere at the time of the interview, including those living in institutional or collective housing (*e.g.*, university residences, student apartments, hotels, hospitals, and elderly residences). The U.S. CE survey only includes the expenditures for individuals who reside in this consumer unit. Transfers to others outside the unit, including to college students living away from home, are considered gifts. Expenditures for gifts of goods and services are considered to be among the consumption expenditures of the consumer unit for the purposes of this unit in the CE.

More serious are the differences about the way expenditures on any good are annualized. As indicated, 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, 14 years of age or older, are supposed to record, in a Diary, all expenditures taking place during a sample week. Naturally, many goods and services with frequency of purchase beyond a week escape from this Diary. Thus, an in-depth interview is conducted in each household to register past expenditures made within reasonable reference periods, determined by experts, prior to the sample week. These reference periods cover expenditures made during the past one, two, three or

twelve months. From that information, the INE estimates annual household total expenditures. In this paper, annual expenditures on food and drinks take 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 this set of different reporting periods, are assigned the reference 1990-91 period. Notice, however, that the estimates of annual household total expenditures obtained from a sample spread out over 52 weeks during a year will be subject to seasonality bias

The U.S. CE has two components, a Diary or record-keeping survey and an Interview. The Diary captures all expenditures made during two consecutive weeks, and the Interview captures all expenditures made during the previous three months prior to the beginning of the month of the interview. Five consecutive personal interviews are conducted once every three months. Data from the first interview are used to 'bound' expenditures for subsequent interviews and are not used in estimation. For official publication purposes, the BLS assumes that the quarters of expenditures are independent and annualize 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 this study the correlation of expenditures across quarters is considered however.

This paper limits itself to CE Interview survey consumer units only, since they provide the maximum of data over the longest period of time, relative to the Diary sample. However, data from both the Diary and Interview are used to define annual total expenditures following a method developed by Rob Cage at the BLS (for more details, see the Appendix and Cage *et al.* 2002). The advantage of this procedure is twofold. In surveys where each household is interviewed only once per year, reference periods must cover a full year prior to the date of the

interview. In surveys where each household is interviewed once per quarter during four consecutive quarters, like the CE, reference periods must cover only the three months prior to the date of the interview. Consequently, the infrequency of purchase problem is much less damaging in the CE than in surveys like the EPF. When the panel aspects of the CE are exploited, seasonality bias is reduced.

The Interview sample is selected on a rotating panel basis. For the 1990-91 period, the sample was 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. The continuous and rotating nature of the CE Interview in the U.S. case posed 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. For this study, quarterly expenditure reports were not assumed to be independent (as in official CE publications, see BLS 1993), but each household was required to have reported expenditures for two, three, or four quarters during the time period 1990-1991. By way of example, consider a household having reported expenditures only from Spring 1990 to Autumn 1990. How can its expenditures for Winter 1991 be estimated? As explained in Cage *et al.* (2002), current expenditures from Winter 1990 in a 207-dimensional commodity space can be expressed at 1991 prices. Annual expenditures are the sum of commodity quantities bought from Spring to Autumn of 1990 at current prices, plus the quantities bought in Winter 1990 at Winter of 1991 prices. In this way, the seasonal nature of consumption patterns is preserved as best as possible.

To obtain annual expenditures for the U.S. 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 do not have a year's worth of data results 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 be 1,367 observations in the U.S. sample. In contrast, the final U.S. sample is composed of 6,284 households, representing 118,481,815 households and 307,204,548 people in the sample population over 1990-91. The 1990-91 EPF consists of 21,155 sample households for a 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 the interview period.

In brief, the CE does a better job than the EPF as far as frequency of purchase and seasonality problems are concerned. Thus, it may be conjectured that, for any definition of household annual total expenditures and abstracting from large differences in sample size, expenditures inequality in Spain would tend to suffer from an upward bias relative to expenditures inequality in the U.S. However, no conjectures can be made on these grounds about the possible relative bias of mean household expenditures estimates in both countries.

As far as the measurement of economic well-being is concerned, consumption expenditures are used as a proxy for consumption. The starting point is the set of expenditures used by the statistical agencies for the production of their official Consumer Price Indexes (CPIs). These are then adjusted in order to reflect more accurately household current consumption (see the Appendix for a detailed description and a discussion of possible bias).

Consider the construction of statistical price indexes of the Laspeyres type for a set of households interviewed in a survey like the CE in the U.S. 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 $i = 1,\ldots, n$, published by the BLS in the U.S. and the INE in Spain; and a set of vectors of household budget

shares, $w^h = (w^h_1,\ldots, w^h_n)$, $h = 1,\ldots, H$. An individual consumer price index (cpi^h) for household h is then defined by

$$cpi^h_t = \Sigma_i \, w^h \, R_{it} \quad [15]. \tag{15}$$

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

Assume for simplicity that the period in which households are interviewed coincides with the base year of the official CPI system. Then, to convert any household magnitude 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: $x^h \; cpi^h_t = x^h_t$. In this paper, the 1990-91 household expenditures distributions for the U.S. and Spain are expressed at constant prices using household specific price indexes for two periods in each country: the winter of 1991 and the winter of 1981. In this way, the distributional role of price changes during the 1980s in both countries can be analyzed. These results are presented in Section IV.D.

In order to standardize the comparisons of expenditures and welfare in the two countries, purchasing power parities (PPPs) for private consumption expenditures are used. These 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).[16] PPPs based on the Elteto-Koves-Szulc (EKS)

[15] As 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: $CPI_t = \Sigma_h \, \alpha^h \, cpi^h$, where $\alpha^h = x^h / \Sigma_h x^h$, and x^h is household's h total expenditures.

[16] 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 also differences in price levels.

method of aggregation are used (OECD 1993). Although the EKS indexes are not additive, the OECD notes that the EKS can be used to compare levels.[17] 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. Therefore, 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; OECD 1993).

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

IV. RESULTS

A. 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.[18] One- and two-person households are much more prevalent in the U.S. than in Spain (around 57 percent *versus* 32 percent of all households, respectively) while the opposite is true for larger households.[19] The

[17] 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 (*versus* 74.74) and the index for 1991 is and 106.8 (*versus* 108.9).

[18] Due to the small size of the remaining groups, only households with one to seven members that represent about 99 per cent of all households and 97 per cent of all persons in the population are included. We use these households to examine in detail differences between Spain and the U.S. 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).

[19] Duclos and Mercader-Prats (1999) find also similar differences between Spain and the U.K. in 1980-81: there are about four times as many one-adult households in the U.K. as there are in Spain, while there are many more

age distribution of these two types of households differs considerably between both countries, with Spanish singles and couples older and with a lower purchasing power than their U.S. counterparts (results not shown).[20]

Table 1 around here

Some of these differences are attributable to population definitions since, as was said before, students living in college residences are counted as separate units in the CE, even if they are economically dependent on their parents. In contrast, such students are counted as members of their parent households in the EPF. Yet, students living in college residences represent only 1.4 percent of all households in the U.S. sample population for 1990-91 and 7.4 percent of all households whose heads are less than 31 years of age (results not shown).

Table 2 shows mean household expenditures by household size, the only demographic characteristic considered in this study, as well as for the population as a whole for different equivalent scales denoted by adjustment factor, Θ[21]. Using person-weighting, U.S. households have higher mean expenditures than same sized households do in Spain. The differences are statistically significant (at the 0.05 level) in all cases, except for households with six members, and are especially important for smaller households. Adjusting expenditures by an equivalence scale also result in higher values for the U.S.: adjusted expenditures are greater in the U.S. relative to those in Spain for all values of Θ.

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households with three and more adults in Spain. This, together with the fact that the presence of children in Spain is much greater than in the U.K., turns out to be a crucial factor in the poverty comparison between these two countries.

[20] Singles aged 65 or older represent 64 per cent of the Spanish single population *versus* 34 percent in the U.S. On the other hand, around a quarter of the single population are under age 31 in the U.S. *versus* 5.5 percent of Spanish singles.

[21] All comparisons in this paper for the population as a whole are made for common values of the parameter Θ. Given the fact 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 around here

In brief, the differences in household size are sufficiently large to indicate important differences in living arrangements and to explain some of the divergences in the levels of living of different size households between both countries. This is an important fact in inequality and welfare comparisons, as will be seen below.

B. Relative Inequality

Generalized Entropy indices for households of size one to seven, based on 1990-91 expenditures in Winter 1991 prices, are presented in Table 3. For both the U.S. and Spain, inequality is greater for the indices more sensitive to differences at the top and the bottom of the distribution (I_2 and I_{-1}, respectively), which means that in both countries inequality in the tails of the distributions is larger than in the middle part. In spite of the fact that (except for households of size three and four) differences between estimated inequality indices are of a considerable magnitude (between 20 and 30 per cent), only in smaller households (singles and two people) expenditures are significantly less unequally distributed in the U.S. than in Spain. The relatively smaller number of observations in the U.S. sample for larger households mostly contribute to this effect (see the first two columns in Table 1).

Table 3 around here

The use of decomposable inequality measures facilitates the understanding of the results for the population as a whole. Table 4 provides the results on the decomposition for the basic partition using the mean logarithmic deviation, or the index I_0. As was seen in equation (7), this index can be decomposed as the sum of 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 U.S. (country 2), according to the mean logarithmic deviation index, I_0,, *i.e.,* $\Delta I(\Theta) = I_0(z_2(\Theta)) - I_0(z_1(\Theta))$. This magnitude can be expressed as

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

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

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

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

Table 4 around here

The difference in within-group expenditure is determined by the differences between countries in the expenditure inequality in the partition by household size. As was seen in the lower panel of Table 3, expenditure inequality is smaller in the U.S. for small households comprising one person or two people, statistically equal in both countries for three- and four-person households, and larger (although not statistically) in the U.S. for greater household sizes. As it can be seen in columns three and six of Table 4, when such differences are weighted by population shares, within-group expenditure inequality is larger in the U.S., but this difference is not statistically significant[22].

[22] 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: 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 since the differences in within-group inequality are not

In both countries, the importance of between-group inequality as an explanatory factor of overall inequality follows a non-linear pattern with Θ, the scale adjustment factor. As can be seen in Table 4, when no allowance is made for household size and economies of scale are assumed to be infinite, *i.e.*, $\Theta = 0$, between-group inequality accounts for a sizable percentage of overall inequality, 13 to 18 per cent. As the adjustment factor Θ increases, reflecting the decreasing importance of economies of scale in consumption, re-orderings take place: larger households, who have larger unadjusted expenditures, tend to occupy lower positions as household size increases its role in the definition of adjusted expenditures. The opposite is the case for smaller households, whose adjusted expenditures depend relatively less on household size. As a consequence of this complex process in which the identity of households at the top and the bottom of the distribution is changing dramatically, the ratio "between-group inequality/overall inequality" rapidly declines and increases again as the scale factor Θ approaches one and adjusted total expenditures become *per capita* total expenditures.

However, there are differences across countries that explain the differences in the between-group term which represents the difference in the contaminated part, $\Delta C(\Theta)$, shown in column 3 in the bottom panel of Table 4. Although mean expenditures are essentially an increasing function of household size in both countries (see Table 2), smaller households in the U.S. are found to be younger, more affluent (as represented by their expenditures), and more prevalent than in Spain. As a consequence, on average the range of variation between mean household expenditure by household size is smaller in the U.S. than in Spain. Thus, for low values of the scale adjustment factor Θ, between-group inequality is lower in the U.S. than in

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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.

Spain. On the other hand, for larger households the relationship between mean expenditures and household size is smoother in Spain (as a matter of fact, mean expenditure for six-person households in the U.S. is lower than for five-person households). It is also observed that the difference in favor of the U.S. tends to decline as household size increases (for six-person households, those differences are not statistically significant). As the scale factor grows toward one, these differences manifest themselves in a different U pattern for the ratio "between-group inequality/overall inequality" (see the upper panel in Table 4). The re-orderings among households of different sizes which take place as the scale factor increases are more dramatic in the U.S, where between-group inequality reaches a minimum before and increases afterwards more rapidly than in Spain. Consequently, for larger values of the scale adjustment factor Θ between-group inequality is larger in the U.S.

Since the difference in contaminated inequality tends to dominate the difference in uncontaminated inequality, the results on overall inequality depend on the assumptions concerning economies of scale. Thus, when economies of scale are assumed to be large (for values of Θ below 0.5), expenditures are marginally more unequally distributed among Spanish households than in the U.S., although the difference is not statistically significant. On the contrary, when economies of scale are assumed to be low (for values of Θ above 0.5), overall expenditure inequality is significantly greater in the U.S.

The decomposition of the original Theil inequality index, $I_{1,}$ follows the same pattern as that of the mean logarithmic deviation I_0 (results not shown but available from the authors). On one hand, differences in within-group inequality are not statistically significant. On the other hand, for low values of Θ between-group inequality is lower in the U.S. while the opposite happens for higher values of Θ. In any case, overall differences are not statistically significant

except when $\Theta = 1$, in which case *per capita* expenditures inequality in the U.S. is larger than in Spain.

Inequality comparisons are very vulnerable to what happens at both ends of the distributions, where data imperfections might be particularly serious. Following Cowell *et al.* (1999), the robustness of the above results is analyzed by trimming each country's distribution. In order to do so, one percent and then five percent of the observations from each tail of the distribution were removed in both one-tailed and two-tailed exercises. However, the results obtained (which are available upon request), are essentially the same and increase only slightly the possibility of re-ranking the distributions between the two countries.

The conclusion 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 decreases by household size for Spain. For the U.S. the results are more mixed but generally inequality is higher for larger households. As a consequence, expenditure inequality for the population as a whole is very similar for both countries. Only when economies of scale are small or non-existent do expenditures in the U.S. appear to be significantly more unequally distributed than in Spain.[23]

C. 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

[23] 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 1.0 and the index is I_{-1} is an unambiguous ranking produced, indicating that expenditure inequality is significantly greater in the U.S. than in Spain (see Table 1 in the Appendix).

expenditure inequality. For this analysis, the GE inequality index I_1 is used[24] (see Section III. B.3 for a justification).

Table 5 around here

According to equation (11), for each household size we have

$$W(x^m) = \mu(x^m)F(x^m) \qquad (19)$$

where $F(x^m) = 1 - I_1(x^m)$. Table 2 showed that, except for six-person households, mean household expenditures are greater in the U.S. than in Spain. The difference is considerably larger for smaller households. On the other hand, for one- and two-person households, expenditures are more equally distributed in the U.S. than in Spain, while the differences in expenditure inequality for the rest of household sizes are 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 two-person households in the U.S. is almost 75 per cent greater than that of their Spanish counterparts, and around 30 percent and 16 percent greater for three- and four-person households. For larger households, differences in welfare between both countries are not statistically significant.

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

$$W(z(\Theta)) = A(\Theta) - B(\Theta) \qquad (20)$$

where:

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

[24] Results for other SEFs are shown in the Appendix (Table 1).

and

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

As the scale adjustment factor 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 decrease in the within-group term is larger in Spain than in the U.S.

Table 6 around here

On the other hand, between-group expenditure inequality according to I_1 is greater in Spain than in the U.S. for Θ, the scale adjustment factor, equal to *0.0* and *0.3*, and the opposite is the case for larger values of Θ. Thus, the penalty imposed on social welfare through this term is correspondingly larger (smaller) for Spain when the scale factor is low (high). This effect works in the opposite direction to the previous one (the variation in within-group welfare with the adjustment factor Θ) but it is of a much lower order of magnitude. Therefore, the conclusion is that although social welfare in the U.S. is significantly greater than in Spain, the difference grows continuously from 12 to 40 percent as the scale factor increases and economies of scale diminish.[25,26]

D. Accounting for Differences in Prices

As 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

[25] This is also the case for SEFs that correct mean expenditures by between-group inequality using members of the GE family different from I_1. Results are available upon request.

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 between periods *t* and *t'* in country *1* is very different from the one in country *2*, then 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*, *i.e.*,

$$\Delta I_t(\Theta) = I_0(\mathbf{z}_{2t}(\Theta)) - I_0(\mathbf{z}_{1t}(\Theta)). \quad (23)$$

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

$$\Delta I_{t'}(\Theta) = I_0(\mathbf{z}_{2t'}(\Theta)) - I_0(\mathbf{z}_{1t'}(\Theta)). \quad (24)$$

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,

$$\Delta P_i(\Theta) = I_0(\mathbf{z}_{it}(\Theta)) - I_0(\mathbf{z}_{it'}(\Theta)). \quad (25)$$

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 anti-rich. 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, inequality at *t'* prices is smaller than inequality at *t* prices, that is to say, $\Delta P_i(\Theta) = I_0(\mathbf{z}_{it}(\Theta)) - I_0(\mathbf{z}_{it'}(\Theta)) > 0$.

It is easy to see that

[26] See the Appendix for differences in the definition of total expenditures that could affect the welfare results.

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

That is:

$$I_0(\mathbf{z}_{2t}(\Theta)) - I_0(\mathbf{z}_{1t}(\Theta)) = (I_0(\mathbf{z}_{2t}(\Theta)) - I_0(\mathbf{z}_{2t'}(\Theta))) - ((I_0(\mathbf{z}_{1t}(\Theta)) - I_0(\mathbf{z}_{1t'}(\Theta)))$$
$$+ (I_0(\mathbf{z}_{2t'}(\Theta)) - I_0(\mathbf{z}_{1t'}(\Theta))). \quad (27)$$

Therefore, the difference in expenditure inequality between country 1 and country 2 is the same at prices of both periods, *i.e.,* $\Delta I_t(\Theta) = \Delta I_{t'}(\Theta)$*, if and only if* the distributive effect of price change s 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 (results by household size are available upon request). The positive sign of $\Delta P_2(\Theta)$ and $\Delta P_1(\Theta)$ reveals that changes in prices from the winter of 1981 to the winter of 1991 are anti-rich in both countries, meaning that the rich faced higher inflation over the time period. However, neither of the two terms is significant for any value of the adjustment factor, which indicates that inflation during this period in both countries has been essentially neutral from a distributional point of view. Therefore, it can be concluded that the results on expenditure inequality and welfare comparisons between the two countries are robust to the choice of the reference time period. In particular, for expenditure inequality comparisons at winter of 1981 and winter of 1991 prices, respectively (see columns three and four in Table 7), the conclusion is that expenditure inequality in the U.S. and Spain are indistinguishable when economies of scale are assumed to be large (low values of Θ), while U.S. expenditure inequality is significantly greater when economies of scale are assumed to be small or non-existent (high values of Θ).

Table 7 around here

V. SUMMARY AND CONCLUSIONS

This paper has highlighted the role of demographics and the choice of the reference time period on expenditure inequality and welfare comparisons for Spain and the U.S. In order to assess the statistical significance of all results, bootstrap estimates of the sampling variance of all magnitudes have been computed throughout.

Using a model in which equivalence scales are assumed to depend only on household size and a parameter reflecting different views about the importance of economies of scale, the results show that differences in demographic factors can be very important in international comparisons. Inequality and welfare comparisons of similarly defined 1990-91 expenditure distributions for both countries are drastically different for smaller and larger households. In particular, smaller households in the U.S. are more prevalent, younger, more affluent (based on expenditures) and exhibit less inequality than their Spanish counterparts; while larger households are relatively less prevalent, not as affluent and have greater inequality. Given this diversity, decomposable measurement instruments help to explain how results at the household size level are translated at the population level.

When the 1990-91 expenditure distributions in both countries are expressed at winter of 1991 and winter of 1981 prices, inflation over the time period in both countries is essentially neutral from a distributional point of view. Because the distributional impact of price changes is of a comparable order of magnitude, expenditure inequality and welfare comparisons are robust to the choice of the reference price vector. Those comparisons are 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 are few country-wide and international studies that take this view although the number is growing. Previous studies (Gottschalk and Smeeding 1997) show that around the year 1990, household income inequality was clearly greater in the U.S. than in Spain. However, when expenditures are substituted for income as the measure of economic well-being, the ranking of the two countries cannot be maintained unequivocally. The ranking can be maintained only for the expenditure distributions when economies of scale are assumed to be small or non-existent. Otherwise, expenditure inequality is smaller in the U.S. although the differences are not statistically significant. On the other hand, social welfare is significantly greater in the U.S than in Spain for all values of the equivalence scale parameter, and the difference increases as economies of scale diminish.

If it is desirable to reduce expenditure inequality, then Spain would have to strive to lower expenditure inequality within small households while the U.S. would have to pay special attention to larger households. However, to be able to draw useful policy conclusions much more work would have to be done. Decomposition analysis could be applied to learn about the main factors, together with household size, which account for expenditure inequality differences between the two countries. But, ultimately, policy conclusions will need to wait until the explicit modeling of such differences has been empirically tested.

APPENDIX

A. 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) comprises either: 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 have to be provided entirely, or in part, by the respondent. For further details on the Spanish and the U.S surveys used for this study, see INE (1992) and Bureau of Labor Statistics (1993).

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

As indicated in Section III, data from both the Diary and Interview are used to define total expenditures following a method developed by Rob Cage at the BLS (Cage *et al.* 2002). The BLS (1993) estimates that about 80 to 95 percent of total household 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. Data from the Diary are used to impute additional expenditures for these omitted items to the Interview households. This is 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 are produced by index-area and consumer unit size in the Diary sample. These shares are then mapped to the CE Interview sample by index area and consumer unit size, and are used to impute expenditures for these additional items in the Interview.

Household size and age of head are 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 are also the result of averaging the quarterly weights over the number of quarters for which the consumer unit participates in the survey.

C. Definition of household expenditures

In this paper, household economic well-being is identified with 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, the focus remained on current consumption expenditures.

The starting point is the expenditure bundle used by the statistical agencies for the production of their official Consumer Price Indexes (CPIs). Included in the U.S. CPI bundle but not the Spanish CPI bundle are 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 are considered current consumption for 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 of a form of savings than current consumption. Thus, they are 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 are included. In addition, for the U.S., adjustments are made to account for the flow of services from selected household durables (see Cage *et al.* 2002).

However, some differences in the Spanish and U.S. definition of household consumption expenditures remain. For example, it is known that 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 U.S. To include the household's expenditures for the U.S., and not the comparable expenditures made by Spanish households and the government on the part of Spanish households means that an item like health care (and its value) in Spain will be underestimated. About 2.28 percent of total expenditures for Spain are for out-of-pocket health expenditures. This is in contrast to the share for the U.S. that is about 7 percent. Included in the Spanish measure, however, but not the U.S. one are (i) cash contributions to non-profit institutions and cash transfers to members of the household who are not living at the residence[27] (for example, college students), as well as (ii) the value of home production[28]. As noted in the main part of the paper, cash transfers are not collected each quarter in the CE data so they could not be included in the U.S. total. No information is collected in the CE on home production. However, when these last two sets of expenditures are excluded, the overall results with respect to inequality and social welfare in Spain as compared to the U.S. change very little[29].

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

[28] Home production includes self-consumption and self-supply. Self-consumption is defined to be goods (mainly food) produced on one's own farm, in one's own factory or workshop, or by one or some member of the household. These goods are consumed by household members or given as gifts to others not of this household during the reference period. These goods are valued at local retain market prices.

[29] 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 (*versus* 0.166), when $\Theta = 0.3$, the index was 0.149 (*versus* 0.145), when $\Theta = 0.5$, the index was 0.143 (*versus* 0.139), when $\Theta = 0.7$, the index was 0.143 (*versus* 0.140), and when $\Theta = 1.0$, the index was 0.158 (*versus* 0.155).

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Table 1. Sample Size and Population Distributions by Household Size in Spain and the United States. 1990-91 Distributions

Household Size	Sample size		Population Distribution of Persons			Population Distribution of Households		
	Spain	United States	Spain	United States	Percent Difference	Spain	United States	Percent Difference
1	2,174	1,672	2.9	10.3	252.1	10.0	26.8	168.0
2	4,735	1,837	13.1	23.4	78.8	22.3	30.3	36.1
3	4,427	1,106	18.3	19.8	8.1	20.8	17.1	-17.8
4	5,052	968	29.3	23.7	-19.2	25.0	15.3	-38.5
5	2,822	428	19.4	12.7	-34.3	13.2	6.6	-50.0
6	1,206	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 to 7	20,887	6,236	97.1	97.4	0.4	98.9	99.3	0.4
Total	21,155	6,284	100.0	100.0		100.0	100.0	

Table 2. Mean Household Expenditures in Spain and the United States for 1990-91 Distributions of Expenditures in Winter 1991 Prices and U.S. Dollars[1]

	Mean Household Expenditures		
Household Size	**Spain**	**United States**	**Percent Difference[2]**
1	$9,993	$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

	All Households Mean Adjusted Household Expenditures (person weighted)		
Adjustment Factor Θ	**Spain**	**United States**	**Percent Difference**
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	9,471	12,712	*34.2
1.0	6,445	9,504	*47.5

[1]Based on EKS purchasing price parity conversion factor of 108.9 Spanish pesetas to $1 U.S. for 1991

[2]Percent difference = ((U.S. - Spain) / Spain)*100

*Difference statistically significant at the 0.05 level

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

Household Size	Generalized Entropy Inequality Indices (I_c)			
	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]
	Percent Difference Between the United States and Spain[1]			
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

Bootstrapped standard errors in brackets: 1000 replications

[1]Percent difference = ((U.S. - Spain) / Spain)*100

*Difference statistically significant at the 0.05 level

Table 4. Decomposition of Relative Inequality Index I_0 for Spain and the United States Based on 1990-91 Distributions of Adjusted Household Expenditures in Winter 1991 Prices (person weighted)

	All Households[1] Decomposition of I_0 by Household Size					
	Spain			United States		
Adjustment Factor Θ	Overall	Within-Group	Between-Group	Overall	Within-Group	Between-Group
0.0	0.166 [0.0032]	0.136 [0.0027]	0.030 [0.0014]	0.161 [0.0053]	0.140 [0.0042]	0.021 [0.0029]
0.3	0.145 [0.0034]		0.009 [0.0007]	0.144 [0.0044]		0.004 [0.0010]
0.5	0.139 [0.0029]		0.003 [0.0004]	0.146 [0.0037]		0.006 [0.0013]
0.7	0.140 [0.0033]		0.004 [0.0005]	0.160 [0.0045]		0.020 [0.0020]
1.0	0.155 [0.0030]		0.018 [0.0013]	0.201 [0.0050]		0.061 [0.0032]

Decomposition of Differences in Inequality according to I_0: U.S. Inequality - Spain Inequality

Adjustment Factor Θ	Difference in overall inequality $\Delta I(\Theta)$	Difference in "uncontaminated" (within group) inequality ΔU	Difference in "contaminated" (between group) inequality $\Delta C(\Theta)$
0.0	-0.005	0.004	*-0.009
0.3	-0.001		*-0.005
0.5	~0.008		*0.004
0.7	*0.020		*0.016
1.0	*0.046		*0.043

[1]Groups partitioned by household size with all households accounted for

Bootstrapped standard errors in brackets: 1000 replications

~Difference statistically significant when expenditure distributions trimmed to eliminate top and bottom 5 % of the weighted sample

*Difference statistically significant at 0.05 level

Table 5. Social Welfare by Household Size in Spain and the United States Based on 1990-91 1990-91 Distributions of Unadjusted Household Expenditures in Winter 1991 Prices and U.S. Dollars[1]

	Social Welfare Based on Social Evaluation Function *W*		
Household Size	**Spain**	**United States**	**Percent Difference[2]**
1	$7,553 [155.5]	$13,160 [255.5]	*74.2
2	12,624 [158.3]	21,601 [291.2]	*71.1
3	18,867 [188.8]	24,365 [425.5]	*29.1
4	23,102 [267.5]	26,859 [490.3]	*16.3
5	24,591 [302.0]	26,723 [835.8]	8.7
6	25,891 [529.9]	24,216 [1295.7]	-6.5
7	26,529 [681.4]	31,412 [2752.9]	18.4

[1]Based on EKS purchasing price parity conversion factor of 108.9 Spanish pesetas to $1 U.S. for 1991

[2]Percent difference = ((U.S. - Spain) / Spain)*100

Bootstrapped standard errors in brackets: 1000 replications

*Difference statistically significant at 0.05 level

Table 6. Social Welfare in Spain and the United States Based on 1990-91 Distributions of Adjusted Household Expenditures in Winter 1991 Prices and U.S. Dollars[1] (person weighted)

Adjustment Factor Θ	All Households Social Welfare Based on Social Evaluation Function *W*								
	Spain			United States			Percent Difference[2]		
	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	8,119 [40.3]	8,151	32	10,687 [107.6]	10,924	237	*31.6	34.0	631.2
1.0	5,412 [29.4]	5,526	115	7,602 [77.8]	8,160	557	*40.5	47.7	385.4

[1]Based on EKS purchasing price parity conversion factor of 108.9 Spanish pesetas to $1 U.S. for 1991

[2]Percent difference = ((U.S. - Spain) / Spain)*100

Bootstrapped standard errors in brackets: 1000 replications

*Difference statistically significant at 0.05 level

Table 7. The Impact of Prices on Relative Inequality (I_0) in the United States and Spain in 1981 and 1991 Using 1990-91 Adjusted Household Expenditures. All Households (person weighted)

Adjustment Factor Θ	Inequality Based on Winter 1991 Prices Minus Inequality Based on 1981 Prices		Inequality in United States Minus Inequality in Spain	
	Spain $\Delta P_1(\Theta)$	United States $\Delta P_2(\Theta)$	In Winter 1981 Prices $\Delta I_{t'}(\Theta)$	In Winter 1991 Prices $\Delta I_t(\Theta)$
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

*Difference statistically significant at 0.05 level

Appendix Table. Relative Inequality and Overall Welfare for Spain and the United States Based on 1990-91 Distributions of Adjusted Household Expenditures in Winter 1991 Prices and U.S. Dollars (person weighted)

Adjustment Factor Θ	Spain			United States			Percent Difference		
	I_{-1}	I_1	I_2	I_{-1}	I_0	I_2	I_{-1}	I_0	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]			
				Overall Welfare					
0.0	$19,336	$20,622	$19,948	$22,073	$23,191	$22,153.5	*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	7,918	8,149	7,783	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	5,275	5,449	5,105	7,052	7,594	7,036	*33.7	*39.4	*37.8
	[41.7]	[27.5]	[70.6]	[120.7]	[91.6]	[185.3]			

[1]Based on EKS purchasing price parity conversion factor of 108.9 Spanish pesetas to $1 U.S. for 1991

Bootstrapped standard errors in brackets: 1000 replications

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

*Difference statistically significant at the o.o5 level

~Difference statistically significant when expenditure distributions trimmed to eliminate top and bottom 5 % of the weighted sample