Distributive implications of member level income aggregation within the household

An approximation through mobility indices[1]

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Abstract

This paper adapts the ethical index of income mobility first suggested by Chakravarty, Dutta and Weymark (1985) to assess the contribution of wives, husbands, and other adults' member level income to husband-wife households' income mobility according to two of the criteria discussed in the literature. For any partition of the population, a source's contribution is seen to be decomposable into within-group and between-group income mobility indices plus a term capturing sub-group differences in income shares. The approach is applied to a sample of husband-wife households where both spouses are present, extracted from the 1990–91 *Encuesta de Presupuestos Familiares*, the Spanish household budget survey. While the husbands' income contribution is large and positive, the contribution of wives and other adults is practically equal to zero. When mean income differences are eliminated, all member contributions to husband-wife households' income mobility are substantially reduced.

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1. Introduction

At least since Shorrocks (1982), we know that there are fundamental difficulties in the field of inequality decomposition by factor components. As Lerman (1999) concludes in a recent survey, ''It is now well understood that the seemingly simple question 'what is the role of an income source in overall income inequality' is complex''. Surely, part of the difficulty is that a source's contribution to inequality depends not only on aspects of the source itself but also on how it interacts with other sources'.

The aim of this paper is to gain a better understanding of how the incomes of different household members interact in the determination of the household income inequality in Spain. Only income that can be identified by household member is analyzed in this study. Member level annual income includes wage earnings, unemployment benefits, self-employment income and old-age, disability and other public pensions. Each member's income, summed over all of these sub-types of income, is defined as a 'source'. (This is in contrast to defining each type of income as a source). The data refer to a sample of households in which both spouses are present. Although these households may also include other members, they will be referred to as husband-wife households.

The data are selected from the 1990–91 *Encuesta de Presupuestos Familiares* (EPF), a household budget survey whose main aim is the estimation of the weights in the official Consumer Price Index. The only two previous papers on this issue in Spain, Alba and Collado (1998) and Gradín and Otero (1999), assess the effects of wives' income on household income inequality.[2] However, husbands, wives and other household members 16 years of age (the legal working age in Spain) or older contribute 75.2, 11.2 and 13.6 per cent, respectively, of all income in the sample. Thus, the first distinctive feature of this paper is that it compares the contribution of the three groups already mentioned to overall income inequality. The contribution of females' income, as opposed to wives' income, is also estimated.

From a methodological point of view, the starting point of this paper is the idea in Cancian and Reed (1998) that the impact of a member level income on the aggregate income distribution can be assessed meaningfully by comparing the observed distribution with an interesting hypothetical benchmark. But this is exactly the point of view taken in Chakravarty, Dutta and Weymark (1985), or CDW for short, in the study of income mobility in a dynamic context. In order to assess the contribution of each member level income to husband-wife households' income inequality, two criteria are used in this paper.

First, CDW suggest comparing the actual path of incomes with a situation of complete income immobility. In our context, the following counterfactual is

[2] This is also the case in other countries. For the US see, for instance, Cancian and Reed (1998) and most of the references quoted there.

posed: What would social welfare be in the absence of income mobility due to a given source? This first criterion corresponds to the first alternative considered by Cancian and Reed (1998), in which the counterfactual distribution is the aggregate labour earnings from current paid employment of all household members excluding the wives. In the second criterion in this paper, the counterfactual is: What would social welfare be in the absence of a member's income inequality? This is the third alternative in Cancian and Reed (1998), and the second one in the concluding section in Shorrocks (1982).

The advantages of adopting this approach are three-fold. First, it is useful to know whether or not a member's income contribution to aggregate household income mobility is socially desirable. Since an ethical index is used in each of the two alternatives described above, this approach is capable of rationalizing existing results in the literature from a normative point of view. Second, consider the simplest case of husband-wife households consisting of only two types of adults: husbands and wives. The consequences of adding wives' income to their husbands' depend on three factors: (i) the differences between husbands' and wives' income inequality; (ii) the fact that both income distributions might not be equally ordered; and (iii) the differences in mean income between the two groups involved. Fortunately, as shown in Ruiz-Castillo (2000) the role of these three factors can be disentangled in this approach. This is important. On one hand, one of the four issues discussed in Lerman's (1999) survey is how to deal with the re-ranking of the population. On the other hand, this is the first paper in which the impact of differences in mean incomes is explicitly analyzed.

Third, the vast majority of husbands, 99.5 per cent, but only 32.3 per cent of wives and 34.6 per cent of other household members has positive income. Therefore, it is interesting to investigate, for example, the impact of wives' income on husband-wife households' income mobility not only for all husband-wife households, but also for the sub-samples in which either only husbands or both spouses receive some positive income. This calls for additively separable measurement instruments. Using an additively decomposable social evaluation function originally suggested by Herrero and Villar (1989), the CDW approach in the relative case leads to a suitable exact decomposition of this type. Due to some shortcomings of this function, as well as to enhance the robustness of the results, several other social evaluation functions are also applied in the empirical part of the paper.

The main results are the following: (i) according to the first criterion, the contribution of wives and other adults' income to husband-wife households' income mobility is practically equal to zero. However, the contribution of husbands' income amounts to a 95.06 per cent welfare increase; (ii) when mean income of the member source being analyzed is set equal to the mean of the aggregate income distribution excluding the source in question, the latter contributions are substantially reduced; (iii) the application of the second criterion gives results consistent with the first one only if mean income differences are eliminated; and (iv) wives' income contribution to husband-wife household income mobility increases when the focus is placed on sub-groups in which wives receive positive income. A similar result is obtained for other adults' income. These results are robust to the choice of equivalence scales to compare households of different size and composition.

The rest of the paper is organized in four sections. Section 2 is devoted to measurement procedures following the income mobility approach, including a discussion of the admissible social evaluation functions and the limitations of the measures proposed. Section 3 presents the data and some descriptive analysis. Section 4 contains the empirical results, while Section 5 concludes.

2. Measurement procedures

2.1 The social welfare impact of different income sources

As pointed out in the Introduction, this paper studies husband-wife households in which both spouses are present and where there are three types of members with potential income: husbands, wives, and other household members 16 years of age or older referred to as 'others' or 'other adults'. The social welfare framework that is applied here was originally suggested for a dynamic context and was limited to a two-period world. Most of this section is devoted to a static (one-period world) version of the model that refers to N husband-wife households consisting only of two types of members with income. Once its properties are established, the uses of the model in a three member income source context are introduced in Section 3.

A *set of husband-wife households* is described by an ordered pair $(X,Y) \in \Re_+^{2N}$ where $X = (x_1,\ldots,x_N) \in \Re_+^N$ and $Y = (y_1,\ldots,y_N) \in \Re_+^N$ are the two member income distributions. For the remainder of the paper, the income distribution which appears in the first place, or the *reference* distribution, X in this case, is always assumed to be ordered by the 'less than or equal' relationship, so that $x_1 \le x_2 \ldots, \le x_N$. Let Z be the *aggregate* or the *husband-wife households' income distribution* corresponding to the set (X,Y), where $Z = (z_1,\ldots,z_N) \in \Re_+^N$ with $z_i = x_i + y_i$. Denote by μ_j, $j = X,Y,Z$ the means of distributions X, Y and Z, respectively.

A *social evaluation function* (SEF for short) is a continuous function which assigns a level of social welfare to each set of couples $(X,Y) \in \Re_+^{2N}$. Following CDW, it is assumed that the only feature of the set (X,Y) relevant for a welfare comparison is the aggregate income distribution Z. Thus, social evaluations are made in terms of a SEF $W: \Re_+^N \to \Re$ defined on aggregate income space. It is assumed that the social evaluation of member income sources X and Y can also be made in terms of the same SEF W.

Most of welfare economics refers to SEFs which can be expressed in terms of only two statistics of income distributions: the mean, and an index of relative inequality (for a discussion of the necessary conditions, see Dutta and Esteban, 1992). Following CDW, it is convenient to express the trade-off between efficiency and distributional considerations in a multiplicative fashion, i.e., for any income distribution $Z \in \Re_+^N$, it is assumed that $W(Z) = \mu(Z)[1 - I(Z)]$ for some relative inequality index, I.

In order to assess the contribution of one member income source to the aggregate income inequality, two criteria will be used. In each criterion the actual set of husband-wife households $(X,Y) \in \Re_+^{2N}$ is compared in social welfare terms to a different benchmark set: (i) a set of husband-wife households where, given X, there is complete income immobility in a sense to be defined below; and (ii) a set of husband-wife households where the income inequality of the source under study is eliminated. The two criteria will be discussed in succession.

2.1.1 The first criterion

Given X, the second income source Y affects husband-wife households' social welfare in two ways. First, by increasing mean aggregate income, in which case social welfare increases. Second, by inducing some income mobility that may or may not be socially desirable. Following CDW, it is said that the set of husband-wife households $(X,Y) \in \Re_+^{2N}$ exhibits complete *income immobility* in the relative case if (i) there is no difference in income inequality between the two sources, i.e., if $I(Y) = I(X)$ for any index I of relative inequality, and (ii) Y is ordered as X, i.e., $y_1 \le y_2 \ldots, y_N$. That is to say, $(X,Y) \in \Re_+^{2N}$ exhibits complete income immobility if $Y = \lambda X$ for some $\lambda > 0$, in which case $I(Z) = I(X)$. Therefore, the source Y is said to induce income mobility if either $I(Y) \ne I(X)$ or there is at least one rank reversal between X and Y, i.e., there is a pair of husband-wife households i and j, with $i < j$, such that $x_i \le x_j$ and $y_i > y_j$. In either case, $I(Z) \ne I(X)$.

To assess the contribution of one member income according to the first criterion, we suggest measuring the change in husband-wife households' social welfare resulting from the income mobility induced by this source, leaving aside efficiency considerations. Thus, the concept explored is the one embodied in a welfare comparison of the actual set of husband-wife households $(X,Y) \in \Re_+^{2N}$, and a counterfactual set $(X,Y_b) \in \Re_+^{2N}$, corresponding to a situation of complete income immobility. Define $Y_b = (\mu_y / \mu_x)X$ and let $Z_b = X + Y_b$ be the new aggregate income distribution. Since the mean income of Y_b is equal to μY, the mean aggregate income of Z_b is equal to $\mu Z = \mu X + \mu Y$. Therefore, relative to the set (X,Y), the efficiency aspects remain the same. On the other hand, distribution Y_b is ordered as X, and it has the same income inequality, i.e., $I(Y_b) = I(X)$. Therefore, $I(Z_b) = I(X)$. Hence, given (X, Y), the set of husband-wife households (X, Y_b) exhibits complete income immobility.

An ethical index which measures the contribution of source Y to the income mobility within husband-wife households, is a real valued function which assigns a welfare level to the ordered pair $(X,Y) \in \Re_+^{2N}$, i.e., it is a function M: $\Re_+^{2N} \to \Re^1$. Following CDW, such an index is defined as the percentage change in observed social welfare, $W(Z) = \mu Z(1 - I(Z))$, relative to the social welfare which would be obtained in a situation of complete income immobility abstracting from efficiency considerations, $W(Z_b) = \mu Z(1 - I(X))$:

$$M(X,Y) = \frac{(W(Z) - W(Z_b))}{W(Z_b)} = \frac{(I(X) - I(Z))}{(1 - I(X))} \tag{1}$$

Contrary to merely descriptive indices, this ethical index permits us to determine whether or not the addition of the second income distribution to the reference one is socially desirable. Given the operational assumptions made on the SEF, and the fact that the notion of income immobility used is unconcerned with efficiency considerations, the inequality of the aggregate income distribution is what matters at the social level in this framework. Thus, under the assumption that $(1 - I(X))$ is positive, which will always be the case given the SEFs used in this paper, the sign of $M(X,Y)$ depends on the relationship between $I(X)$ and $I(Z)$, as called for in Cancian and Reed's (1998) first measure. Thus, we say that the contribution of the second income distribution to the aggregate income mobility is, for instance, (weakly) positive, if and only if the index $M(X,Y)$ is positive, that is, if and only if the income inequality of the observed aggregate income distribution $Z = X + Y$ is less than the income inequality $I(X)$ which would have resulted in the absence of any income mobility due to the second income source.

Income mobility within husband-wife households depends on different factors. For the moment, it is convenient to distinguish between two of them: the differences between the income inequality and the ordering of both distributions. Ruiz-Castillo (2000) shows how to decompose CDW's index into two indexes of *structural* and *exchange income mobility* which capture, respectively, the welfare effect of these two types of income changes.

Consider any set of husband-wife households, $(X,Y) \in \Re_+^{2N}$, in which the reference distribution X is ordered by the 'less than or equal' relation. Whenever X and Y are not equally ordered, define $Z_c = X + Y'$, where Y' is distribution Y ordered as the initial distribution X. Then the CDW index is decomposed as follows:

$$M(X,Y) = SM(X,Y) + EM(X,Y)$$

Where

$$SM(X,Y) = \frac{(W(Z_c) - W(Z_b))}{W(Z_b)} = \frac{(I(X) - I(Z_c))}{(1 - I(X))} \quad (2)$$

$$EM(X,Y) = \frac{(W(Z) - W(Z_c))}{W(Z_b)} = \frac{(I(Z_c) - I(Z))}{(1 - I(X))} \quad (3)$$

The term $SM(X,Y)$ can be viewed as the income mobility associated with the set of husband-wife households (X,Y') in which X and Y are equally ordered, i.e., $SM(X,Y) = M(X,Y')$. Then, exchange mobility is defined as a residual, i.e., $EM(X,Y) = M(X,Y) - M(X,Y')$, capturing the welfare effect of rank reversals between X and Y.

It turns out that $SM(X,Y) >=< 0 \Leftrightarrow I(X) >=< I(Y)$, that is, the structural mobility index captures the welfare change due to the differences in the two sources income inequality. On the other hand, in the presence of some rank reversals between X and Y, it can be shown that $EM(X,Y) > 0$, that is, exchange mobility is always welfare enhancing.

In cases where $M(X,Y) \neq 0$, it is reasonable to view the contribution of the second income source to the husband-wife households' income mobility as closely related to the relative size of the two income distributions,[3] i.e., to differences between μ_Y and μ_X. To study this question, a new set of husband-wife households is considered where the income inequality of both distributions is preserved but the mean income of the second distribution is made equal to the mean income of the reference one. The contribution of the second income source to husband-wife households' income mobility is now independent from any differences in mean income. Such contribution depends exclusively on income inequality differences between the two sources and the rank reversals between them.

To any set of husband-wife households $(X,Y) \in \Re_+^{2N}$ with $\mu_X \neq \mu_Y$, let us associate another set $(X,U_Y) \in \Re_+^{2N}$, where U_Y is called a *unitary* income distribution, defined by $U_Y = (\mu_X / \mu_Y)Y$. Therefore, $\mu U_Y = \mu_X$, $I(U_Y) = I(Y)$ and, as shown in Ruiz-Castillo (2000), the set of rank reversals between X and Y coincides with that same set between X and U_Y. Given a set of husband-wife

[3] In a dynamic context, this idea is stressed in Fields and Ok's (1999) recent survey on income mobility: 'While most people feel that the notions of income inequality and income growth are largely independent concepts, it seems reasonable to view the movement aspect of mobility as closely related with *income growth*.' (p. 563, emphasis in the original).

households (X,Y), the income distribution U_Y can be viewed as arising from X through income transfers among the individuals. This leads to income inequality $I(U_Y)=I(Y)$ that preserves the same set of rank reversals between X and Y. Let $V_Y = X + U_Y$ be the aggregate income distribution in the set (X, U_Y), and let $V_b = 2X$, so that $\mu_{V_b} = \mu_{V_Y} = 2\mu_X$ and $I(V_b)=I(X)$. The contribution of the second source, U_Y, measured according to the unitary income mobility index $M(X,U_Y)$, is equal to:

$$M(X,U_Y)=\frac{(W(V_Y)-W(V_b))}{W(V_b)}=\frac{(I(X)-I(V_Y))}{(1-I(X))} \quad (4)$$

If there is any rank reversal between X and U_Y, then we have:

$$M(X, U_Y)=SM(X, U_Y)+EM(X, U_Y),$$

where the structural and exchange mobility indices $SM(X, U_Y)$ and $EM(X, U_Y)$ are defined as in expressions (2) and (3), respectively. As before, $SM(X, U_Y) >=< 0 \Leftrightarrow I(X) >=< I(U_Y)=I(Y)$ and $EM(X, U_Y)>0$. The fact that the set of rank reversals between X and U_Y and between X and Y coincide does not imply that $EM(X, U_Y)$ is equal to $EM(X, Y)$.

The differences in income mobility between the sets of husband-wife households (X,Y) and (X,U_Y) are solely due to differences between $\mu_{U_Y} = \mu_X$ and μ_Y. If a *mean income adjustment factor* is defined by $A(\mu_X/\mu_Y)=M(X, Y)-M(X, U_Y)$, then we can write:

$$M(X, Y)=M(X, U_Y)+A(\mu_X/\mu_Y)= SM(X, U_Y)+EM(X, U_Y)+A(\mu_X/\mu_Y) \quad (5)$$

Expression (5) indicates that the income mobility index $M(X,Y)$ can be decomposed into three terms: $SM(X, U_Y)$, which captures the structural mobility due to differences in income inequality between the two income sources once X and U_Y (or X and Y) are equally ordered, holding mean income constant at the level μ_X; $EM(X,U_Y)$, which captures the exchange mobility due to the rank reversals between X and U_Y (or X and Y), holding mean income constant at the level μ_X; and $A(\mu_X/\mu_Y)$, which captures the income mobility due to the differences between the mean income μ_X and μ_Y in the set of husband-wife households (X, Y).[4] Naturally, the index $M(X, U_Y)$ provides a measure in its own right of the second source's contribution to husband-wife households' income mobility, alternative to the one provided by $M(X, Y)$.

The income mobility indexes just presented are sensitive to the choice of reference distribution. This is important in the present context because we are equally interested in the contribution of both sources to social welfare. As shown in Ruiz-Castillo (2000), as far as the CDW index, it turns out that:

$$M(X, Y) >=< M(Y, X) \Leftrightarrow I(X) >=< I(Y).$$

That is to say, the relationship between the income inequality of both sources determines which contribution to income mobility is larger.

In empirical applications one source must typically exhibit more income inequality than the other. Without loss of generality, let us assume that $I(X) < I(Y)$. In this case, we have that

$$M(X, Y) < M(Y, X) \quad (6a)$$

$$M(X, U_Y) < M(U_Y, X) \quad (6b)$$

Moreover, $I(X) < I(Y)$ implies that structural mobility is positive. Since exchange mobility is always positive, we have that $M(Y, X) > 0$. Similarly, since $I(U_Y) = I(Y)$, it can be concluded that $M(U_Y, X)$ is also positive. Therefore, from $I(X) < I(Y)$ it can be inferred that, according to the first criterion, the contribution of source X to income mobility is (i) weakly positive, and (ii) greater than the contribution of source Y to income mobility, independently of whether the mean income of both sources are maintained at their observed values or are set equal at the level of μ_X, as in (6a) and (6b), respectively. However, it is an open empirical question whether or not the contribution of source Y is weakly positive.

2.1.2 The second criterion

Given a set of husband-wife households $(X, Y) \in \Re_+^{2N}$, consider the possibility of

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[4] In principle, to examine these questions there is a symmetric procedure where the income inequality of both distributions is preserved but the mean income of the reference distribution is made equal to the mean income of the second one, as in the set of husband-wife households

$$(U_X, Y) \in \Re_+^{2N} \text{ where } U_X = (\mu_Y / \mu_X) X$$

However, it can be shown that $M(U_X, Y) = M(X, U_Y)$, which means that the decomposition obtained through this route is identical to the one reflected in equation (5).

assigning each person in the second distribution the mean income of Y. The question is: What is socially preferable, maintaining the observed income distribution Y or eliminating the income inequality in the second situation in the manner just described? For the second alternative, mean aggregate income remains constant, $I(Y)$ is eliminated, but so are the rank reversals that might exist between X and Y which are known to be welfare enhancing. Thus, a new income mobility index M^*: $\Re_+^{2N} \rightarrow \Re^1$ can be defined which compares the social welfare in the observed aggregate situation, $Z = X + Y$, with the social welfare in the new counterfactual situation, $Z_Y = X + \mu_Y$, where $\mu_{\mathbf{Y}} = (\mu_Y, \ldots, \mu_Y)$.

$$M^*(X, Y) = \frac{(W(Z) - W(Z_Y))}{W(Z_Y)} = \frac{(I(Z_Y) - I(Z))}{(1 - I(Z_Y))} \tag{7}$$

Under the assumption that $(1 - I(Z_Y))$ is always positive, the following results

$$M^*(X, Y) >=< 0 \Leftrightarrow I(Z_Y) >=< I(Z).$$

Thus, the sign of the term $M^*(X, Y)$ depends on the relationship between the income inequality resulting from eliminating the second source's income inequality, $I(Z_Y)$, and the observed aggregate income inequality, $I(Z)$. This is exactly the criterion considered in Cancian and Reed's (1998) third alternative and in Shorrocks' (1982) second alternative in his concluding section.

Adding up an equal absolute amount μ_Y to every person in distribution X must necessarily reduce the original income inequality $I(X)$, that is, $I(Z_Y) < I(X)$. However, given that $I(Y) > I(\mu_Y) = 0$, it is uncertain what the relationship between $I(Z)$ and $I(X)$ might be. However, *a priori*, it is likely that $I(Z_Y) < I(Z)$, so that $M^*(X, Y) < 0$. The interpretation would be that the greater this index is in absolute value for a given source, the more socially damaging the source is, and the better off society would be if this source's income inequality were to be eliminated as explained. It appears that $M^*(X,Y)$ can only be positive if the rank reversals between X and Y have a sufficiently large effect. Thus, in the unlikely event that $M^*(X,Y) > 0$, we shall say that the second income distribution's contribution to husband-wife households' income mobility is strongly positive.[5]

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[5] For an alternative way of grasping how hard it is that $M^*(X, Y) > 0$, consider the following expression which uses the income mobility index defined in equation (1):

$$\Delta_Y (X, Y) \equiv M(X, Y) - M(X, \mu_Y) = \{I(Z_Y) - I(Z)\}/\{1 - I(X)\}.$$

As far as the study of inequality decomposition by factor components is concerned, the ethical indexes of income mobility presented in this section offer some advantages over standard decomposition methods. They assign to every source its direct 'marginalist' contribution, holding mean aggregate income constant. This marginalist contribution would be the difference between observed aggregate income inequality and the income inequality that would arise if we eliminate either the income mobility induced by the source (first criterion) or the income inequality from that source (second criterion). These contributions are seen to be decomposable in different directions. However, it should be clear that the contributions defined in equation (1) and (7) do not add up to the amount of aggregate income inequality that needs to be accounted for.[6] Consequently, the contribution to welfare of a given source, such as other adults' income, depends on how many income components are distinguished within the source, although it is independent from the number of other sources considered. Thus, the contribution of 'other adults' to income mobility can differ if they are considered as a single entity or if they are split into several sub-groups as 'young adults' and 'older adults'.

Finally, like the rest of the field of inequality decomposition by factor components, it should be emphasized that the measurement procedures presented in this paper are accounting exercises. Such procedures are used to decompose changes in social welfare due to income mobility into a set of member level contributions that may reflect endogenous as well as exogenous changes. To overcome this limitation would require estimating an economic behaviour model, a task beyond the scope of this paper.

2.2 Admissible social evaluation functions

Ideally, an admissible SEF must satisfy the following demands: (i) for any $X \in \Re_+^N$, $W(X) = \mu_X (1 - I(X))$; (ii) it is convenient that the inequality measure is

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Under the assumption that $(1 - I(X))$ is positive, we have that $\Delta_Y (X, Y) >=< 0 \Leftrightarrow M^*(X, Y) >=< 0$. Since there are no permutations between X and μ_Y by construction, all income mobility in the set of husband-wife households (X, μ_Y) is structural mobility, $M(X, \mu_Y) = SM(X, \mu_Y)$. Furthermore, since $I(X) > I(\mu_Y) = 0$, $M(X, \mu_Y)$ is necessarily positive. If the contribution of Y to husband-wife households' income mobility is non-positive, i.e., if $M(X, Y) \le 0$, then $\Delta_Y (X, Y) < 0$, meaning that this contribution is negative according to the second criterion. However if the contribution of Y to husband-wife households' income mobility is weakly positive, i.e., if $M(X, Y) > 0$, then $\Delta_Y (X, Y)$ might be either positive or negative. This is why in the latter case we say that the contribution of the second income source to husband-wife households' income mobility is strongly positive.

[6] Chantreuil and Trannoy (1999) propose applications of co-operative game concepts to the decomposition of income inequality by factor components trying to conciliate marginality and consistency. In particular, the Shapley value presents some interesting features from a theoretical point of view: it has a marginalist interpretation and the sum of contributions equals the total amount of income inequality. However, an important drawback of the Shapley inequality decomposition is that the contribution of any factor depends on how many income sources are distinguished. See Sastre and Trannoy (2000) for an empirical application.

normalized in the unit interval. In this way, all the expressions of the form $(1-I(X))$ will be positive. (iii) Income distributions in this context may contain many zero values for member level income. Think, for example, of wives' or others' income. Therefore, it is convenient that the inequality measure is defined in the entire non-negative N-dimensional space, $\Re_{+}^{N}$. (iv) Suppose that we have two islands where income is equally distributed but whose means are different. If they now form a single entity, there will be no within-island inequality but there would be inequality between them. In income inequality theory we search for additively separable measures capable of expressing this intuition. In our context, given any population partition, it is desirable that social welfare can be expressed as the sum of two terms: a weighted average of welfare within the sub-groups, minus a term that penalizes the inequality between sub-groups. In this case, we say that the SEF is additively decomposable by population sub-groups. Unfortunately, there is no SEF which satisfies all these requirements. However, a few SEFs satisfy some of them and provide acceptable alternatives for the two empirical sub-sections of the paper.

Consider the SEF $W_G(X) = \mu_X(1 - G(X))$, where *G* is the Gini coefficient. It has been known since the publication of Sen's work in 1976 that this SEF can be obtained from an explicit axiom system. Moreover, W_G is defined on $\Re_{+}^{N}$. In its usual decomposition, the Gini coefficient can be expressed as the sum of three terms: a within-group, a between-group and an interaction term. In addition, it is decomposable by income source, involving the sources' Gini coefficients, income shares and Gini correlations between income sources and total income.[7] However, none of these two decompositions make the Gini SEF additively separable by population sub-groups.

It is well known that if the SEF is assumed to be homothetic, then it can be expressed as $W_{AKS}(X) = \mu_X(1 - I^{AKS}(X))$, where I^{AKS} is the relative inequality index obtained according to the Atkinson-Kolm-Sen procedure which uses the notion of an equally distributed income. The family of Atkinson SEFs can be written as $W_{A(\varepsilon)}(X) = \mu_X(1 - A(\varepsilon)(X))$, where $A(\varepsilon)$ is the Atkinson index and ε is a parameter reflecting different degrees of inequality aversion. $A(\varepsilon)$ also takes values in the unit interval, but it is only defined for positive income in the space $\Re_{++}^{N}$. Moreover, this family of SEFs is not additively decomposable by population sub-groups.[8]

For the decomposability property, one can inspect the family $W_C(X) = \mu_X(1 - I_C(X))$, where I_C identifies a member of the GE (general entropy) family of relative inequality indices. Consider the case $c = 1$, i.e., the

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[7] For a criticism of this decomposition in the present context, see Cancian and Reed (1998). For an answer to this criticism and a full discussion of the Gini coefficient's decomposability property see Lerman (1999).
[8] See Blackorby *et al*. (1981) for the decomposability properties of the Atkinson index.

index first suggested by Theil:

$$I_1(X) = (1/N)\sum_i {x_i}/{\mu_X}\ log\left({x_i}/{\mu_X}\right).$$

Given any partition of X into K sub-groups, X^k, $k = 1,\ldots,K$, Herrero and Villar (1989) show that the SEF $W_1(X) = \mu_X(1 - I_1(X))$ is additively decomposable in the following sense:

$$W_1(X) = \sum_k p^k\, W_1(X^k) - \mu_X\, I_1(\mu^1,\ldots,\mu^K), \tag{8}$$

where p^k is the demographic share of sub-group k in the population, and ($\mu^1,\ldots,\mu^K$) is the income distribution in which each individual is assigned the mean income of the sub-group to which s/he belongs. Thus, overall social welfare is equal to two terms:[9] the weighted average of welfare within each sub-group, $W_1(X^k)$, with weights equal to the demographic shares, p^k; and a term equal to the between-group income inequality $I_1(\mu^1,\ldots,\mu^K)$, weighted by the distribution mean μ_X. Moreover, in empirical applications, including this one, the expression $(1 - I_1(X))$ is generally positive. However, I_1 is only defined on $\Re^N_{++}$.

Consider all other SEFs which use the GE family of inequality indices, $W_c(X) = \mu_X(1 - I_c(X))$ with $c \neq 1$. As pointed out in Ruiz-Castillo (1995), the only SEF in this class for which the weights in the within-group term add up to one, is the function $W_2(X) = \mu_X(1 - I_2(X))$ where I_2 is half the square of the coefficient of variation. However, in this case the weights are the sub-groups' income shares, so that richer sub-groups weigh more than poorer ones in social welfare. This is a less appealing property from the normative point of view than the corresponding one for W_1 (see expression (8)), where the sub-groups' weights are given by their demographic shares. An advantage of W_2 is that it is defined in all of $\Re^N_+$. A final difficulty with this indicator is that the inequality index I_2 is not bounded above by one. As a matter of fact, it easily reaches values greater than one (see, for example, Cancian and Reed, 1998, and Section 4 of this paper). In these cases, the expression $(1 - I_2(X))$ becomes negative, thus distorting the interpretation of the relative indexes of income mobility introduced earlier.

The SEFs used in the sequel are the following. First, we use the Gini SEF W_G to

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[9] Herrero and Villar (1989) also show that $W_1(X) = \Sigma_i \alpha_i x_i$, where $\alpha_i = [1 - ln(y_i/\mu)]/N$. Thus, individuals whose incomes equals the population mean receive a weight equal to $1/N$, and individuals with incomes above or below the mean receive weights increasingly smaller or greater, respectively, than $1/N$. From a normative point of view, this is an appealing form of weighted utilitarianism.

assess the contribution of household member sources to husband-wife households' income mobility. This measure is chosen because different income distributions can include many zero income values and because Gini inequality indexes take values in the unit interval. To check the robustness of the results thus obtained, the SEF W_2, also defined in $\Re_{+}^{N}$, will be used. Since in the analysis of wives' and other adults' income contributions the reference distributions only contain a handful of zero values, in these cases the two following SEFs will also be used: W_1 and the Atkinson function for a value of ε=1, $W_{A(1)}(X) = \mu_X (1 - A(1)(X))$, where A(1) is ordinally equivalent to the member I_0 of the GE family, the mean logarithmic deviation. For simplicity, W_A denotes this member of the Atkinson family.

The SEF W_1 is used for decomposability purposes. As far as the first criterion is concerned, for any partition of the set of husband-wife households, $(X,Y) \in \Re_{++}^{2N}$, divided into K sub-groups (X^k, Y^k), $k = 1,\dots,K$, we have:

$$M(X, Y) = \frac{(W_1(Z) - W_1(Z_b))}{W_1(Z_b)} = \frac{(I_1(X) - I_1(Z))}{(1 - I_1(X))}$$
$$= \frac{\sum_k v_X^k I_1(X^k) + I_1(\mu_X^1,\dots,\mu_X^K) - \sum_k v_Z^k I_1(Z^k) - I_1(\mu_Z^1,\dots,\mu_Z^K)}{(1 - I_1(X))} \qquad (9)$$

For each k, $Z^k = X^k + Y^k$, and v_j^k is the income share of sub-group k in distribution j, where $j = X$, Z; $\mu_j = (\mu_j^1,\dots,\mu_j^K) \in \Re_{++}^{N}$ is the income distribution in which each husband-wife household in distribution j is assigned the mean income of the sub-group X^k or Z^k to which it belongs, μ_X^k or μ_Z^k, respectively.

For each k, consider the income mobility within each sub-group $M(X^k, Y^k) = (I_1(X^k) - I_1(Z^k))/(1 - I_1(X^k))$. Given the set of husband-wife households $(\mu_X, \mu_Y) \in \Re_{++}^{2N}$, define the income mobility index $M(\mu_X, \mu_Y) = (I_1(\mu_X) - I_1(\mu_Z))/(1 - I_1(\mu_X))$. Using the last two definitions, expression (9) can be written as follows:

$$M(X, Y) = \sum_k \alpha^k M(X^k, Y^k) + \beta M(\mu_X, \mu_Y) + S \qquad (10)$$

where

$$\alpha^k = \frac{\left(v_X^k\left(1 - I_1\left(X^k\right)\right)\right)}{\left(1 - I_1(X)\right)},\ \beta = \frac{\left(1 - I_1\left(\mu_X\right)\right)}{\left(1 - I_1(X)\right)},$$

and

$$S = \frac{\left(\sum_k \left(v_Z^k - v_X^k\right) I_1\left(Z^k\right)\right)}{\left(1 - I_1(X)\right)}$$

Thus, for any partition of the set of husband-wife households $(X,Y) \in \Re_{++}^{2N}$ divided into K sub-groups (X^k, Y^k), the income mobility index $M(X,Y)$ can be decomposed into three terms: (i) a within-group term, which is a weighted sum of the income mobility within each sub-group; (ii) a between group term, which contains the income mobility between the sub-groups, $M(\mu_X, \mu_Y)$, weighted by the factor β, and (iii) a term S which captures differences between income shares.

3. Data and descriptive analysis

The Spanish 1990–91 EPF provides information about all income sources received by a maximum of four household members (for detailed information, see INE, 1992). This paper studies a sample of 16,556 husband-wife households where both spouses are present and other persons could also be living in the household. This sample is representative of 8,904,871 households and constitutes 79.1 per cent of all households living in residential housing in Spain.[10]

Member level income data collected and used for this analysis include: annual wage earnings, net of social security contributions and income tax withdrawals; unemployment benefits; self-employment income; and old-age, disability and other public pensions. Non-cash income components such as imputed rents or in-kind wages could not be imputed to individual household members. Capital income is also excluded due to imputability and reliability problems. Out of a total of 42,529 household members in the sample aged 16 years of age or older, 46.4 per cent receive some positive income. In nine cases negative incomes have been made equal to zero.

It could be argued that a husband-wife household's welfare is better approximated by some income measure that takes into account household size. Following Buhman *et al.* (1988), household i's equivalent income z_i^e can be defined as

[10] Instead both Alba and Collado (1998) and Gradín and Otero (1999) restrict themselves to husband-wife households where both spouses are aged 16–64

$$z_i^e = z_i / (s_i)^{\Theta}, \Theta \in [0, 1],$$

where z_i and s_i are, respectively, unadjusted aggregate income and household size in household i. The parameter Θ is the equivalence elasticity: the greater Θ, the smaller the economies of scale in consumption within the household are assumed to be. For comparability with other studies, most results presented are for unadjusted household income, that is, for Θ = 0 under the assumption that economies of scale are infinite. However, the robustness of the results to other choices of Θ are discussed in the next section.

Table 1 presents descriptive statistics concerning the three types of household members distinguished in this study: husbands, wives, and other household members aged 16 years of age or older. In Spain, as in other Southern European countries, the latter group is important. Adults other than husbands and wives account for one-fourth of all adults in husband-wife households. Approximately, 34.6 per cent of husband-wife households receive some income from these adults[11] as opposed to 32.3 per cent of households where wives receive income. Other adults contribute 13.6 per cent of husband-wife households' income, slightly above the wives' share that is equal to 11.2 per cent.

Most papers in this area concentrate, almost exclusively, on the wives' contribution to husband-wife households' income inequality. Given the importance of the other adults in the Spanish economy, this paper focuses on a comparison of the contribution of wives and other's income to husband-wife households' income mobility. Traditionally, the distribution of husbands' incomes has been considered the reference distribution against which the contribution of the rest of the household members' income can be evaluated. In this paper, we define the reference household income as total income across all member income minus the member income for which the impact is being assessed. Thus, for example, the wives' contribution according to the two criteria introduced in Section 2 is studied by computing $M(X, Y)$ and $M^*(X, Y)$; X = husbands' plus others' income and Y = wives' income. Consequently, Figure 1A shows the distribution of income and member income shares among wives by deciles of the reference distribution. Similarly, Figure 1B shows the same information for other adults by deciles of the sum of husbands' and wives' income.

[11] Other household member income is obtained by aggregating the income from all adult household members other than husbands and wives.

Table 1. Descriptive statistics of individuals living in husband-wife households in Spain, 1990–91

	Population		Husband-wife households (a)		
Household members	**Number of persons**	**Percentage**	**Percentage of households receiving income from household members**	**% income share**	**Mean income* (pesetas)**
Husbands	8,904,871	38.9	99.5	75.2	1,364,404
Wives	8,904,871	38.9	32.3	11.2	780,628
Other	5,064,877	22.1	34.6	13.6	991,614
Age-16–30 years	3,729,347	16.3	24.9	9.2	968,357
Age-over 30 years	1,335,531	5.80	13.8	4.4	734,772
ALL	22,874,620	100.0	100.0	100.0	1,952,657**
Males	11,048,441	48.3	99.6	83.2	1,569,028
Females	11,826,179	51.7	46.4	16.8	840,446

Notes: a) The unit of analysis is the household. *Means based on zero and positive income. **Refers to total household mean income.

Figure 1. Percentage distribution and income shares for wives by deciles of husband + other (reference) income: Spain 1990–91

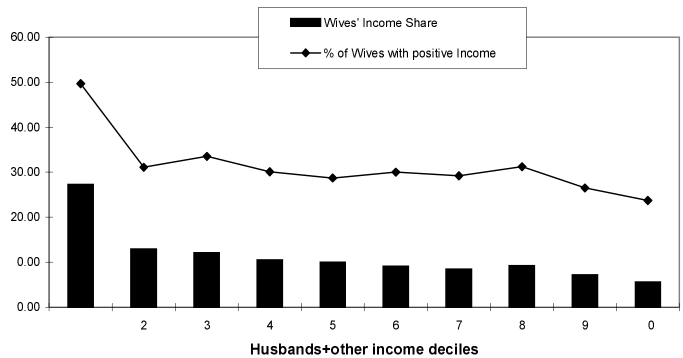
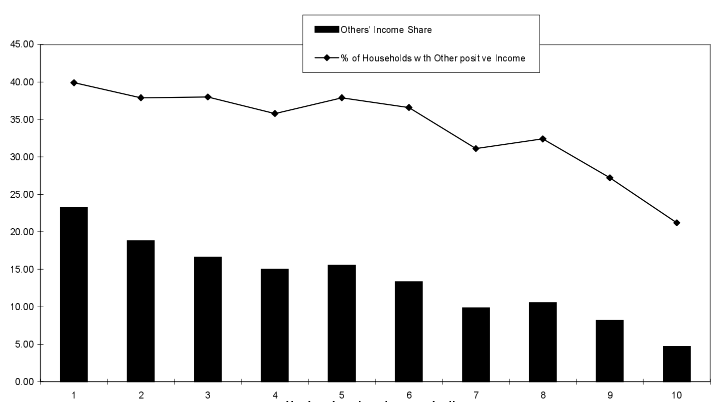


Figure 1B. Percentage distribution and income shares for others by deciles of husbands+wives (reference) income: Spain, 1990–91



The patterns in Figures 1A and 1B are very similar for member based income sources. On one hand, on average, 32.3 per cent of all wives receive some income

(Table 1). However, the lower the decile of the reference distribution the larger is the percentage of income recipients. The percentage of wife income recipients drops quite dramatically from 49.7 to 31.1 per cent from the first to the second decile, but diminishes smoothly from the third to the tenth decile down to 23.7 per cent (Figure 1A). Quite similarly, the percentage of husband-wife households with other adults receiving income diminishes smoothly from 39.9 per cent in the first decile to 21.2 per cent in the last decile. On the other hand, the wives' income share drops from 27.3 to 12.9 per cent from the first to the second decile, but diminishes continuously from there on with a single reversal in the eighth decile. Similarly the others' income share diminishes continuously with minor reversal exceptions in the fifth and eighth deciles. From this initial information, it can be expected that both wives and other adult incomes play a similar, and mild, equalizing role relative to the aggregate income distribution. In other words, both sources are expected to contribute a small positive amount to husband-wife households' income mobility.

4. Empirical results

4.1 Contribution of member level income to husband-wife households' income mobility

This sub-section is devoted to the contribution of wives, other adults, and husbands to husband-wife households' income mobility according to the two criteria introduced in Section 2.

As pointed out already, wives do not receive any income in 67.7 per cent of husband-wife households, and there is no income from other adults in 65.4 per cent of the households considered in this study. Table 2 presents income inequality results for different member based income sources accounting for zero values. Only those inequality measures defined in $\Re_+^N$, namely, the Gini coefficient and the member I_2 of the GE family, are used for this part of the analysis.

Only for the specification Y = husbands and X = wives plus others, is it the case that $I(Y) < I(X)$. Therefore, as shown in Section 2.1, both the structural and the overall mobility indexes $SM(X, Y)$, $M(X, Y)$, and $M(X, U_Y)$ must be positive. When Y = wives or others and $I(Y) > I(X)$, the only thing *a priori* that is certain is that structural mobility is negative, i.e., $SM(X, Y)$ and $SM(X, U_Y)$ < 0. Whether or not exchange mobility due to rank reversals between X and Y (or between X and U_Y) offsets those negative values is an open empirical question. The evidence for the Gini SEF is in Table 3. The first two panels refer to the first criterion, while the third panel refers to the second one.

Table 2. Household income inequality for several specifications of *X* and *Y* using Gini and I_2 indices: Spain, 1990–91

	Specification of *X* and *Y* member incomes		All member income
	***Y* = Wives'**	***X* = Husbands' and others'**	***Z* = *X*+*Y***
Gini	0.803	0.329	0.323
I_2	1.958	0.334	0.291
	***Y* = Others'**	***X* = Husbands' and wives'**	
Gini	0.794	0.325	
I_2	1.877	0.349	
	***Y* = Husbands'**	***X* = Wives' and others'**	
Gini	0.317	0.653	
I_2	0.396	0.893	
	***Y*=Females'**	***X*=Males'**	
Gini	0.718	0.324	
I_2	1.223	0.354	

Notes: The unit of analysis is the household. Others' income is obtained by aggregating the income from household members other than husbands and wives. Household female (male) income is obtained by aggregating the income of wives (husbands) and the rest of women (men) in the household.

As far as the first criterion, the results in Tables 2 and 3 deserve the following three comments: (i) wives' income inequality (0.803) is somewhat greater than others' income inequality (0.794). However, the reference distribution in the first case, i.e., distribution X, exhibits greater income inequality (0.329) than the reference distribution in the second case (0.325). Therefore, both sources induce approximately the same structural mobility in absolute value. In addition, both sources happen to induce similar exchange mobility, which nearly offsets the negative structural mobility. In other words, observed aggregate income inequality (0.323) practically coincides with the income inequality that would have been obtained in the absence of any income mobility caused by wives' income (0.329) or others' income (0.325). Hence, the contribution of wives and others income to husband-wife households' income mobility is practically equal to zero;[12] (ii) Instead, due essentially to structural mobility, the contribution of

[12] Using data from Tables 1 and 2 in Cancian and Reed (1998), it is seen that in 1989 in the US wives' earnings inequality according to the Gini coefficient (0.587) is greater than reference earnings (husbands

husbands' income to husband-wife households' income mobility is positive and equal to 95.06 per cent; (iii) it could be argued that these findings are heavily dependent on large differences in mean income (see the last column in Table 1).

Table 3. Percentage contributions of member income to husband-wife households' social welfare according to the Gini social evaluation function, equivalence scale parameter Θ =0. Spain, 1990–91

Income source *Y* relative to reference source *X*				
Income source *Y*	**Total mobility**	**Structural mobility**	**Exchange mobility**	
First Criterion*	***M(X,Y)***	***SM(X,Y)***	***EM(X,Y)***	
Wives	0.57	–9.58	10.14	
Others	0.29	–11.95	12.24	
Husbands	95.06	67.77	27.29	
Sum of Contributions	95.92			
Female	–0.10	–12.06	11.96	
Mean differences removed				
	M(X,U$_Y$)	***SM(X,U$_Y$)***	***EM(X,U$_Y$)***	$A(\mu_X/\mu_Y)$
Wives	–23.40	–36.65	13.25	23.97
Others	–21.94	–34.24	12.30	22.23
Husbands	75.62	48.66	26.96	19.43
Female	–16.57	–30.27	13.70	16.47
Second criterion**	***M*(X,Y)***	***M*(U$_x$,Y)***	**Adjustment**	
Wives	–5.29	–38.32	33.03	
Others	–7.52	–37.08	29.56	
Husbands	–15.48	–9.50	–5.98	
Sum of contributions	–28.29			
Female	–8.67	–32.555	23.88	

Notes: *First criterion: Eliminating income from source *Y*; **Second criterion: Eliminating inequality from source *Y*; The sum of the contributions do not add up the total amount of welfare that needs to be accounted for due to the marginalist interpretation used in this paper.

The second panel in Table 3 presents information on $M(X, U_Y)$, where the influence of mean differences is removed. When Y = wives (or others), $I(Y)$ is

plus other incomes) inequality (0.359). This means that structural mobility is necessarily negative. However, in this case exchange mobility is large enough, so that wives' earnings contribution to husband-wife households' earnings mobility is positive and equal to $M(X, Y)$ = 100 (0.359 – 0.325)/(1 – 0.325) = 5.03 per cent.

considerably larger than $I(X)$ but μ_Y is smaller than μ_X Given the disequalizing role of Y from the structural viewpoint, the closer μ_Y is brought to μ_X, the greater in absolute value is the structural mobility induced by Y. The opposite is the case when Y = husbands. In this case, as μ_Y and μ_X are brought together structural mobility goes down. On the other hand, surprisingly enough, the exchange mobility induced by the three member based income sources, when mean incomes are equalized, is not that different from exchange mobility in the original situation. Consequently, unitary income mobility $M(X, U_Y)$ is lower than $M(X,Y)$ in the three cases. In particular, wives' and others' income contribution to husband-wife households' income mobility is now clearly negative. Because $I(Y) > I(X)$ when Y = wives or others, the fact that $(\mu_Y / \mu_X) < 1$ tends to make this source's contribution larger as measured by $M(X,Y)$. Symmetrically, because $I(Y) < I(X)$ when Y = husbands, the fact that $(\mu_Y / \mu_X) > 1$ causes the same effect. Thus, the adjustment factor $A(\mu_X / \mu_Y)$ in equation (5) in Section 2 is positive in all three member cases.[13]

As far as the second criterion, recall that the conceptual experiment consists of eliminating each source's income inequality, $I(Y)$, by adding the source mean income μ_Y to the corresponding reference distribution X. According to the results in the first column of the third panel in Table 3, it is found that, as expected, $M^*(X, Y)$ is negative for the three specifications.[14] Furthermore, the social welfare loss when husbands' income inequality is held constant is equal to 15.48 per cent, a larger figure in absolute value than the one obtained when each of the other two sources' income inequality is kept constant. Therefore, the source that induces a greater social welfare gain according to the first criterion now appears as the one whose income inequality is responsible for the greater welfare loss.

It could be argued that this result is heavily dependent on mean member income differences. Therefore, in the second column of this panel in Table 3, the second criterion is applied to a set of husband-wife households $(U_X, Y) \in \Re_+^{2N}$ where X is replaced by a distribution U_X with the same income inequality $I(X)$ and Y's mean income μ_Y. The ranking of sources is now consistent with previous findings: when mean incomes are equalized, the social welfare gain obtained

[13] In spite of the fact that in Spain income inequality is greater in 1980–81 (the Gini coefficient is 0.330 *versus* 0.323 for 1990–91), the pattern of members' income contributions to husband-wife households' income mobility according to the first criterion is the same as the one obtained in 1990–91. Using the W_G SEF, we have that $M(X, Y)$ = 0.21, 1.20, and 167.6, while $M(X, U_Y)$ = –31.3, –26.4, and 123.0, when Y = wives, others, and husbands, respectively.

[14] Using Cancian and Reed's (1998) data, it is found that when Y = wives, $M^*(X, Y)$ = 100(0.275–0.325)/(1–0.275)=–6.9 per cent.

when husbands' income inequality is eliminated is considerably smaller than the one obtained when the other two member sources' income inequality is eliminated.[15]

The negative sign in the husbands' case indicates that, even in the most favourable case, the elimination of member level income inequality leads to greater social welfare than preserving this source's income inequality and the welfare enhancing rank reversals between U_X and Y. Hence, in the language of Section 2.2 we cannot conclude that the contribution of husbands' income to husband-wife households' income mobility is strongly positive, a fact that casts some doubts on the empirical interest of the second criterion.

Finally, it is likely that the usual focus on the contribution of wives' income hides a wider interest about the contribution of females' income. Consequently, this contribution to husband-wife households' social welfare is reported in the last row of each panel in Table 3 (see also the income inequality among males and females in Table 2). Not surprisingly, given how close the contributions of wives and other adults are, the combined effect of wives' and other female adults' incomes is not very different from the impact of either of these two sources.

To what extent do these results depend on the SEF or the equivalence scale parameter value used? As far as the first question is concerned, the first two columns in Table 4 present, by way of example, a summary of results on $M(X,Y)$ for the three Y's specifications and two SEFs defined in $\Re_{+}^{2N}$: the Gini W_G and W_2, which uses the inequality index I_2 of the GE family.[16] The last two columns report estimates for Y = wives and others for two more SEFs defined only for positive income in $\Re_{++}^{2N}$: W_1, which uses the inequality index I_1 of the GE family, and the Atkinson SEF with parameter $\varepsilon = 1$, denoted by W_A.[17]

Starting with the usual case in which Θ=0, the values obtained for the different contributions, according to the different SEFs, are rather close, except for W_2. However, it is known that the coefficient of variation is rather sensitive to the upper tail of income distributions. Therefore, column 3 in Table 4 reports the estimates for W_2 when the upper one per cent of data is trimmed in all relevant distributions.[18] The results are now seen to be in line with those obtained using the remaining SEFs without trimming.

The lower panel in Table 4 includes results for $M(X,Y)$ when the equivalence

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[15] Again, this is the same pattern found in the 1980–81 Spanish dataset: when Y = wives, others, and husbands, $M^*(X, Y)$ = –3.87, –5.09 and –19.88, while $M^*(U_X, Y)$ = –44.93, –41.33 and –39.05, respectively.

[16] Results for $M(X, U_Y)$, $M^*(X, Y)$ or $M^*(U_X, Y)$ are available on request.

[17] Some elements of the reference distributions have zero income. The husband-wife households in this situation, 63 when X = husbands plus others, have been eliminated from the analysis. Therefore, results in Table 4 for W_1 and W_A refer only to 16,493 observations.

[18] The results before and after trimming, available on request, for the remaining SEFs are practically the same.

scales parameter is Θ=0.5. The only noticeable difference is that the smaller economies of scale are assumed to be, i.e., the larger Θ, the greater the others' income contribution to husband-wife households' income mobility appears to be. It is well known that relative household income or expenditures inequality follows a U pattern as Θ grows from 0 to 1, reaching a minimum for Θ in the range (0.4, 0.5).[19] In this context, the income inequality of the aggregate distribution Z for all specifications is considerably smaller for Θ =0.5 than for Θ =0 (0.304 *versus* 0.323, respectively). This would tend to raise $M(X,Y)$ for all specifications. However, when Y = wives $I(X)$ follows a similar U pattern, while when Y = others $I(X)$ remains fairly constant as Θ changes. Thus, only in the latter case $M(X,Y)$ turns out to be larger when Θ =0.5.

Table 4. Percentage contributions of member income to husband-wife households' social welfare according to difference social evaluation functions, equivalence scale parameters Θ = 0 and 0.5. Spain, 1990–91

Income Source *Y*	Social welfare due to members' incomes				
	Entire income distribution		Upper 1% of distribution trimmed	Positive incomes only	
	W_G	W_2	W_2	W_1	W_A
	Equivalence Scale Parameter Θ *= 0*				
Wives	0.57	6.07	0.48	1.20	0.87
Other	0.29	8.87	1.28	1.27	0.17
Husbands	95.06	564.75	300.12	–	–
	Equivalence Scale Parameter Θ *= 0.5*				
Wives	–0.42	7.54	–0.33	0.40	0.13
Other	2.96	15.31	3.22	3.56	2.30
Husbands	94.13	304.00	13.01	–	–

Notes: W_G = Social Welfare Function: Gini; W_2 = Social Welfare Function: ½ Coefficient of Variation; W_1 = Social Welfare Function: Mean Log Deviation; W_A = Social Welfare Function: Atkinson.

4.2 Decomposability results

It has been found that, according to the index $M(X,Y)$, both wives and other

[19] For the Spanish case, see Del Río and Ruiz-Castillo (2001). For other countries, see the references quoted in that paper.

adults make no noticeable contribution to husband-wife households' income mobility. However, taking into account that, for example, as much as 67.7 per cent of all wives receive no income, the following questions arise. First, what is the contribution of wives' income in the subset of husband-wife households in which wives do receive positive incomes? And second, how does this contribution vary depending on whether households do or do not receive income from other adults? Given that almost the same percentage of households do not receive income from other adults, the same questions can be asked with respect to this source.

First assume a partition of the set of husband-wife households $(X,Y) \in \Re_{+}^{2N}$ that are divided into (X^k, Y^k) subsets with k = 1, …, K. The index $M(X,Y)$ is seen to be additively decomposable according to equation 10. To begin with, consider the partition of the sample into three sub-groups where (X^1, Y^1) = husband-wife households in which wives have zero income, (X^2, Y^2) = husband-wife households in which only the spouses have income, and (X^3, Y^3) = husband-wife households in which both spouses and other adults all have income. These sub-groups represent, respectively, 68.2, 22.9 and 8.9 per cent of all husband-wife households. *A priori*, it is clear that $M(X^1, Y^1)$ = 0. Moreover, there are reasons to believe that $M(\mu_X / \mu_Y) < 0$ and $\beta > 1$. The interesting question is to compare $M(X^2, Y^2)$ and $M(X^3, Y^3)$ with $M(X,Y)$ = 1.20 (see column 4 in the first panel of Table 4). The empirical results are the following: $\beta M(\mu_X / \mu_Y)$ = –0.37, S = 0.48, $M(X^2, Y^2)$ = 4.30, and $M(X^3, Y^3)$ = 2.65. Therefore, in the two subsets where wives receive positive incomes, their contribution to social welfare is always greater than in the total sample of couples which includes a large proportion of wives with zero income.[20] This is particularly the case in the sub-set where only the two spouses receive any positive income.

Now consider the partition of the sample into three sub-groups where (X^1, Y^1) = husband-wife households in which there are no other adults or other adults have zero incomes, (X^2, Y^2) = husband-wife households in which only husbands and other adults have incomes, and (X^3, Y^3) = husband-wife households in which both spouses and other adults all have income. These sub-groups represent, respectively, 65.4, 25.6 and 8.9 per cent of all husband-wife households. The empirical results are the following: $\beta M(\mu_X / \mu_Y)$ = – 1.49, S= 1.28, $M(X^2, Y^2)$ = 4.70, and $M(X^3, Y^3)$ = 4.05. Therefore, in the two subsets where others receive positive incomes, their contribution to overall income mobility is of the same order of magnitude and is always greater than in the total sample where $M(X,Y)$ = 1.27 (see column 4 in the first panel of Table 4).

[20] This is also observed in Gradín and Otero (1999) for their sample of working age husband-wife households.

5. Conclusions

This paper has presented a social welfare framework in which the contribution of a given household member income is assessed by comparing the observed aggregate income distribution with two of the benchmark alternatives previously discussed in the literature. These alternatives are: (i) a situation in which, abstracting from efficiency considerations, the source being investigated had created no income mobility at all; and (ii) a situation in which the income inequality of a given source is eliminated by assigning each recipient the source's mean income.

The two time-period approach developed by CDW for the assessment of income mobility has been applied to multiple member based income sources within a single time period. This approach is able to distinguish between structural and exchange income mobility which capture, respectively, the welfare effect of differences between both sources' income inequality, and the rank reversals between the two income distributions. However, it has been pointed out that the main drawbacks of this approach are that the sum of the sources' contributions do not add up to the aggregate income inequality which is to be accounted for in each case, and that, like in the rest of the literature on inequality decomposition by factor components, this approach does not take into account individuals' behavioural responses.

A valuable contribution of the paper is the emphasis on the role played by mean income differences when evaluating a given source's contribution to husband-wife households' income mobility. For example, as in many other countries, in the Spanish case wives' and others' mean incomes (and income inequality) are considerably lower (and greater, respectively) than the analogous magnitudes in the corresponding reference distributions. If these sources' mean income and the mean income of the corresponding reference distribution are made equal, then their contribution to husband-wife households' income mobility is significantly lowered.

There are many contexts in which it might be interesting to express the contribution of, say, wives incomes to husband-wife households' income mobility in terms of the contribution of this member source in the sub-groups of a given population partition. This paper has presented an exact decomposition of this sort, which has been applied to the partition in which sub-groups depend on whether wives receive zero or positive income and, in the second case, on whether there is only one or more additional income receivers in each husband-wife household.

As far as dynamic aspects are concerned, it remains to be seen whether the conclusions in this paper are maintained in an inter-temporal scenario, with household members income measured over several years. This topic is left for further research.

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