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THE EVOLUTION OF THE STANDARD OF LIVING IN SPAIN, 1973-74 TO 1980-81

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Abstract

In this paper we have investigated the evolution of the standard of living in Spain from 1973-74 to 1980-81 for a population of about 10 million household and 34 or 37 million persons occupying private housing. The standard of living has been approximated by a private consumption measure, comparisons in real terms have been made possible by household specific statistical consumer price indices, and the heterogeneity of the household population has been taken into account by means of several parametrisations of the weight to be given to household size, or to children needs relative to those of adults. Social or aggregate evaluations have been performed by scalar indicators which permit to summarise judgements about an entire distribution by means of two statistics: the mean and an index of either relative or absolute inequality. Standard restrictions, as well as the requirement of additive separability, lead to a member of the General Entropy family of social evaluation functions in the relative case, and to several members of the Kolm-Pollack family in the absolute case. Comparisons have been made with and without weighting household adjusted expenditure by household size in the domain of the social evaluation functions.

Key Words

Social Welfare Comparison, Relative Inequality, Absolute Inequality, Additive Decomposability

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INTRODUCTION

Most of the analytical and empirical literature on income distribution has been concentrated on income inequality. In this paper we introduce efficiency considerations by means of social evaluation functions, taking advantage of some of the lessons learned in comparisons of income inequality over time and/or across space.

We first summarise the framework of analysis presented in Ruiz-Castillo (1994) to compare the social or aggregate welfare of independent cross-sections of household data on total income, expenditures on particular commodities, and non-income characteristics. In the second place, we propose a simple but useful statistical specification, which we then apply to Spanish data from two large household budget samples, of about 24.000 observations each, for a population of approximately 10 million households occupying private housing: the *Encuestas de Presupuestos Familiares* (EPF from here on) for 1973-74 and 1980-81, collected by the Spanish *Instituto Nacional de Estadística*.

If we allow households to have different preferences, we will be forced to establish a "welfare correspondence" in the sense of Pollak (1991), determining which indifference curve on one's household's map yields the same welfare level as a particular curve on each other's map. Lacking a theory for that purpose, we must restrict ourselves to what Pollak calls "situational comparisons". These are made in terms of a fundamental unconditional utility function, common to all households, defined on commodities and ethically relevant household characteristics. Then, following Muellbauer (1974) and standard practice since that date, we can adjust incomes for price change and non-income needs, taking as reference a vector of base prices and a household type.

For the aggregation part we need a social evaluation function (SEF from here on) embodying all the relevant value judgements from an ethical point of view. Notice that the assumption of a common utility function only allows us to compare the household welfare of households of different characteristics, that is, to perform inter-household, not inter-personal, welfare comparisons. Naturally, a different issue is whether in the domain of the SEF we should weight or not household equivalent income by household size, measured in terms of the number of equivalent adults or the number of persons in the household.

We will accept the usual assumptions on SEFs: continuity, replication invariance and S-concavity, implying symmetry. The critical question is which other properties should we impose on admissible SEFs for empirical analysis. In the ethical approach to the measurement of inequality one would like to use a SEF to which one can associate, in a consistent way, only one inequality index. Furthermore, most welfare analysis implicitly assume that social welfare can be expressed in terms of only two statistics of the income distribution: the mean, and a measure of inequality. As Dutta and Esteban (1991) have shown, to achieve these objectives we need to specify the type of mean-invariance property we want our inequality indices to satisfy. This is politically important, since we know from the early discussion in Kolm (1976a) that the choice of a mean-invariance class of inequality measures is not merely a technical matter, but a value laden question. Moreover, recent reports based on questionnaires indicate that people are by no means unanimous in their choice between relative, absolute or other intermediate notions of inequality[(1)]. Here, we will consider only the two polar cases of scale-invariant (or relative) and translation-invariant (or absolute) inequality indices.

We are interested in complete indicators which permit the decomposition of welfare changes into changes in the mean, and changes in either relative or absolute inequality. Also, we are interested in investigating which subgroups of the population experiment a welfare gain or a welfare loss during this period. Therefore, we will be using welfare measures which can be easily decomposed by population subgroups. This is particularly important for those characteristics which entail differences in household needs. Since any procedure for taking them into account is open to objections, it is mandatory that we look separately into each of the homogeneous subgroups with equal needs, and that we understand how alternative aggregation schemes produce a single scalar for the population as a whole. As we saw in Ruiz-Castillo (1994), this leads, in the relative case, to a SEF which is the product of the distribution mean and Theil's first index of equality and, in the absolute case, to the Kolm-Pollak family of SEFs.

Pooling homogeneous subgroups together into a unique distribution requires a procedure to compare non-income needs across subgroups. But such a procedure affects also the evaluation within any homogeneous subgroup. As a matter of fact, in the absence of further restrictions on unconditional preferences, inequality within each subgroup depends on the value judgement implied in the choice of a reference type, say a single adult or a couple. The reason is that identical characteristics might be enjoyed differently depending on the income level. For instance, identical households might experience different economies of scale in consumption depending on their income level. To avoid this, and to expose the incidence of the choice of reference type on the within-group and between-group terms of the ethically relevant partition, we may assume that the adjustment procedure for taking into account non-income needs is independent of the utility level -an assumption originally introduced in the theoretical literature by Lewbel (1989) and Blackorby and Donaldson (1989) in the relative case, which was extended in Ruiz-Castillo (1994) to the absolute case.

For the empirical exercise, we will do without knowledge of the fundamental utility function. We concentrate on the case in which household size is the only characteristic determining non-income needs, although we also study the impact of weighting children differently than adults. Following Coulter *et al* (1992a, 1992b), we rely on *ad hoc* models of the weight to be given to household size and household composition. Here again, we must extend known methods in the literature on relative inequality to fit the absolute case. On the other hand, for the adjustment of money incomes to price change we use, as in Ruiz-Castillo (1993), household specific statistical price indices. Finally, like Slesnick (1991, 1993), as far as the scale variable is concerned we propose to work with a measure of net total expenditures to approximate private household consumption, rather than total income.

The rest of the paper is organized in four sections. The first section presents the conceptual framework. The second section discusses the statistical specification. The third section contains the empirical results for the country as a whole, and for the partition by household size. The final section offers some concluding comments on the main empirical issues: i) the robustness of our estimates of welfare change to the choice of base prices and parameter values reflecting the weight to be given to household size and children relative to adults; ii) the decomposition of the change in real welfare into changes in the mean at constant prices, and changes in either relative or absolute real inequality; iii) the distributional impact of changes in relative prices; iv) the consequences of using different weighting schemes in the domain of the SEFs; and v) the decomposition of aggregate welfare by population subgroups, to learn about which ethically homogeneous subgroups gain or loose in real welfare.

I. THE CONCEPTUAL FRAMEWORK

I.1. The domain of the social problem

Assume we have a heterogeneous population of H households, facing a common price vector p in R^L_+, and let $\tilde{A}$ be the set of household characteristics which give rise to ethically relevant differences in needs. Households may differ in income x^h and/or a vector of characteristics a^h in $\tilde{A}$. There can be a number M of different household types with $1 < M \leq H$. Within each type m, all households have identical characteristics:

$$a^h = a^m \text{ for all } h = 1_m,\ldots,H_m\,,\ m = 1,\ldots,M.$$

If M = H, then all households are different.

We assume that there exists a common unconditional utility function U for all households, defined on commodities and characteristics, that is, on pairs (q, a) in $R^L_+ \times \tilde{A}$. The indirect utility function and the cost function will be denoted, respectively, by

$$u = \varphi(x, p, a)$$

and

$$x = c(u, p, a).$$

In a given sample of utility maximising and price taking households, the observable data on prices, incomes, characteristics, and commodity demands for each h are related by

$$u^h = U(q^h, a^h) = \varphi(x^h, p, a^h)$$

and

$$x^h = c(u^h, p, a^h).$$

In an alternative interpretation, the fundamental preferences represented by U correspond to an agent in charge of aggregate evaluations.

In income distribution theory we cannot treat symmetrically the vector of household incomes $x = (x^1,\ldots,x^H)$, each component of which is supposed to serve different needs. We will attack this problem using a set of equivalence scales defined in terms of the cost function as follows:

$$d(a^h, a^0; p, u) = c(u, p, a^h)/c(u, p, a^0).$$

If we take the reference household a^0 to consist of a single adult, the function d gives the number of equivalent adults in a household of characteristics a^h who can enjoy the utility level u at prices p. For each h in the sample, define the adjusted, or equivalent, household income by

$$z^h = x^h / d(a^h, a^0; p, u^h) = c(u^h, p, a^0).$$

This is the income necessary for a single adult to enjoy the utility level u^h at prices p. Alternatively, we can define the compensation function

$$d^*(a^h, a^0; p, u) = c(u, p, a^h) - c(u, p, a^0)$$

which gives the income we can subtract from a household of characteristics a^h for a single adult to enjoy the same utility level u at prices p with the remaining income. Then

$$z^h = x^h - d^*(a^h, a^0; p, u^h) = c(u^h, p, a^0).$$

In our case, where we want to compare two heterogeneous populations confronting different price vectors in situations $\tau = 1, 2$, we can express the two distributions at common prices using a true cost-of-living index, say of the Paasche type, defined as follows:

$$P(p_\tau, p_0 ; u, a) = c(u, p_\tau, a)/c(u, p_0, a).$$

The function P compares the price vector in situation τ, p_τ, with the vector of base prices p_0 at the utility level u for a household of characteristics a. Then, equivalent household income in situation τ will be:

$$z^h_{\tau 0} = x^h_\tau / [P(p, p_0; u^h_\tau, a^h_\tau)\, d(a^h_\tau, a^0; p_0, u^h_\tau)] .$$

Alternatively, we can define the function

$$P^*(p_\tau, p_0 ; u, a) = c(u, p_\tau, a) - c(u, p_0, a),$$

so that

$$z^h_{\tau 0} = x^h_\tau - P^*(p, p_0; u^h_\tau, a^h_\tau) - d^*(a^h_\tau, a^0; p_0, u^h_\tau) = c(u^h_\tau, p_0, a^0).$$

Of course, for each h we have

$$u^h_\tau = \varphi(x^h_\tau, p_\tau, a^h_\tau) = \varphi(z^h_{\tau 0}, p_0, a^0),$$

while for every pair of households h, k, we have

$$z^h_{\tau 0} \geq z^k_{\tau 0} \Leftrightarrow c(u^h_\tau, p_0, a^0) \geq c(u^k_\tau, p_0, a^0) \Leftrightarrow u^h_\tau \geq u^k_\tau ;$$

that is, the income adjusted for price change and non-income needs provides a comparable indicator of household welfare.

I.2. Properties of the social evaluation function

A Social Evaluation Function (SEF) is a real valued function W defined in the space R^H of adjusted or equivalent incomes, with the interpretation that for each income distribution $\mathbf{z} = (z^1,...,z^H)$, $W(\mathbf{z})$ provides the "social" or, simply, the aggregate welfare from a normative point of view. We know that only under very stringent conditions on U the social evaluation process will be independent of prices(2) or characteristics. Therefore, in practice we must confront two index number problems: the choice of a price vector p_0, and the choice of a reference type a^0.

Which properties should we impose on the admissible class of SEFs? What we call the standard model for welfare analysis is characterised by a minimal axiom set on W, covering both a relative and an absolute concept of inequality: A.1 S-concavity; A.2 continuity; A.3 population replication invariance; plus A.4R weak-homotheticity and A.5R monotonicity along rays from the origin, in the relative case; or A.4A weak-translability and A.5A monotonicity along rays parallel to the line of equality, in the absolute case. Under these conditions, there exists a unique function V such that

$$W(\mathbf{z}) = V(\mu(\mathbf{z}), I(\mathbf{z})),$$

where μ is the function giving the mean, I an index of relative or absolute inequality, and V is increasing in its first argument and decreasing in its second argument. Notice that, in this model, transfers which preserve the mean of equivalent incomes will generally require changes in the mean of unadjusted incomes. We believe that this should cause no particular concern, since the latter is not the distribution ethically relevant in the inhomogeneous case(3).

We are interested in complete quantitative assessments of welfare change in real terms, and its decomposition into changes in the mean at constant prices and changes in either relative or absolute real inequality. For that purpose, we have to be more specific about the trade-off between efficiency and distributional considerations. It suffices to indicate that any homothetic SEF can be expressed as the product of the mean and the so called AKS equality index:

$$W(\mathbf{x}) = \mu(\mathbf{x}) [1 - I^{AKS}(\mathbf{x})] = \mu(\mathbf{x}) E^{AKS}(\mathbf{x}),$$

while any translatable SEF can be expressed as the difference between the mean and the KBD inequality index:

$$W(\mathbf{x}) = \mu(\mathbf{x}) - I^{KBD}(\mathbf{x}).$$

These are inequality indices derived from W using the EDEI (equally-distributed-equivalent-income)(4).

For any partition of the population, we are also interested in welfare measures capable of distinguishing -in a convenient additive way- between two components: welfare within the subgroups, and the loss of welfare due to inequality between the subgroups. Which homothetic or translatable SEF should we use for that purpose? There are different ways to decompose a summary statistic like an inequality or a welfare index to achieve this practical aim. The following two are the best known and will permit to single out the SEFs to be used in this study.

Consider the unweighted distribution of household equivalent income and, in the first place, define between-group inequality as the inequality remaining after removing all within-group inequality by assigning each household her subgroup mean, that is, the inequality of the distribution $\mu^* = (\mu^1,...,\mu^M)$ where, for each m,

$$\mu^m = (\mu(\mathbf{z}^m).\mathbf{1}^{Hm}), \text{ and } \mathbf{1}^{Hm} = (1,...,1) \in R^{Hm}.$$

Then, one investigates under what conditions overall inequality can be expressed as

$$I(\mathbf{z}) = \Sigma_m \alpha^m I(\mathbf{z}^m) + I(\mu^*), \quad (1)$$

where the weights α^m are functions only of the set of subgroup means and sizes. Let us denote by T the function giving the total income of a distribution. If the weights in the above expression are subgroup shares in total income, i.e.

$$\alpha^m = T(\mathbf{z}^m)/T(\mathbf{z}),$$

and we choose a multiplicative trade off between the mean and the equality index, that is, a SEF W such that

$$W(\mathbf{z}) = \mu(\mathbf{z})E(\mathbf{z}),$$

then we have

$$W(\mathbf{z}) = \Sigma_m [H_m/H]W(\mathbf{z}^m) - \mu(\mathbf{z})I(\mu^*).$$

This is a useful expression, indicating that aggregate welfare can be expressed as a weighted average of the welfare within each subgroup, with weights equal to population shares, minus the between-group inequality according to method I, weighted by the population mean. Although all the members of the General Entropy family of relative inequality indices admit the decomposition of equation (1), only the first Theil index I_T has the required properties so that

$$W_T(\mathbf{z}) = \mu(\mathbf{z})[1 - I_T(\mathbf{z})] = \Sigma_m[H_m/H]W_T(\mathbf{z}^m) - \mu(\mathbf{z})\, I_T(\mu*).$$

Blackorby, Donaldson and Auersperg (1981) define between-group inequality as the inequality that would result if each household received her subgroup's EDEI ξ^m. The separability conditions required to estimate the EDEI of any subgroup in any partition independently of the rest of the distribution, combined with assumptions A.1, A.2, and A.5A for a translatable W, lead to the Kolm-Pollak family:

$$W_\gamma(\mathbf{z}) = -\,[1/\gamma]\ln[(1/H)\,\Sigma_h e^{-\gamma z^h}],\quad \gamma > 0,$$

where γ is interpreted as an aversion to inequality parameter: as γ increases, the social indifference curves show increasing curvature until only the income of the poorest person matters. The KBD index of absolute inequality consistent with W_γ is

$$A_\gamma(\mathbf{z}) = [1/\gamma]\ln[\,(1/H)\Sigma_h e^{\gamma(\mu(\mathbf{z}) - z^h)}],\quad \gamma > 0.$$

Since

$$A_\gamma(\mathbf{z}) = \Sigma_m [H_m/H]A_\gamma(\mathbf{z}^m) + A_\gamma(\xi^*),$$

where

$$\xi^* = (\xi^1,\ldots,^M),\ \ \xi^m = (\xi(\mathbf{z}^m).1^{Hm}),\ \ m = 1,\ldots,M,$$

we have

$$W_\gamma(\mathbf{z}) = \mu(\mathbf{z}) - A_\gamma(\mathbf{z}) = \Sigma_m [H_m/H]W_\gamma(\mathbf{z}^m) - A_\gamma(\xi*).$$

This is an appealing decomposition, in which social welfare is seen to be equal to the weighted average of the aggregate welfare within each of the subgroups, with weights equal to population shares, minus the inequality between the subgroups according to method II.

I.3. An special assumption on preferences

Suppose we have M < H homogeneous subgroups with identical characteristics. As pointed out in the Introduction, in general inequality of the unadjusted distribution within a homogeneous subgroup will differ from inequality of the adjusted distribution depending on whether we take one adult or a couple as reference type. To avoid this, and to expose the incidence of the choice of reference type on the within-group and between-group terms of the ethically relevant partition, we may assume that the adjustment procedure for taking into account non-income needs is independent of the utility level. Then, in the relative case preferences must be restricted as follows(5):

$$c(u, p, a) = f(u, p)\, g(p, a),$$

in which case

$$W_1(\mathbf{z}) = \Sigma_m[H_m/H][W_1(\mathbf{x}^m)/d(a^m, a^0)] - \mu(\mathbf{z})I_1(\mu^*),$$

where for each m

$$\mu^m = [\mu_x^m/d(a^m, a^0)]\, \mathbf{1}^{Hm}.$$

In the absolute case, the function d* is independent of utility levels if, and only if, preferences are restricted as follows:

$$c(u, p, a) = f^*(u, p) + g^*(p, a).$$

Then, the decomposition of the Kolm-Pollak family will be:

$$W_\gamma(\mathbf{z}) = \Sigma_m [H_m/H] W_\gamma(\mathbf{x}^m) - \Sigma_m[H_m/H] d^*(a^m, a^0) - A_\gamma(\zeta^*),$$

where for each m

$$\zeta^m = [\zeta_x^m - d^*(a^m, a^0)]\, \mathbf{1}^{Hm}.$$

As mentioned in the Introduction, the assumption of a common utility function only allows us to compare the household welfare of households of different characteristics. This presents a problem, since in welfare economics we are mostly interested in personal welfare. However, without abandoning the present framework, we can extend the domain of the SEF weighting each household h by the scalar β^h:

$$W(\underbrace{z^1,\ldots, z^1}_{\beta^1}, \ldots , \underbrace{z^H,\ldots, z^H}_{\beta^H}).$$

Lacking ethical reasons to discriminate within types, we will restrict ourselves to the case in which all households of the same type m, receive the same weight β^m. It is worth while pointing out that under the restriction we are discussing, in the relative case transfers which preserve the mean of equivalent incomes do not require changes in the mean of unadjusted incomes if, and only if,

$$\beta^h/d(a^h, a^0) = \beta^k/d(a^k, a^0).$$

Thus, transfers of equivalent income between households of the same subgroup will preserve the mean of unadjusted incomes. This will happen for the population as a whole whenever the weights are the number of equivalent adults, i.e., whenever $\beta^h = d(a^h, a^0)$ for all h. In the absolute case, transfers which preserve the mean of equivalent incomes will not require changes in the mean of unadjusted incomes if, and only if, $\beta^h = \beta^k$. Hence, total unadjusted income will be constant after the transfer within homogeneous subgroups and, for the population as a whole, only in the unweighted case.

In empirical applications, we recommend experimenting with different weighting schemes, regardless of the impact of transfers of equivalent income on the unadjusted distribution. For that purpose, let $\mathbf{v} = (\mathbf{v}^1,...,\mathbf{v}^M)$ be the distribution where adjusted incomes are weighted by the number of household members, s^h (6), and assume that all households of type m have the same number s^m. Then, the welfare measure in the relative case becomes

$$W_T(\mathbf{v}) = \Sigma_m[S_m/S][W_T(\mathbf{x}^m)/d(a^m, a^0)] - \mu(\mathbf{v})I_T(\mu_v^*),$$

where $S_m = mH_m$ is the number of persons of type m, and $S = \Sigma_m S_m$. Similarly, in the absolute case we have

$$W_\gamma(v) = \Sigma_m [S_m/S]W_\gamma(\mathbf{x}^m) - \Sigma_m[S_m/S]d^*(a^m, a^0) - A_\gamma(\zeta_v^*).$$

II. THE STATISTICAL SPECIFICATION

II.1. The scale variable

For reasons spelled out in Ruiz-Castillo (1993), we prefer to use household total expenditure as an estimate of private total consumption as our scale variable, rather than total income. In this, we follow Slesnick (1991, 1993) who has made a strong case in favor of consumption as the best proxy for the standard of living. One may or may not agree with this choice, but we can be certain that results using household income will be very different indeed.

In our surveys, the concept of total expenditure includes transfers made by the household, as well as a number of imputations for consumption and wages in kind, subsidized meals at work, and a market rental value, estimated by the owner, for owner-occupied housing. However, our experience with the 1980-81 EPF indicates that discontinuous household expenditures on some durables, whose occurrence may distort heavily the total, are best considered investment rather than consumption. These include current acquisitions of cars, motorcycles and other means of private transportation, as well as house repairs financed by either tenants or owner-occupiers. Thus, our estimate of household current consumption, x_{τ}^{h}, will be total household expenditures, net of these investment items(7).

In should be noticed that we have used the information on blowing up factors provided by INE. Thus, ours are not sample estimates but blown up estimates for the total population.

II.2. The treatment of heterogeneous households

The estimation of equivalence scales along with the usual price and income effects under the assumption of a single unconditional preference ordering, is plagued with a number of well known difficulties, even under the simplifying restriction on preferences discussed in the previous section(8). As Coulter *et al.* (1992a) conclude, there is no "correct" set of scales and searching for some would possibly be misguided. Thus, they suggest two immediate alternatives(9) which we have pursued already in Ruiz-Castillo (1993). In the first place, if one insists in pooling people of different characteristics by means of some equivalence scales, then robustness should be checked by estimating welfare for different values of the key parameters which determine the scales. In the second place, we can always study each homogeneous household type separately and then use welfare measures additively decomposable by population subgroup to minimize the impact of "inappropriate" scale relativities.

In most of this paper, we will consider the simplest case in which the only ethically relevant characteristic is the number of household members s^h and the reference type is a household consisting of a single adult, so that $s^0 = 1$. Moreover, the functions d and d* will be independent, not only of the utility level, but also of the price vector(10).

In the relative case preferences will be parametrised as follows:

$$c(u, p, s^h) = f(u, p)\,[1/(s^h)^\Theta],\ \Theta \in [0,1],$$

so that

$$d(s^h, s^0; u, p) = (s^h)^\Theta,$$

and

$$z^h_{\tau 0}(\Theta) = x^h_{\tau 0}/(s^h_\tau)^\Theta,\ h = 1_\tau,\ldots,H_\tau.$$

When $\Theta = 0$, equivalent income coincides with unadjusted household income, while if $\Theta = 1$, it equals per capita household income. In the absolute case, preferences will be parametrised by

$$c(u, p, s^h) = f^*(u, p) + \lambda s^h,\ \lambda \in [0,\lambda^*],$$

so that

$$d^*(s^h, s^0; u, p) = \lambda(s^h - 1),$$

and

$$z^h_{\tau 0}(\lambda) = x^h_{\tau 0} - \lambda(s^h_\tau - 1),\ h = 1_\tau,\ldots,H_\tau.$$

The parameter λ can be interpreted as the cost of an adult. As we shall see, the upper bound for λ, as well as the values for the aversion to inequality parameter γ, must be jointly selected taking into account that absolute inequality measures are not independent of the measurement unit.

Under these simplifying assumptions, aggregate welfare in situation τ for the unweighted distributions -in terms of the partition in which m is the number of household members- will be, in the relative case,

$$W_T(\mathbf{z}_\tau(\Theta)) = \Sigma_m[H_{\tau m}/H_\tau][W_T(\mathbf{x}^m_\tau)/m^\Theta] - \mu(\mathbf{z}_\tau(\Theta))I_T(\mu^*_\tau(\Theta)),$$

where for each m

$$\mu^m_\tau(\Theta) = [\mu_{x^m_\tau}/m^\Theta]\,\mathbf{1}^{Hm}.$$

In the absolute case,

$$W_\gamma(z_\tau(\lambda)) = \Sigma_m [H_{\tau m}/H_\tau]W_\gamma(x^m_\tau) - \Sigma_m [H_{\tau m}/H_\tau]\lambda(m-1) - A_\gamma(\xi^*_\tau(\lambda)),$$

where for each m

$$\xi^m_\tau(\lambda) = [\xi^m_{x_\tau} - \lambda(m-1)]\, \mathbf{1}^{Hm}.$$

The expressions for other weighting schemes and other partitions need not be given here.

Finally, we will consider the case in which adults and children may receive different consideration(11). In particular, we will study the convenient parametrisation in which "effective household size" is seen to be equal to

$$s^h_A + \eta\, s^h_C, \quad \eta \in (0,1]$$

where s^h_A and s^h_C are the number of adults and children in household h, and η is a parameter. Then, in the relative case we will have

$$z^h_{\tau 0}(\Theta,\eta) = x^h_{\tau 0}/((s^h_A + \eta\, s^h_C)^\Theta,$$

while in the absolute case

$$z^h_{\tau 0}(\lambda,\eta) = x^h_{\tau 0} - \lambda(s^h_A + \eta\, s^h_C - 1).$$

This two parameter specification will be contrasted with the OECD scale in which efficient household size is equal to

$$1 + 0.7\,(s^h_A - 1) + 0.5\,(s^h_C).$$

II.3. Repricing the scale variable

Under the above assumptions we have

$$x^h_{\tau 0} = x^h_\tau / P(p_\tau, p_o; u^h, a^h) = x^h_\tau / [f(u^h, p_\tau)/f(u^h, p_o)]$$

or

$$x^h_{\tau 0} = x^h_\tau - P^*(p_\tau, p_o; u^h, a^h) = x^h_\tau - [f^*(u^h, p_\tau) - f^*(u^h, p_o)].$$

Changes in real welfare, in terms of changes in the mean and changes in distribution, will be given by

$$\Delta W_{T0}(\Theta) = W_T(\mathbf{z}_{20}(\Theta))/W_T(\mathbf{z}_{10}(\Theta)$$
$$= [\mu(\mathbf{z}_{20}(\Theta))/\mu(\mathbf{z}_{10}(\Theta)]\ [E_T(\mathbf{z}_{20}(\Theta))/E_T(\mathbf{z}_{10}(\Theta)] = \Delta\mu_0(\Theta)\Delta E_{T0}(\Theta)$$

and

$$\Delta W_{\gamma 0}(\lambda) = [W_\gamma(\mathbf{z}_{20}(\lambda)) - W_\gamma(\mathbf{z}_{10}(\lambda)]/W_\gamma(\mathbf{z}_{10}(\lambda)$$
$$= [\mu(\mathbf{z}_{20}(\lambda)) - \mu(\mathbf{z}_{10}(\lambda)]/W_\gamma(\mathbf{z}_{10}(\lambda) - [A_\gamma(\mathbf{z}_{20}(\lambda)) - A_\gamma(\mathbf{z}_{10}(\lambda)]/W_\gamma(\mathbf{z}_{10}(\lambda)$$
$$= \Delta\mu_0(\lambda) + \Delta E_{\gamma 0}(\lambda).$$

We will consider the two polar cases $p_o = p_2$ and $p_o = p_1$. Notice that there need not be any relationship between $\Delta\mu_2(\Theta)$ and $\Delta\mu_1(\Theta)$, or between $\Delta E_{T2}(\Theta)$ and $\Delta E_{T1}(\Theta)$. Therefore, there is no *a priori* reason to expect $\Delta W_{T2}(\Theta)$ greater or smaller than $\Delta W_{T1}(\Theta)$. Similarly, nothing can be said *a priori* about $\Delta W_{\gamma 2}(\lambda)$ relatively to $\Delta W_{\gamma 1}(\lambda)$.

Rather than estimating the functions f or f* to construct P or P*, we will express the various distributions in comparable money units of the same time period by means of household specific price indices, in whose construction we used a system of official price indices which has 1976 as the base year. Since we have monthly price data from 1976 onwards, and we know the quarter during which each household of the second survey was interviewed, it is possible to select one of them, namely Winter 1981, as situation 2. Unfortunately, this is not the case for the first survey: we only have annual price data from 1960 to 1975, and we do not have information about the time structure of the survey during the span July 1973 to June 1974. Therefore, situation 1 is taken to be the average of 1973 and 1974.

As reported in Higuera and Ruiz-Castillo (1991), to compare a price vector in a given year t with prices in the base year 1976 for a household h, we estimated individual indices of the type

$$I(p_t, p_{76}; w_\tau^h) = \Sigma_j w_{j\tau}^h I_{jt},$$

where $w_{j\tau}^h$ is the share of total expenditure devoted to commodity j by household h in the survey year τ, I_{jt} is the official price index for commodity j in year t. For the period after 1976, data is available for 58 commodities, while for the period before that date we can only distinguish between 5 commodity groupings. To express a given distribution -for instance the distribution x_1- in money terms of a year 0, we need individual Paasche type indices based on situation 1. These are easily constructed as follows:

$$P^{\#}(p_1, p_o; w_1^h) = I(p_1, p_{76}; w_1^h)/I(p_o, p_{76}; w_1^h)$$

where

$$p_1 = (1/2)\, p_{73} + (1/2)\, p_{74}.$$

Then, the repriced distribution will be

$$y_{10}^{h} = x_1^{h} / P^{\#}(p_1, p_o; w_1^{h}).$$

for h = 1,..., 24.151. Similarly, the repriced distributions for the second survey data will be

$$y_2^{h} = x_2^{h} / P^{\#}(p_2, p_o; w_2^{h}).$$

for h = 1,..., 23.952 , where p_2 = Winter 81.

For base prices p_o, let us denote our estimates by

$$\Delta W_{T0}^{\#}(\Theta) = W_T(y_{20}(\Theta))/W_T(y_{10}(\Theta)) = \Delta\mu_0^{\#}(\Theta)\Delta E_{T0}^{\#}(\Theta)$$

and

$$\Delta W_{\gamma 0}^{\S}(\lambda) = W_\gamma(y_{20}(\lambda)) - W_\gamma(y_{10}(\lambda) = \Delta\mu_0^{\S}(\lambda) + \Delta E_{\gamma 0}^{\S}(\lambda).$$

Of course, a statistical Paasche price index provides only a lower bound to the true cost-of-living construction, i.e.

$$P^{\#}(p_1, p_o; w_1^{h}) \leq P(p_\tau, p_o; u^h, a^h).$$

Therefore, for all h and τ = 1, 2, we have

$$y_{\tau 0}^{h} \geq x_{\tau 0}^{h}.$$

Hence, for all Θ and λ, when $p_o = p_2$ ($p_o = p_1$) our estimates $\Delta\mu_0^{\#}(\Theta)$ and $\Delta\mu_0^{\$}(\lambda)$ provide a lower (upper) bound for $\Delta\mu_0(\Theta)$ and $\Delta\mu_0(\lambda)$, respectively. On the other hand, if the substitution bias is greater for the rich, as can be expected, and the change in relative prices from p_1 to p_2 is less damaging to the poor than to the rich, as we know to be the case for Spain in this period, then when $p_o = p_2$ ($p_o = p_1$), $\Delta E_{T0}^{\#}(\Theta)$ and $\Delta E_{\gamma 0}^{\$}(\lambda)$ provide an upper (lower) bound for $\Delta E_{T0}(\Theta)$ and $\Delta E_{\gamma 0}(\lambda)$, respectively. Therefore, nothing definite can be said in our case about the nature of the approximation of our estimates $\Delta W_{T0}^{\#}(\Theta)$ and $\Delta W_{\gamma 0}^{\$}(\lambda)$ to the true values of $\Delta W_{T0}(\Theta)$ and $\Delta W_{\gamma 0}(\lambda)$, respectively.

III. EMPIRICAL RESULTS

We will address the following questions for the population as a whole: **1.** How does the measurement of real welfare according to $W_T(\Theta)$ vary with Θ and the choice of p_0 for the unweighted distributions of household equivalent expenditure? **2.** How does the measurement according to $W_\gamma(\lambda)$ vary with λ, γ and the choice of p_0 for those same distributions? **3.** What is the distributional impact of changes in relative prices? **4.** What qualifications should be introduced if we estimate a two parameter model involving household size and the distinction between adults and children? **5.** Finally, we will study each homogenous subgroup in the crucial partition by household size. **6.** At this point it will be easy to understand the consequences of weighting household adjusted expenditures by household size.

1. The parameter Θ, representing the weight given to household size in the relative case, takes on the values 0.0, 0.2, 0.4, 0.6, 0.8, and 1.0. Under our assumptions,

$$\mu(y(\Theta)) = \Sigma_m[H^m/H][\mu(x^m)/m^\Theta].$$

Therefore, the mean is a decreasing function of Θ. On the other hand, in Spain, like in the U.K., we saw in Ruiz-Castillo (1993) that relative equality follows an inverted U pattern. As we see in Table 1, $W_T(y_{\tau 0}(\Theta))$ turns out to be decreasing with Θ at both p_1 and p_2 in both surveys.

More interestingly, we observe that, at p_2, there has been an improvement in real mean, real equality and, hence, real welfare. At p_1 increases in real equality barely offsets losses in real mean. To see this, recall that the decomposition of changes in real welfare at base prices p_0 is given by

$$\Delta W^{\#}_{T0}(\Theta) = \Delta\mu^{\#}_0(\Theta)\Delta E^{\#}_{T0}(\Theta),$$

where the symbol # indicates ratio comparisons. Thus, for instance, at $p_0 = p_2$

$$\Delta W^{\#}_{T2}(\Theta) = W_T(y_2(\Theta))/W_T(y_{12}(\Theta)).$$

The information is in the upper part of Table 2 and the patterns in percentage terms for the three concepts, as a function of Θ, are shown in the left-hand panel of Figure 1.

The main conclusions are that i) the improvement in real welfare is remarkably stable as a function of Θ, and ii) there is a considerable difference between choosing p_1 or p_2 as the reference price vector. Taking into account that $\Delta\mu_2^{\#}$ and $\Delta E_{T2}^{\#}$ provide a lower (upper) bound to the corresponding true values at prices p_2, we may say that, for an intermediate value of Θ, there has been an improvement in real mean at least as large as 2%, an improvement in real equality at most equal to 5.5%, and an improvement in real welfare of about 7%. At prices p_1, there has been a loss in real mean at least as large as 3.5%, an improvement in equality at least as large as 5%, and a negligible improvement in real welfare at most equal to 1.5%.

2. The parameters γ and λ have to be chosen taking into account that the measurement of absolute inequality depends on the units in which household expenditure is measured. We have selected parameter values so as to achieve a wide range of variation of the ratio of absolute inequality to the distribution mean. The results for the unweighted distributions in both survey years are in Tables 3 and 4 for p_1 and p_2, respectively. For instance, at prices p_2 and $\lambda = 0$, absolute inequality in situation 2 represents less than 1%, more than 30%, and more than 50% of the mean when the aversion to inequality parameter γ is set up, respectively, at 5.10^{-7}, 5.10^{-6}, and 10^{-5} (12). These percentages are greater for the 1973-74 distribution.

On the other hand, recall that λ can be interpreted as the cost of an adult. At p_2, the upper bound for λ has been fixed at 90.000 pesetas, which is 35% of the mean of per capita household expenditures in 1980-81, or close to per capita household expenditure for very large units consisting of more than 10 members. Given the selection of γ's already mentioned, values of λ beyond 90.000 lead to negative welfare estimates which are difficult to interpret. At p_1, household adjusted expenditures are smaller than at p_2 by a factor greater than 3. Correspondingly, we have fixed the upper bound for λ at 30.000 pesetas. The ratios of absolute inequality to the mean at different values of λ are considerably lower than at p_2, indicating that γ values -which are kept at 5.10^{-7}, 5.10^{-6}, and 10^{-5} for comparison purposes- are perhaps too small for distributions expressed at this measurement unit.

At any rate, absolute inequality decreases with λ most of the time. However, as can be seen in the left hand panel of Figure 2 for the unweighted distributions, for high values of γ absolute inequality for both survey years at p_2 first decreases and then increases as λ approaches its upper bound. Such curvature is less pronounced at p_1. Nevertheless, at both p_2 and p_1 (right hand panel of Figure 2), there is an improvement in absolute inequality at all values of γ. Such an improvement is greater the smaller the aversion to inequality, and in all cases suffers small variations as a function of λ.

Of course, as we see in Table 3 and 4, in all survey years the mean is a decreasing function of λ. In real terms, there is an increase of 1-2 % at p_2, but a decrease of about 4.5-5.5% at p_1. The joint impact on welfare of changes in absolute inequality and changes in the mean at base prices p_0, is judged by

$$\Delta W^{\S}_{\gamma 0}(\lambda) = \Delta\mu^{\S}_{\gamma 0}(\lambda) + \Delta E^{\S}_{\gamma 0}(\lambda),$$

where the symbol § indicates percentage differences relative to the welfare in situation 1. Thus, for instance, at $p_0 = p_2$

$$\Delta\mu^{\S}_{\gamma 2}(\lambda) = [\mu(y_2(\lambda)) - \mu(y_{12}(\lambda)]/W_\gamma(y_{12}(\lambda).$$

Numerical estimates of this decomposition for $\gamma = 5.10^{-6}$ are in Table 5, while Figure 3 provides a graphical representation for all γ.

The main conclusions are that: i) at every value of λ, the change in real welfare tends to be greater the greater the aversion to absolute inequality. ii) For every value of γ, the change in real welfare increases slightly as a function of λ, exploding at high values of γ and λ as a consequence of large increases in inequality, partly induced by large increases in the mean(13). iii) At any rate, as in the relative case, the results vary considerably depending on whether real change is expressed at p_2 or p_1. We might say that, at p_2 there has been an increase in real welfare of about 3.5-10.0%, depending on the choice of λ and γ. Between 2.0-6.5% of such an increase should be attributed to an improvement in absolute inequality, and the rest to a slight improvement in the mean. At p_1, the estimates for the change in real welfare vary from a decrease of about 3.5% to an improvement of 2%, depending on λ and γ. This is the result of a relatively large loss in the mean in the range 4.5-8.0%, partially offset by an improvement in absolute inequality of 1.0-9.0%.

3. That intertemporal comparisons of welfare require an adjustment for price change is, of course, widely recognised. However, researchers often correct the original distributions with a single measure of price change for all households(14). We have done that taking into account the 322% inflation rate, measured by the official price index, between situations 1 and 2. Notice that now, in the relative case

$$\Delta\mu^{\#}_{*}(\Theta) = \mu(y_2(\Theta))/[\mu(y_1(\Theta))\ 3.22]$$

and

$$\Delta E^{\#}_{T*}(\Theta) = E_T(y_2(\Theta))/E_T(y_1(\Theta)).$$

The last expression is the change in *money* equality. Estimates appear in Tables 1, 2 and Figure 1 under the p^* heading.

We see that, in both the unweighted and the weighted cases, the change in real welfare at p^* as a function of Θ is not that different from the change estimated at p_2. However, as far as the reasons for it, estimates at p^* tell the wrong story: a large improvement in the mean and a relatively small improvement in money inequality. Because the change from p_1 to p_2 has damaged the standard of living of the rich more than that of the poor, what has happened in Spain during this period is exactly the opposite: a relatively small increase in the mean, but a considerable improvement in real inequality.

The information for the absolute case is in Tables 4 and 5, as well as in Figure 3, also under the p^* heading. At an intermediate value of γ, for instance, the picture is very similar: i) welfare change at p^* is of the same order of magnitude than at p_2. ii) However, the mean effect is exagerated at the expense of the improvement in inequality. As a matter of fact, at high λ values and high mean increments we observe an inexistent loss in absolute inequality.

4. In the model where adults and children are treated differently according to the specification

$$s^h_A + \eta\, s^h_C, \quad \eta \in (0,1],$$

we have compared previous results, in which $\eta = 1$, with the following values for η: 0.75, 0.50, and 0.25. The estimation of the full grid for the two parameter models -(Θ, η) and (λ, η)- in the relative and the absolute cases, respectively, in the unweighted case at p_2, are available upon request. Here, to begin with, in the upper part of Figure 4 we show how the measurement of relative equality according to E_T varies with Θ and η for the unweighted distribution y_{12}, i. e., the 1973-74 distribution at prices of situation 2.

As predicted in Jenkins and Cowell (1993), i) when Θ is low (≤ 0.4), variations in η have a negligible impact on equality: as a function of η the corresponding curves are very flat (upper left hand side of Figure 4), while as a function of Θ they are very close together (upper right hand side of that Figure). Also ii) the inverse-U pattern implied by Θ variations are less pronounced when η is relatively low. At any rate, for each household size, decreases in η raise the equivalent expenditures of larger households relative to those of smaller households; given the negative covariance between number of children and total household expenditure, there is an equalising impact. The gross grid we have investigated does not allow us to see whether there is a non-monotonic relationship of the type detected by Jenkins and Cowell (1993) at low values of η .

Since we find sufficient stability in shape for other distributions, we end here the report for single cross-sections. Furthemore, we are mostly interested in trends. The lower part of Figure 4 shows the change in relative equality and welfare at p_2. We observe that the improvement in real equality is uniformly smaller as the weight given to children decreases. The impact on the mean (not shown) goes in the opposite direction. The net result is that, at every value of Θ, the improvement in real welfare increases as η decreases. However, the magnitude of the impact is very small indeed.

To complete this study of the sensitivity of our results to different models for taking into account demographic factors, we have considered the so-called OECD equivalence scale, widely used internationally, including the Spanish INE. It gives a unit weight to the first adult -a person 14 or more years old- 0.7 to each additional adult, and 0.5 to every person less than 14 years old. Estimates in Tables 1 and 2 and graphical representations in Figure 4 are refered to by the symbol OECD.

We see that, for the individual cross-sections, the OECD estimate corresponds to a low value of Θ -and hence any value of η- or a high value of both Θ and η. For the change in real welfare in the unweighted case at p_2, the OECD estimate corresponds to the choice $(\Theta, \eta) = (0.8, 0.25)$; that is, to counting children at half what the OECD suggests, but admitting considerable economies of scale in consumption. This result is robust to changes in the reference price vector and in the weighting scheme.

Being scale independent, relative inequality measurement is not affected by the fact that as the weight given to children decreases, the mean of any adjusted distribution increases at all values of λ. However, the situation in the absolute case, as we see for example in Figure 5, is rather different: because the mean is changing, absolute inequality at p_2 and an intermediate value of γ increases uniformly as a function of η, in spite of the fact that relative inequality decreases as η goes down.

As far as the trend is concerned, under Figure 5 parameter values the improvement in absolute inequality at all values of λ is smaller, the smaller is η. As a percentage of welfare in situation 1, we see also that such an improvement losses importance as children are given a smaller weight. Since the same happens to the change in the mean (not shown), the increase in real welfare at p_2 and $\gamma = 5.10^{-6}$ gets reduced at every λ as η goes down. Of course, as in the relative case, these effects are quite negligible at low λ values. As a matter of fact, except for λ values close to its upper bound, the impact of varying the importance of children relative to adults on mean, absolute inequality and welfare change is less than 2%.

The OECD practice losses some of its meaning in the absolute case: the induced changes in the mean at either p_1 or p_2, precludes comparisons of absolute inequality with or without the OECD convention. As we can see at Tables 3 and 4, essentially both the OECD mean and the OECD absolute inequality are much lower than their counterparts at all values of λ and η. On the other hand, at p_2 the improvement in the mean is rather large, while the improvement in absolute inequality is very small or negative at high λ values (see Table 5 and Figure 3). The net result is a very small increase in real welfare, well below the corresponding to the (λ, η) model. At p_1 one gets the same qualitative results.

5. We have reviewed the main results when all households are pooled into a single distribution by means of one- or two-parameter models. It is time to look into the fundamental partition by household size. The results for each individual subgroup, as well as their relative demographic importance, are in Tables 6 and 7 for the relative and the absolute case, respectively.

Starting with the relative case, there are three groups to consider. We will begin with households consisting of 3- to 7-members which repersent, approximately, two thirds of all households and 80% of all persons. They experience a relatively small or no improvement in the mean at constant prices and some improvement on relative equality. As a consequence, their real welfare goes up by about 4.5-5% at p_2, or goes down by about 1.5% at p_1. Next, there are two tails to study with opposite fortunes. Households of 1 or 2 persons -28% of all households and 13% of all persons- combine a large increase in both mean and relative equality, and therefore a large increase in real welfare. The remaining 3% of all households but 7.5 of all persons, consisting of 8 or more persons, experience losses in the mean, little or no change in real equality and considerable losses in real welfare, of about 7 to 13% depending on whether we look at p_2 or p_1, respectively.

In the absolute case, we have to be careful again with the interaction between the measurement of inequality and the unit of measurement. Except for 1 and 3 person households, all groups experiment an improvement in inequality. However, large increases (decreases) in the mean for small (large) households pushes down (up) changes in absolute inequality. This is of course compatible with larger improvements in relative inequality for small households. Nevertheless, as in the relative case, the net result is a 3 group breakdown at the welfare level: at p_2, for example, we observe considerable increases for 1 and 2 person households, smaller ones for the majority of the population consisting of 3 to 7 members, and a welfare loss for very large households.

6. Let us turn now towards a better understanding of how the aggregation exercise is performed on top of the changes experienced by individual subgroups. At base prices p_0, in the relative case for unweighted distributions, aggregate welfare change can be decomposed in three terms:

$$W_T(y_{20}(\Theta)) - W_T(y_{10}(\Theta)) = F(\Theta) + D(\Theta) + B(\Theta)$$

where:

$$F(\Theta) = \Sigma_m[H_1^m/H_1][\Delta W_T(x^m)/m^\Theta],$$

$$D(\Theta) = \Sigma_m [\Delta r^m W_T(x_{20}^m)/m^\Theta],\ \Delta r^m = H_2^m/H_2 - H_1^m/H_1,$$

$$B(\Theta) = - [\mu(y_{20}(\Theta))I_1(\mu_{20}^*(\Theta)) - \mu(y_{10}(\Theta))I_1(\mu_{10}^*(\Theta))].$$

Dividing up each subgroup's welfare change by a factor m^Θ gives a greater weight to smaller households in $F(\Theta)$, the more so the greater is Θ. Also, weighting this ratio by household demographic shares favors smaller households.

It turns out that the importance of terms $D(\Theta)$ and $B(\Theta)$ is not large. Therefore, the differences between the unweighted and the weighted case are mainly explained by the $F(\Theta)$ term. Given the subgroup differences we have already reviewed, it is easy to see that $F(\Theta)$ will be smaller when households are weighted by household size. The results are reported at the bottom of Table 2 and the right hand panel in Figure 1.

We observe that, as in the unweighted case, i) the improvement in real welfare is stable as a function of Θ, and ii) there is a considerable difference between choosing p_1 or p_2 as the reference price vector. Overall, at p_2 and at an intermediate Θ value, the welfare improvement is only about 5% -versus 7% in the unweighted case- while at p_1 we may have a welfare loss of about 1-2% -versus a small gain of about 1.5% in the unweighted case.

In the absolute case, the analogous decomposition is the following:

$$W_\gamma(y_{20}(\lambda)) - W_T(y_{10}(\lambda)) = F_\gamma + D_\gamma + D(\lambda) + B_\gamma(\lambda)$$

where:

$$F_\gamma = \Sigma_m[H_1^m/H_1][\Delta W_\gamma(x^m)],$$

$$D_\gamma = \Sigma_m [\Delta r^m W_\gamma(x_{20}^m)],$$

$$D(\lambda) = \lambda[(S_1/H_1) - (S_2/H_2),$$

$$B_\gamma(\lambda) = -\left[A_\gamma(\zeta^*_{20}(\lambda)) - A_\gamma(\zeta^*_{10}(\lambda))\right].$$

Again, weighting the welfare change within each group by household shares in F_γ, favors smaller households. Given that the adjustment term D_γ, as well as the sum of $D(\lambda)$ and $B_\gamma(\lambda)$ are of a smaller order of magnitude for all λ and γ, differences between the unweighted and the weighted case are mainly explained by the F term. The results for an intermediate value of γ are reported at the bottom of Table 5.

We observe that, at p_2, welfare increases vary from 6.5 to 9.3% as a function of γ -versus 8.6 to 12.8% in the unweighted case- while at p_1, welfare losses go from 1.4 to 2.9% -versus a variation in the interval (+0.3, -0.3) in the unweighted case.

Finally, since the average household size in situation 1 is slightly greater than in situation 2, the expression between brackets in $D(\lambda)$ is positive. Thus, this term increases with λ. On the other hand, there is an improvement for all λ in the between-group component of absolute inequality from 1973-74 to 1980-81, so that $B_\gamma(\lambda)$ is positive. Because such an improvement is smaller the larger is λ, $D(\lambda)$ and $B_\gamma(\lambda)$ do not reinforce each other. Hence, as we saw in point 2 of this Section, welfare change in the absolute case is quite robust to the choice of parameter λ.

IV. CONCLUSIONS

In this paper we have investigated the evolution of the standard of living in Spain from 1973-74 to 1980-81 for a population of about 10 million household and 34 or 37 million persons occupying private housing. The standard of living has been approximated by a private consumption measure: total household expenditures, net of certain investment items. Comparisons in real terms have been made possible by household specific statistical consumer price indices, constructed on a 57-dimensional commodity space. The heterogeneity of the household population has been taken into account by means of several parametrisations of the weight to be given to household size, or to children needs relative to those of adults.

Social or aggregate evaluations have been performed by scalar indicators which permit to summarise judgements about an entire distribution by means of two statistics: the mean and an index of either relative or absolute inequality. Standard restrictions, as well as the requirement of additive separability, lead to a member of the General Entropy family of social evaluation functions in the relative case, and to several members of the Kolm-Pollack family in the absolute case. Comparisons have been made with and without weighting household adjusted expenditure by household size in the domain of the social evaluation functions.

During the study period, right after the first oil crisis and in the middle of a radical political change in Spain, the Spanish economy was not in good shape: GNP grew only at an average annual rate of about 2.3% at constant prices of 1986, while according to the official CPI the general price level increased 322%. As far as the evolution of the standard of living, our main conclusions are the following:

1. According to our budget surveys, mean household expenditure increased about 2% at prices of situation 2 (Winter 1981), or decreased at least 3.5% at prices of situation 1 (an average of 1973 and 1974 prices).

2. This fundamental change has not been distributed uniformly across groups. Under the assumption that households of the same size are readily comparable because they have the same needs from a social point of view, we concentrate on the partition by household size. We observe that households of 1 or 2 persons enjoy a considerable increase in the mean even at p_1; a majority of the population consisting of households from 3 to 7 persons experience a slight increase at p_2 or a slight decrease at p_1; the remaining of the population, consisting of large households, experience large losses.

3. Relative inequality has improved for all subgroups at both price regimes, but the ordering by household size according to the magnitude of such improvement is the same as before. Hence, at p_2 small households end up with welfare increases greater than 15%, 3 to 7 person households with increases about 4-5%, and large households with welfare losses close to 10%. At p_1, only small households have some welfare gains.

Because the measurement of absolute inequality depends on the measurement unit, large increases (decreases) in the mean for small (large) households pushes down (up) changes in absolute inequality. Nevertheless, except for 1 or 3 person households, all subgroups have an improvement in absolute inequality. Consequently, welfare changes follow the same pattern as in the relative case at both p_2 and p_1.

4. Pooling these subgroups into a single population requires value judgements to make welfare comparisons across subgroups. When we control the ethical weight to be given to household size by parameters Θ and λ in the relative and the absolute case, respectively, we find that although cross section estimates are affected in a non linear manner, aggregate welfare trends do not depend much on such parametrisations. However, in the absolute case, welfare change increases slightly with λ; this, together with the variation induced by changes in the aversion to inequality parameter, opens up the range of variation of our results.

Nevertheless, when we recognize that children might very well be given smaller weights than adults, we find that counting a child at 75, 50, or 25% of an adult has an equalising effect at the cross section level but a small impact on welfare comparisons.

5. At an intermediate value of Θ and at prices p_2, there has been a mean improvement at least as large as 2%, an improvement in relative equality at most equal to 5.5%, and an improvement in real welfare of about 7%. At prices p_1, there has been a loss in real mean at least as large as 3.5%, an improvement in equality at least as large as 5%, and a negligible improvement in real welfare at most equal to 1.5%.

Improvements in absolute inequality are larger the smaller the aversion to inequality parameter γ. At p_2 there has been an increase in real welfare of about 3.5-10.0%, depending on the choice of λ and γ. Between 2.0-6.5% of such an increase should be attributed to an improvement in absolute inequality, and the rest to a slight improvement in the mean. At p_1, the estimates for the change in real welfare vary from a decrease of about 3.5% to an improvement of 2%, depending on λ and γ. This is the result of a relatively large loss in the mean in the range 4.5-8.0%, partially offset by an improvement in absolute inequality of 1.0-9.0%.

To facilitate graphical illustration, consider an economy with only two households: the rich and the poor. In Figure 6 we first compare the original distribution in situation 2, x_2, to the 1973-74 distribution at prices

p_2, y_{12}. There is a gain in the mean -all distributions on BB lie above those in CC- and an improvement in relative inequality, represented by the shift from OR_{12} to OR_2. The improvement in absolute inequality is captured by the move from A_{12} to A_2. Similarly, at p_1 we compare y_{21} to x_1. There is a loss in the mean -B'B' is now below C'C'- but an improvement in both relative and absolute inequality -from OR_1 to OR_{21} and from A_1 to A_{21}, respectively.

6. If one applies the same inflation rate to all households in situation 1, estimates of welfare change are similar to those registered at p_2 with household specific price indices. However, most of the change is attributed to an increase in the mean. This missperception is to be expected in a period in which relative prices have evolved so as to cause a larger reduction in the standard of living of the rich, relative to the poor, hereby improving real inequality beyond the improvement in money inequality.

In Figure 6, x_1 becomes x_{1*}. The change in the mean from DD to BB is larger than before, but the improvement in relative inequality, which now coincides with the change in money inequality, is represented by the shift from OR_1 to OR_2. The distributional role of price changes, which causes the move from OR_{12} to OR_1, is omitted in this account.

7. Given the fact that larger households do worse than smaller ones, welfare changes suffer a downward shift when in the domain of the social evaluation functions each household's adjusted expenditure is weighted by household size. This is the case at both p_1 and p_2 in the relative and the absolute approach.

8. From a quantitative point of view, choosing p_1 or p_2 to express aggregate welfare change in real terms causes a larger impact than counting or not children differently from adults, giving a large or no weight to household size, weighting or not household expenditure by household size in the domain of the social evaluation function, or even choosing a relative or an absolute notion of inequality.

NOTES

(1) See, for instance, Amiel and Cowell (1992), Harrison and Seidl (1991), and Ballano and Ruiz-Castillo (1994).

(2) See, for instance, Muellbauer (1974a), Roberts (1980), and Blackorby, Laisney and Schmachtenberg (1992).

(3) Contrast this position with Glewwe (1991)'s discussion of an example in which a regressive transfer in unadjusted incomes caused an increase in the mean of the adjusted distribution after the transfer, altering the relative share of every one and giving rise to an improvement in the inequality of adjusted incomes. The paradoxical aspect of this example vanishes if we stick to transfers that preserve the total of adjusted incomes, whatever the consequences for the distribution of unadjusted incomes.

(4) The AKS index, which is a relative index of (in)equality if and only if W is homothetic, is named after Atkinson (1970), Kolm (1976a) and Sen (1973). The KBD index, which is an absolute index if and only if W is translatable, is named after Kolm (1976b) and Blackorby and Donaldson (1980).

(5) See Lewbel (1989) and Blackorby and Donaldson (1989).

(6) This is the weighting scheme recommended by Dazinger and Taussig (1979) and Cowell (1984), and used by the present author in Ruiz-Castillo (1993).

(7) This is of course a measure of private consumption of goods and services, which does not include neither leisure nor the impact of the public sector via taxes or publicly provided goods and services. The possible effect on the standard of living of asset ownership or liquidity constraints will be absent also from the analysis.

(8) For a discussion see Deaton and Muellbauer (1980), Ruiz-Castillo (1991), and Coulter *et al.* (1992a). Other approaches are not convincing either, and do not generate robust empirical results, as documented in Buhmann *et al.* (1988) and Coulter *et al.* (1992a).

(9) Atkinson and Bourguignon (1987), Bourguinon (1989) and Jenkins and Lambert (1992) have developed stochastic dominance criteria which, coupled with relatively weak assumptions on the relationship between income and needs, permit an incomplete ordering of income distributions for a heterogeneous population. However, social welfare is only a weighted sum of welfare within each of the subgroups of the relevant partition.

(10) In the relative case, this condition is called Engel Equivalence Exactness in Blackorby and Donaldson (1989).

(11) In this respect, see the interchange between Banks and Johnson (1993) and Jenkins and Cowell (1993), as well as the empirical literature quoted there.

(12) In the only previous empirical study we know of on absolute inequality, Blackorby, Donaldson and Auersperg (1981) choose values of γ equal to 5.10^{-6}, 5.10^{-5}, 10^{-4}, and 5.10^{-4} for distributions expressed in Canadian dollars.

(13) For $\gamma = 10^{-4}$and $\lambda = 90.000$, welfare at y_{12} is barely positive (see Table 4). Welfare change at p_2 and that λ value causes a large discontinuity which, to avoid distorsions, has not been represented in Figure 3.

(14) See, for instance, Jenkins (1991).

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TABLE 1. Mean, relative equality, and welfare in both survey years. Unweighted distributions.

	θ						
	0.0	0.2	0.4	0.6	0.8	1.0	OECD
1973-74 at p_1 : y_1							
μ	254,608	195,073	150,843	117,787	92,933	74,131	96,054
E_T	0.7684	0.7897	0.8029	0.8071	0.8010	0.7837	0.8040
W_T	195,635	154,040	121,110	95,061	74,443	58,095	77,227
1980-81 at p_1 : y_{21}							
μ	243,627	187,561	145,707	114,285	90,558	72,535	94,114
E_T	0.8143	0.8327	0.8434	0.8452	0.8370	0.8177	0.8374
W_T	198,378	156,187	122,889	96,595	75,799	59,310	78,811
1973-74 at p_2 : y_{12}							
μ	842,677	645,743	499,413	390,034	307,783	245,552	318,015
E_T	0.7543	0.7750	0.7876	0.7911	0.7843	0.7661	0.7876
W_T	635,614	500,448	393,341	308,550	241,395	188,116	250,477
1980-81 at p_2 : y_2							
μ	854,091	657,611	510,921	400,782	317,608	254,429	330,010
E_T	0.8050	0.8231	0.8335	0.8350	0.8265	0.8067	0.8271
W_T	687,504	541,303	425,861	334,658	262,494	205,249	272,947
1973-74 at p^* : y_{1*}							
μ	819,640	627,983	485,597	379,182	299,172	238,644	309,219
E_T	0.7684	0.7897	0.8029	0.8071	0.8010	0.7837	0.8040
W_T	629,792	495,889	389,880	306,022	239,649	187,021	248,611

TABLE 2. Change in real welfare in terms of changes in the mean and relative equality, in ratio form.

UNWEIGHTED DISTRIBUTIONS

	At p_1			At p_2			At p^*		
θ	$\Delta W'_{T1}$ =	$\Delta\mu'_1$ *	$\Delta E'_{T1}$	$\Delta W'_{T2}$ =	$\Delta\mu'_2$ *	$\Delta E'_{T2}$	$\Delta W'_{T*}$ =	$\Delta\mu'_*$ *	$\Delta E'_{T*}$
0.0	1.0140	0.9569	1.0597	1.0817	1.0135	1.0672	1.0917	1.0420	1.0476
0.2	1.0138	0.9615	1.0545	1.0816	1.0184	1.0621	1.0915	1.0472	1.0423
0.4	1.0147	0.9660	1.0505	1.0827	1.0230	1.0583	1.0923	1.0522	1.0382
0.6	1.0161	0.9703	1.0472	1.0846	1.0276	1.0555	1.0935	1.0570	1.0346
0.8	1.0182	0.9744	1.0449	1.0874	1.0319	1.0538	1.0954	1.0616	1.0318
1.0	1.0209	0.9785	1.0434	1.0911	1.0362	1.0530	1.0974	1.0661	1.0293
OECD	1.0205	0.9798	1.0415	1.0897	1.0377	1.0502	1.0979	1.0672	1.0287

WEIGHTED BY SIZE

0.0	0.9870	0.9375	1.0528	1.0518	0.9932	1.0590	1.0629	1.0203	1.0418
0.2	0.9880	0.9433	1.0474	1.0529	0.9993	1.0535	1.0641	1.0267	1.0364
0.4	0.9898	0.9488	1.0432	1.0548	1.0051	1.0494	1.0660	1.0329	1.0320
0.6	0.9921	0.9540	1.0400	1.0574	1.0107	1.0462	1.0683	1.0387	1.0285
0.8	0.9949	0.9591	1.0373	1.0607	1.0160	1.0440	1.0711	1.0443	1.0256
1.0	0.9981	0.9639	1.0354	1.0645	1.0210	1.0426	1.0741	1.0497	1.0233
OECD	0.9971	0.9658	1.0324	1.0629	1.0232	1.0388	1.0735	1.0514	1.0211

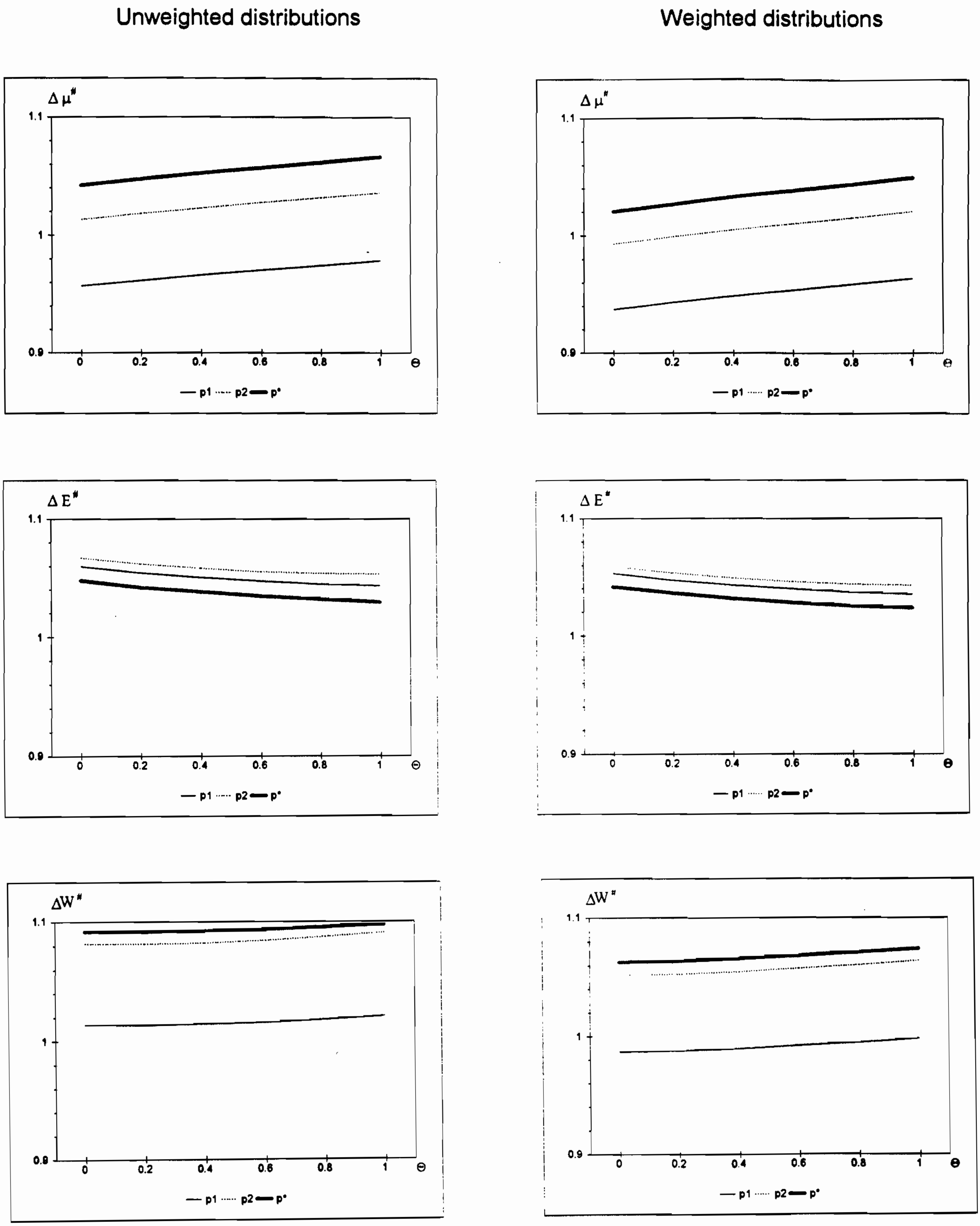


Figure 1. Changes in the mean, relative equality and welfare as a function of theta and base price

TABLE 3. Mean, absolute inequality, and welfare for both survey years for different values of γ. Unweighted distributions at p_1.

1973-74 at $p_1 : y_1$

		λ = 0	5,000	10,000	15,000	20,000	25,000	30,000	OECD
μ		254,608	240,974	227,340	213,707	200,073	186,439	172,805	96,054
A_γ, γ=	$5 \cdot 10^{-7}$	8,604	8,289	8,014	7,780	7,586	7,434	7,323	1,176
	$5 \cdot 10^{-6}$	55,671	53,170	51,050	49,328	48,022	47,151	46,735	8,899
	$1 \cdot 10^{-5}$	85,842	81,546	77,973	75,199	73,309	72,408	72,621	14,815
W_γ, γ=	$5 \cdot 10^{-7}$	246,004	232,686	219,327	205,927	192,487	179,005	165,483	94,878
	$5 \cdot 10^{-6}$	198,937	187,805	176,291	164,379	152,051	139,288	126,070	87,156
	$1 \cdot 10^{-5}$	168,766	159,428	149,367	138,508	126,764	114,031	100,185	81,240

1980-81 at $p_1 : y_{21}$

		λ = 0	5,000	10,000	15,000	20,000	25,000	30,000	OECD
μ		243,627	230,130	216,633	203,136	189,639	176,141	162,644	94,115
A_γ, γ=	$5 \cdot 10^{-7}$	6,020	5,765	5,549	5,371	5,232	5,131	5,069	874
	$5 \cdot 10^{-6}$	43,950	41,797	40,018	38,628	37,644	37,084	36,966	7,149
	$1 \cdot 10^{-5}$	70,776	66,977	63,904	61,632	60,246	59,847	60,560	12,340
W_γ, γ=	$5 \cdot 10^{-7}$	237,607	224,365	211,084	197,765	184,407	171,010	157,575	93,240
	$5 \cdot 10^{-6}$	199,677	188,333	176,615	164,508	151,994	139,058	125,678	86,965
	$1 \cdot 10^{-5}$	172,851	163,153	152,729	141,504	129,393	116,294	102,084	81,774

TABLE 4. Mean, absolute inequality, and welfare for both survey years for different values of γ. Unweighted distributions at p_2.

1973-74 at $p_2 : y_{12}$

	λ	0	15,000	30,000	45,000	60,000	75,000	90,000	OECD
μ		842,677	801,776	760,875	719,973	679,072	638,171	597,269	318,016
A_γ, $\gamma=$	$5 \cdot 10^{-7}$	85,427	82,564	80,058	77,914	76,135	74,726	73,692	12,861
	$5 \cdot 10^{-6}$	379,483	361,611	346,746	335,472	328,548	327,004	332,267	72,329
	$1 \cdot 10^{-5}$	500,297	474,950	454,900	444,477	453,880	499,962	589,499	106,468
W_γ, $\gamma=$	$5 \cdot 10^{-7}$	757,250	719,212	680,817	642,060	602,937	563,445	523,577	305,155
	$5 \cdot 10^{-6}$	463,195	440,165	414,128	384,501	350,524	311,167	265,002	245,687
	$1 \cdot 10^{-5}$	342,380	326,826	305,975	275,496	225,192	138,208	7,770	211,547

1980-81 at $p_2 : y_2$

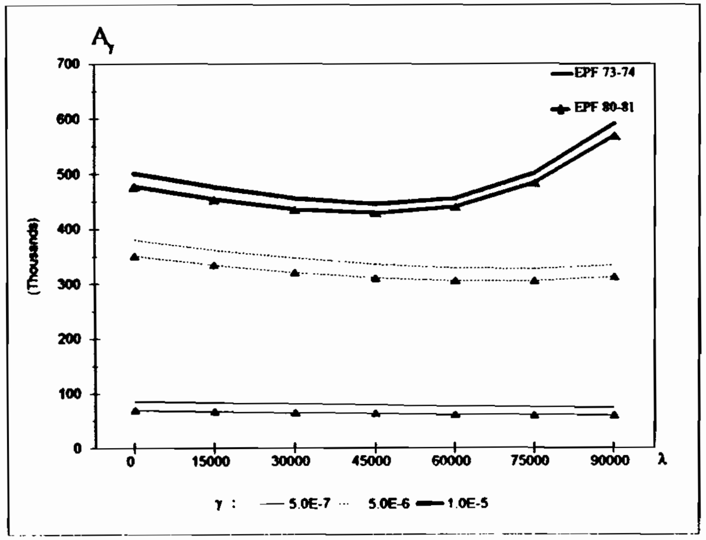
	λ	0	15,000	30,000	45,000	60,000	75,000	90,000	OECD
μ		854,092	813,600	773,108	732,617	692,125	651,634	611,142	330,010
A_γ, $\gamma=$	$5 \cdot 10^{-7}$	69,614	67,091	64,910	63,075	61,589	60,456	59,680	10,739
	$5 \cdot 10^{-6}$	350,841	334,042	320,312	310,268	304,722	304,802	312,134	67,238
	$1 \cdot 10^{-5}$	476,360	452,689	435,014	427,722	439,374	483,036	567,768	101,781
W_γ, $\gamma=$	$5 \cdot 10^{-7}$	784,477	746,509	708,198	669,542	630,536	591,178	551,462	319,272
	$5 \cdot 10^{-6}$	503,250	479,558	452,796	422,349	387,403	346,832	299,008	262,773
	$1 \cdot 10^{-5}$	377,732	360,911	338,095	304,895	252,751	168,598	43,374	228,229

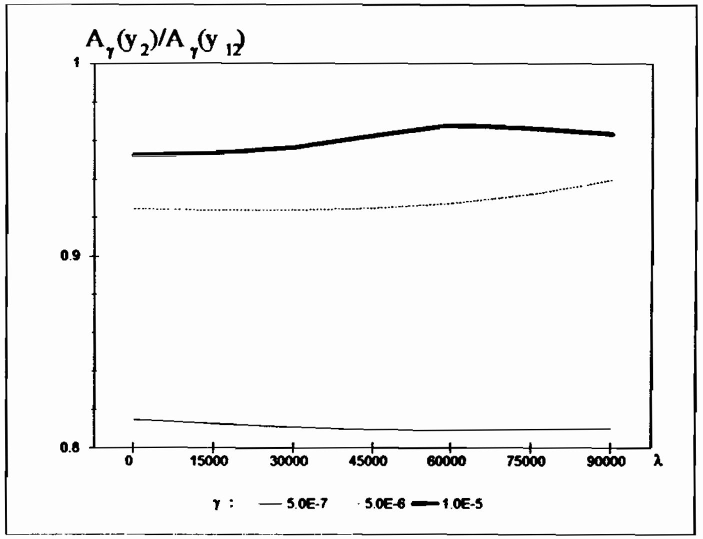
TABLE 4. (Follow up: unweighted distributions at p^*).

1973-74 at p^* : y_{1*}

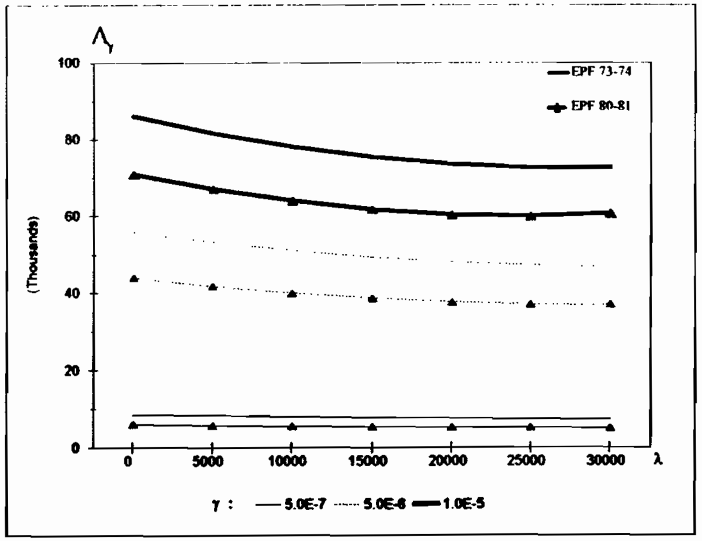
	λ	0	15,000	30,000	45,000	60,000	75,000	90,000	OECD
μ		819,640	778,738	737,837	696,936	656,034	615,133	574,232	309,220
A_γ, $\gamma=$	$5 \cdot 10^{-7}$	76,576	73,751	71,282	69,174	67,431	66,058	65,059	11,130
	$5 \cdot 10^{-6}$	355,396	337,496	322,585	311,240	304,220	302,554	307,683	65,309
	$1 \cdot 10^{-5}$	474,633	449,178	429,040	418,758	429,192	477,865	570,380	97,642
W_γ, $\gamma=$	$5 \cdot 10^{-7}$	743,063	704,988	666,555	627,762	588,603	549,075	509,173	298,090
	$5 \cdot 10^{-6}$	464,243	441,242	415,252	385,695	351,814	312,579	266,549	243,911
	$1 \cdot 10^{-5}$	345,007	329,561	308,797	278,178	226,842	137,268	3,852	211,578

Unweighted distributions at p2





Unweighted distributions at p1



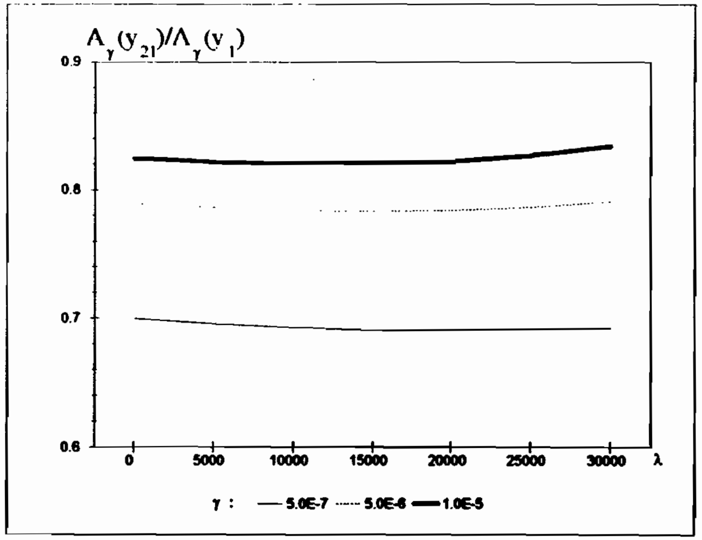


Figure 2. Absolute inequality as a function of gamma and lambda

Unweighted distributions at p1 | Unweighted distributions at p2 and p*

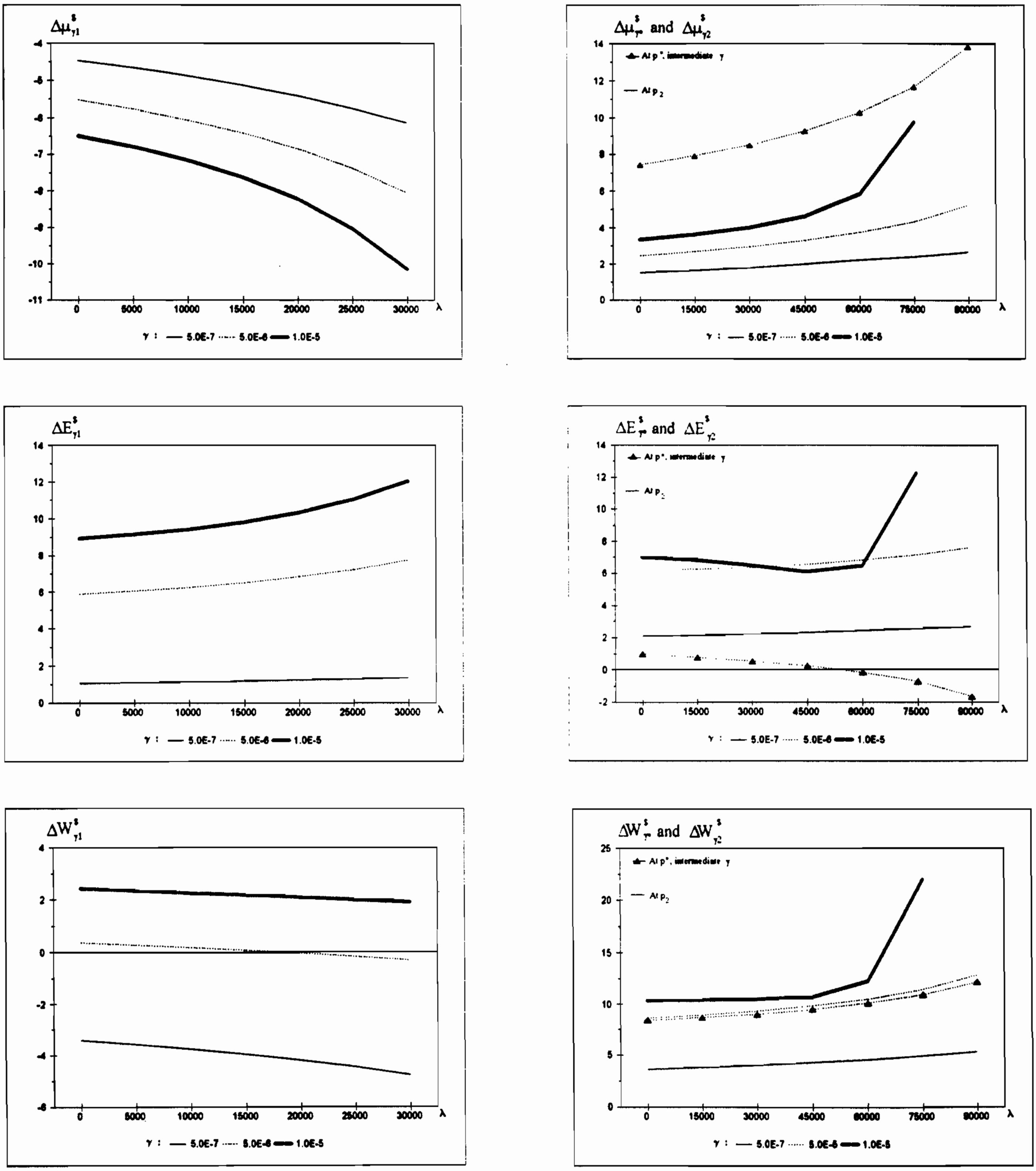


Figure 3. Changes in the mean, absolute inequality and welfare as a function of gamma, lambda and base prices

TABLE 5. Change in real welfare in terms of a change in the mean and a change in absolute inequality at $\gamma = 5 \cdot 10^{-6}$, in percentages.

UNWEIGHTED DISTRIBUTIONS

At p_2

λ	0	15,000	30,000	45,000	60,000	75,000	90,000	OECD
$\Delta\mu_2^\$$	2.46	2.69	2.95	3.29	3.72	4.33	5.24	4.88
$\Delta E_{\gamma 2}^\$$	6.18	6.26	6.38	6.56	6.80	7.14	7.60	2.07
$\Delta W_{\gamma 2}^\$$	8.65	8.95	9.34	9.84	10.52	11.46	12.83	6.95

At p_1

λ	0	5,000	10,000	15,000	20,000	25,000	30,000	OECD
$\Delta\mu_1^\$$	-5.52	-5.77	-6.07	-6.43	-6.86	-7.39	-8.06	-2.22
$\Delta E_{\gamma 1}^\$$	5.89	6.06	6.26	6.51	6.83	7.23	7.75	2.01
$\Delta W_{\gamma 1}^\$$	0.37	0.28	0.18	0.08	-0.04	-0.17	-0.31	-0.22

At p^*

λ	0	15,000	30,000	45,000	60,000	75,000	90,000	OECD
$\Delta\mu_*^\$$	7.42	7.90	8.49	9.25	10.26	11.68	13.85	8.52
$\Delta E_{\gamma *}^\$$	0.98	0.78	0.55	0.25	-0.14	-0.72	-1.67	-0.79
$\Delta W_{\gamma *}^\$$	8.40	8.68	9.04	9.50	10.12	10.96	12.18	7.73

WEIGHTED DISTRIBUTIONS BY HOUSEHOLD SIZE

At p_2

λ	0	15,000	30,000	45,000	60,000	75,000	90,000
$\Delta\mu_2^\$$	-0.89	-0.79	-0.69	-0.57	-0.43	-0.24	0.01
$\Delta E_{\gamma 2}^\$$	7.36	7.59	7.90	8.30	8.84	9.58	10.70
$\Delta W_{\gamma 2}^\$$	6.47	6.80	7.21	7.74	8.41	9.34	10.71

At p_1

λ	0	5,000	10,000	15,000	20,000	25,000	30,000
$\Delta\mu_1^\$$	-7.73	-8.17	-8.69	-9.32	-10.11	-11.11	-12.42
$\Delta E_{\gamma 1}^\$$	6.33	6.61	6.96	7.39	7.93	8.63	9.54
$\Delta W_{\gamma 1}^\$$	-1.40	-1.55	-1.73	-1.93	-2.18	-2.48	-2.87

TABLE 6. Change in real welfare in the partition by household size. The relative case.

	At p_2			At p_1			Demographic shares: Households H_m / H		Persons S_m / S	
Number of persons	$\Delta W'_{T2}$=	$\Delta \mu'_{T2}$ *	$\Delta E'_{T2}$	$\Delta W'_{T1}$=	$\Delta \mu'_{T1}$ *	$\Delta E'_{T1}$	**73-74**	**80-81**	**73-74**	**80-81**
1	1.3334	1.1296	1.1804	1.2135	1.0644	1.1402	8.2	7.8	2.2	2.1
2	1.1683	1.0617	1.1003	1.0901	1.0056	1.0841	20.4	21.1	11.0	11.4
3	1.0491	1.0232	1.0253	0.9869	0.9657	1.0221	19.5	18.6	15.8	15.1
4	1.0554	1.0219	1.0329	0.9913	0.9643	1.0279	22.2	23.6	23.9	25.6
5	1.0461	1.0012	1.0449	0.9812	0.9441	1.0394	14.7	14.9	19.8	20.2
6	1.0462	0.9801	1.0675	0.9816	0.9276	1.0583	8.2	7.7	13.3	12.6
7	1.0437	0.9988	1.0449	0.9795	0.9409	1.0411	3.7	3.6	6.9	6.8
8	0.9294	0.9172	1.0134	0.8702	0.8646	1.0065	1.7	1.5	3.6	3.3
9 +	0.9081	0.8763	1.0364	0.8599	0.8277	1.0390	1.4	1.2	3.4	2.9
TOTAL							100.0	100.0	100.0	100.0

TABLE 7. Change in the mean, absolute inequality and real welfare in the partition by household size. In percentages relative to $W_\gamma(y_{10}^m)$, m=1,2,...,9+, $p_0 = p_2$ and $p_0 = p_1$.

Num. of persons	At p_2: $\Delta W^\$_{\gamma 2}$ =	$\Delta\mu^\$_{\gamma 2}$ +	$\Delta E^\$_{\gamma 2}$	At p_1: $\Delta W^\$_{\gamma 1}$ =	$\Delta\mu^\$_{\gamma 1}$ +	$\Delta E^\$_{\gamma 1}$
$\gamma = 5 \cdot 10^{-7}$						
1	15.3	14.2	-1.2	7.2	6.6	0.6
2	8.6	6.8	1.9	1.4	0.6	0.8
3	3.2	2.5	0.7	-3.0	-3.5	0.5
4	3.5	2.4	1.1	-3.0	-3.6	0.6
5	2.2	0.1	2.1	-4.8	-5.8	1.0
6	0.9	-2.2	3.1	-5.9	-7.5	1.6
7	2.2	-0.1	2.3	-5.0	-6.1	1.1
8	-6.8	-9.4	2.6	-12.9	-14.1	1.2
9 +	-9.2	-14.6	5.4	-19.1	-21.1	2.0
$\gamma = 5 \cdot 10^{-6}$						
1	19.8	20.1	-0.3	10.6	7.8	2.8
2	13.2	9.8	3.4	4.9	0.7	4.3
3	3.6	3.5	0.1	-1.5	-4.1	2.6
4	6.9	3.4	3.6	-0.8	-4.2	3.4
5	5.6	0.2	5.4	-1.5	-6.9	5.4
6	7.4	-3.3	10.8	-2.1	-9.0	6.9
7	5.1	-0.2	5.3	-1.3	-7.6	6.2
8	-6.7	-14.9	8.1	-10.7	-17.8	7.1
9 +	-5.7	-24.2	18.4	-13.6	-27.7	14.0
$\gamma = 1 \cdot 10^{-5}$						
1	20.2	24.1	-3.9	12.0	8.7	3.3
2	14.3	12.1	2.2	6.6	0.8	5.8
3	2.3	4.4	-2.1	-1.0	-4.5	3.5
4	8.6	4.2	4.4	0.5	-4.8	5.3
5	5.1	0.2	4.9	-0.1	-7.8	7.7
6	8.4	-4.3	12.7	0.4	-10.3	10.7
7	2.3	-0.3	2.6	0.1	-8.7	8.8
8	-11.3	-19.2	7.9	-10.3	-20.7	10.4
9 +	-10.4	-32.2	21.8	-11.2	-32.7	21.5

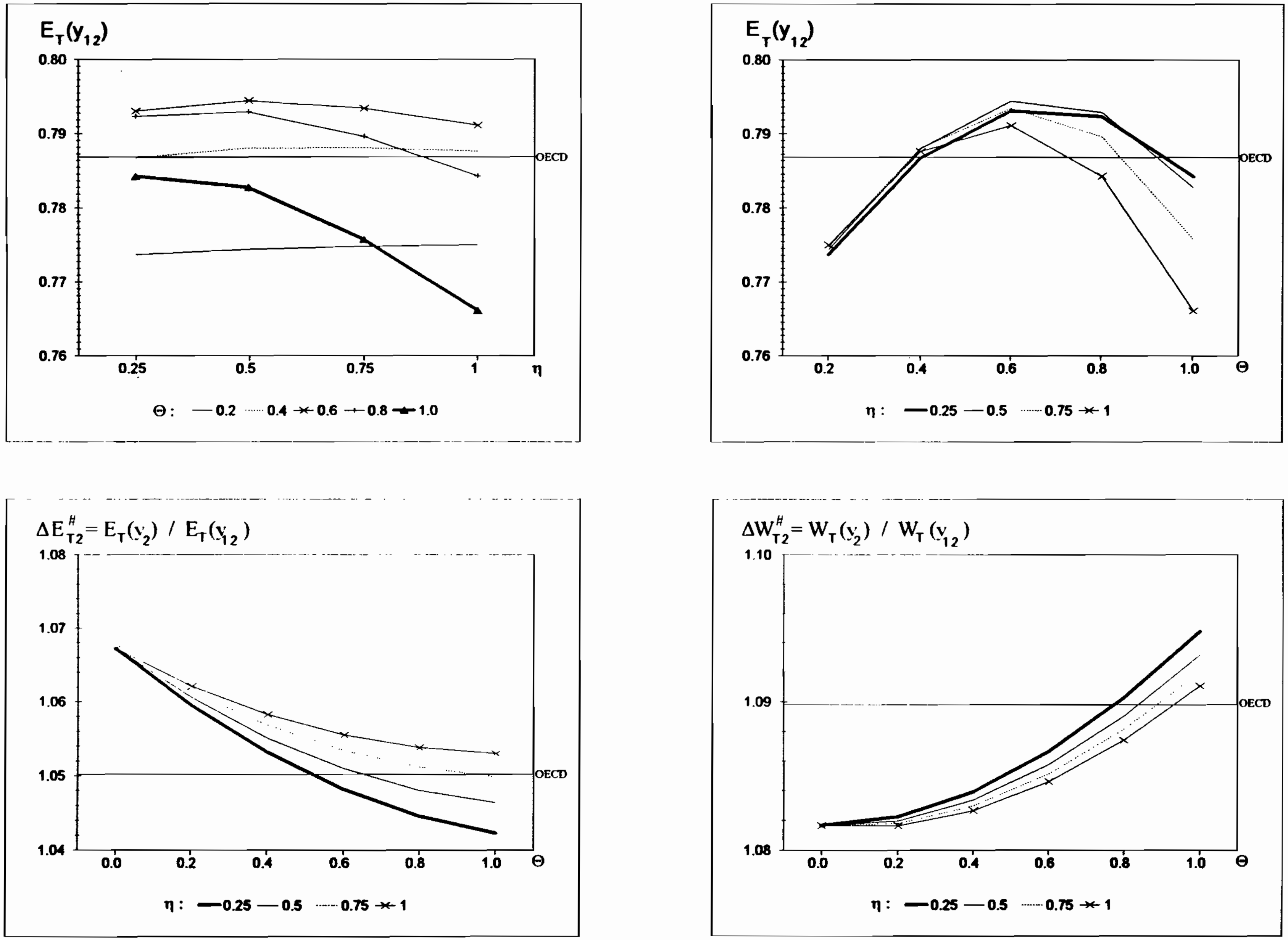


Figure 4. The impact of weighting children differently than adults: the relative case

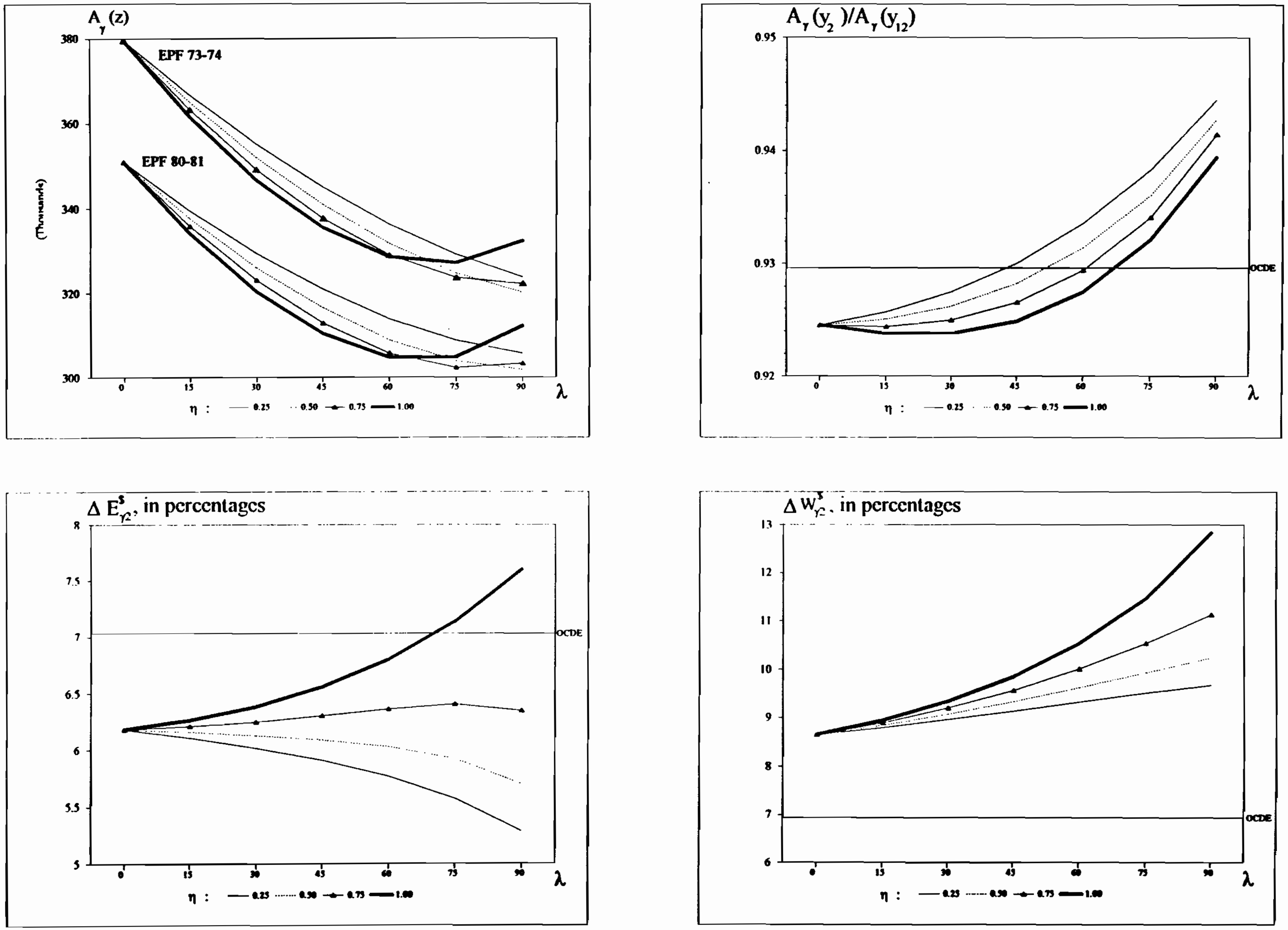


Figure 5. The impact of weighting children differently than adults: the absolute case for gamma = 5.0E-06

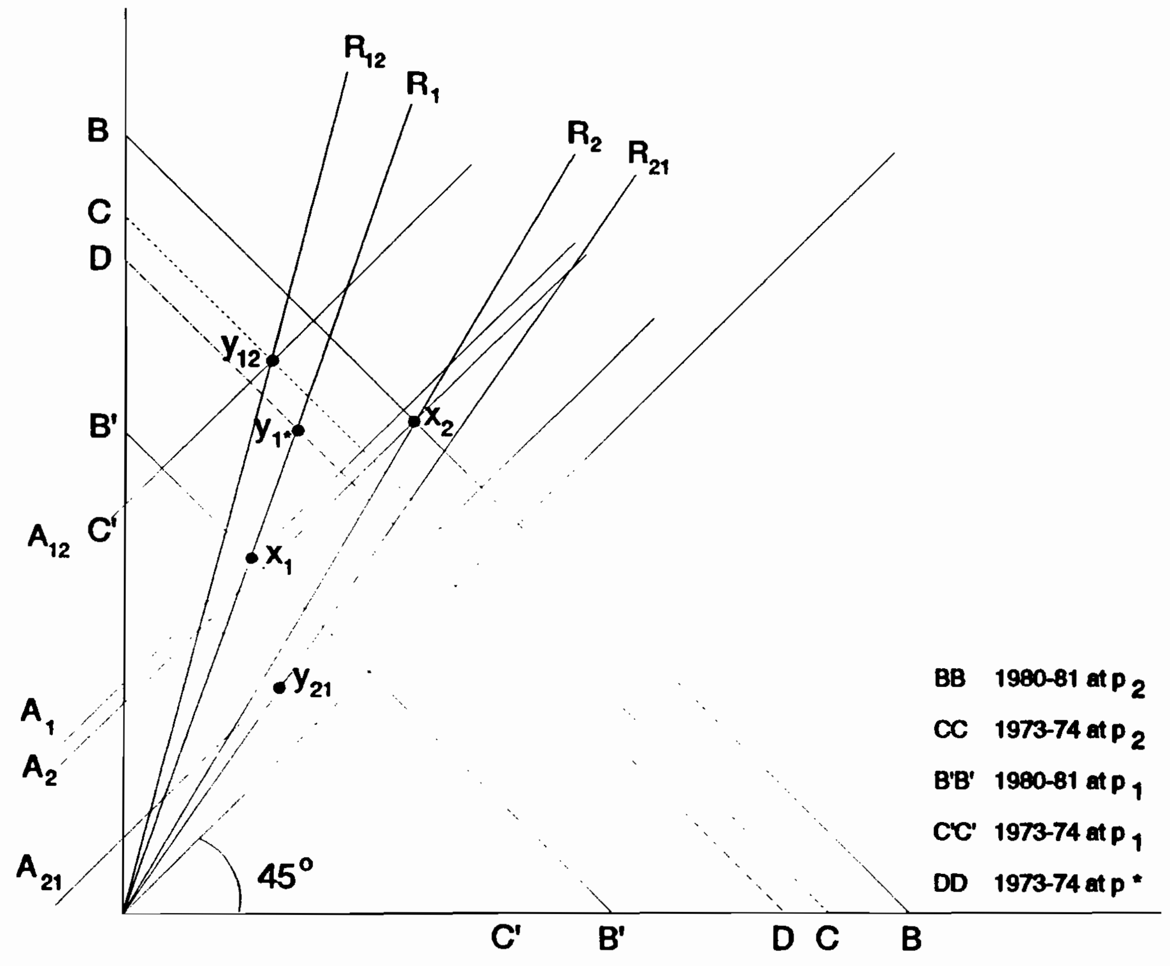


Figure 6. An illustration of main results for a two household economy